Supporting Teacher Wellbeing: New Experimental Evidence

The impact of three wellbeing interventions for teachers in England using the Teacher Tapp app.

Teachertapp

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Executive Summary

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This report explores the impact of three wellbeing interventions for teachers in England using the Teacher Tapp app: gratitude journalling, positive affirmation messaging, and providing information about support organisations.

Key findings include:

1. Gratitude journalling had good engagement across all demographics, with 18% of teachers responding to all four prompts. However, there was no statistically significant difference in wellbeing between the journalling and control groups post-intervention.
2. Few teachers clicked through to read positive affirmation posts or visit support websites, despite viewing the messages. There were no significant wellbeing differences between intervention and control groups.
3. While no intervention significantly improved wellbeing, lessons were learnt
   a. Gratitude journalling was popular. A longer daily intervention with opt-in randomization may show positive effects.
   b. Low click-through rates suggest the app's homepage could be optimised to better display informational content.

The study highlights challenges in influencing teacher well-being through light-touch digital interventions and indicates areas for further research and development.

Background

Teacher wellbeing in England has been a subject of increasing interest due to difficulties with teacher retention in recent years. Academic research has explored various aspects of teacher mental health, the effectiveness of wellbeing initiatives, and the factors influencing teacher satisfaction and retention. Cross-sectional studies have shown that teachers exhibit high levels of stress and low wellbeing, as measured by factors such as dissatisfaction with work.[1] That said, teacher mental health and personal wellbeing in England have remained broadly

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[1] Kidger, J., Brockman, R., Tilling, K., Campbell, R., Ford, T., Araya, R., King, M., & Gunnell, D. (2016). Teachers' wellbeing and depressive symptoms, and associated risk factors: A large cross sectional study in English secondary schools.. *Journal of affective disorders*, 192, 76-82 . https://doi.org/10.1016/j.jad.2015.11.054.

stable over the last 20 years, despite a recent rise in reported mental health problems, which mirrors trends in other professions.[2]

A little is known about where teacher wellbeing is highest. For example, school-level initiatives that are embedded within supportive cultures and aim to reduce workloads and increase autonomy are more effective. By contrast, tokenistic interventions by schools that do not address the root causes of stress are less effective and can even be counterproductive.[3] There is some evidence that better teacher wellbeing is associated with better student wellbeing and improved quality of teacher-student relationships.[4]

Beyond teacher-focused interventions, some other initiatives have been shown to affect wellbeing. Gratitude journaling is the practice of regularly recording things for which one is grateful. It involves writing down positive events, experiences, or people that one appreciates, often on a daily or weekly basis. This activity is intended to shift focus from negative thoughts to positive ones, helping to foster a more positive mindset and increase overall well-being. There have been a large number of experimental studies that have shown gratitude interventions can have a small effect on reducing symptoms of depression and anxiety.[5] They have also been shown to improve measures of overall wellbeing, life satisfaction and positive affect.[6] These intervention studies are often quite short in duration, but usually involve daily journaling.

Two studies of gratitude journaling have been conducted specifically on pre-service teachers. These studies suggest that gratitude journaling positively impacts teachers by improving relationships, enhancing wellbeing, and fostering positive teaching outcomes. However, we know of no international intervention studies of gratitude journaling across the profession as a whole.

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[2] Jerrim, J., Sims, S., Taylor, H., & Allen, R. (2021). Has the mental health and wellbeing of teachers in England changed over time? New evidence from three datasets. *Oxford Review of Education*, 47, 805 - 825. https://doi.org/10.1080/03054985.2021.1902795.

[3] Brady, J., & Wilson, E. (2020). Teacher wellbeing in England: teacher responses to school-level initiatives. *Cambridge Journal of Education*, 51, 45 - 63. https://doi.org/10.1080/0305764x.2020.1775789.

[4] Harding, S., Morris, R., Gunnell, D., Ford, T., Hollingworth, W., Tilling, K., Evans, R., Bell, S., Grey, J., Brockman, R., Campbell, R., Araya, R., Murphy, S., & Kidger, J. (2019). Is teachers' mental health and wellbeing associated with students' mental health and wellbeing?. *Journal of affective disorders*, 242, 180-187 . https://doi.org/10.1016/j.jad.2018.08.080.

[5] Cregg, D., & Cheavens, J. (2020). Gratitude Interventions: Effective Self-help? A Meta-analysis of the Impact on Symptoms of Depression and Anxiety. *Journal of Happiness Studies*, 22, 413-445. https://doi.org/10.1007/s10902-020-00236-6.

[6] Emmons, R., & McCullough, M. (2003). Counting blessings versus burdens: an experimental investigation of gratitude and subjective well-being in daily life.. *Journal of personality and social psychology*, 84 2, 377-89 . https://doi.org/10.1037/0022-3514.84.2.377.
O'Connell, B., O'Shea, D., & Gallagher, S. (2018). Examining Psychosocial Pathways Underlying Gratitude Interventions: A Randomized Controlled Trial. *Journal of Happiness Studies*, 19, 2421-2444. https://doi.org/10.1007/S10902-017-9931-5.

Positive affirmation messaging involves using positive statements and affirmations to influence thoughts, behaviours, and attitudes. This technique is widely used in various fields, including psychology, health communication, and personal development, to foster positive mental attitudes and encourage adaptive responses to challenges. The evidence of their impact on wellbeing mainly relates to their use in relation to the acceptance of health-risk information where it has been shown to evoke positive behaviours.[7] During the pandemic, two intervention studies of belonging affirmation showed that it reduced employee burnout and resignations in front line workers.[8]

Where teachers suffer from very low wellbeing and depressive symptoms, there are organisations available to support them, but they may not be aware of them. These include the trades unions, specialist organisation to help headteachers and charities such as Education Support that run helplines for all teachers and education professionals. Evidence has shown that media advertisements are the most effective strategy for recruiting participants for depression-related programmes, compared to other methods like letters to healthcare providers.[9] Online campaigns on platforms like Facebook can enhance mental health literacy and willingness to seek additional information, although they may not significantly change help-seeking attitudes.[10]

About Teacher Tapp

Teacher Tapp is a daily survey and CPD app that is free to download and used by over 10,000 teachers each day in England. The app validates the status of teachers through a series of survey questions and by asking them to enter their school name. Each day at 3:30pm a notification invites teachers to answer around three questions, to view results from yesterday's questions, and to read messages and articles posted on the homepage of the

[7] Harris, P., & Epton, T. (2009). The Impact of Self-Affirmation on Health Cognition, Health Behaviour and Other Health-Related Responses: A Narrative Review. Social and Personality Psychology Compass, 3, 962-978. https://doi.org/10.1111/J.1751-9004.2009.00233.X.
Howell, A. (2017). Self-Affirmation Theory and the Science of Well-Being. *Journal of Happiness Studies*, 18, 293-311. https://doi.org/10.1007/S10902-016-9713-5.
[8] Goktas, S.m Gezginci, E., & Kartal, H. (2022). The Effects of Motivational Messages Sent to Emergency Nurses During the COVID-19 Pandemic on Job Satisfaction, Compassion Fatigue, and Communication Skills: A Randomized Controlled Trial. *Journal of Emergency Nursing,* 48(5), 547-558.
Linos, E., Ruffini, K., & Wilcoxen, S. (2022). Reducing burnout and resignations among frontline workers: A field experiment. *Journal of Public Administration Research and Theory,* 32(3), 473-488.
[9] Schlernitzauer, M., Bierhals, A., Geary, M., Prigerson, H., Stack, J., Miller, M., Pasternak, R., & Reynolds, C. (1998). Recruitment methods for intervention research in bereavement-related depression. Five years' experience.. *The American Journal of Geriatric Psychiatry*, 6 1, 67-74 . https://doi.org/10.1097/00019442-199802000-00009.
[10] Hui, A., Wong, P., & Fu, K. (2015). Evaluation of an Online Campaign for Promoting Help-Seeking Attitudes for Depression Using a Facebook Advertisement: An Online Randomized Controlled Experiment. *JMIR Mental Health*, 2. https://doi.org/10.2196/mental.3649.

app. This study utilises both the survey question element and the homepage of the app to support teacher wellbeing.

Intervention design

We designed three separate interventions to support teacher wellbeing on Teacher Tapp. Our sample of daily respondents was divided into four groups so that there was no overlap between the interventions we were testing. Interventions received by respondents depended on both randomised grouping and teacher level of wellbeing (described in a later section). This section describes each of the interventions.

Table 1: Summary of interventions in study

	Very low wellbeing	Low wellbeing	Good wellbeing	Very good wellbeing
Randomised Group 1	Control	Control	Control	Control
Randomised Group 2	Gratitude journaling	Gratitude journaling	Gratitude journaling	Gratitude journaling
Randomised Group 3	Positive messages	Positive messages		
Randomised Group 4	Information about support groups			

Intervention – Gratitude journaling

All teachers within the Gratitude Journaling Randomised Group were given an open question inviting them to share a positive moment from the past week. These questions were scheduled weekly from Friday 10th November 2023 for four weeks. The exact wording of the open-ended response question was:[11]

> *Could you share a moment from the past week at school that you found especially rewarding or enjoyable?*

On the final Friday, we asked an additional open-ended question:

> *How do you feel about the process of recording your positive experiences each Friday?*

Intervention – Positive affirmation messaging

Teachers within the Positive Messaging Randomised Group, who were in the bottom half of the distribution by teacher wellbeing, and who had consented to participate, received a positive affirmation message on four different occasions (one a week) during January and

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[11] Question IDs are 18160 and 18161

February. These messages each linked to a short blog post with positive descriptions of working in schools that had been collated from the gratitude journaling.[12]

Table 2: Positive affirmation messages

Date	Text of message	Blog URL
17th Jan 2024	Inside the classroom, every day brings an opportunity to witness the wonders of learning. From the lightbulb moments to the gradual blossoming of understanding, these experiences are the heart of teaching. Explore our latest blog post to hear from teachers about the rewarding and joyful moments they encounter as they guide their students on the path of learning.	https://teachertapp.co.uk/articles/the-joyful-moments-in-a-teachers-classroom/
24th Jan 2024	Connections with teaching colleagues offer support, laughter, and shared successes, contributing significantly to a teacher's professional life. Read our blog post with heartwarming experiences teachers have with their fellow colleagues, celebrating the spirit of teamwork and camaraderie in schools.	https://teachertapp.co.uk/articles/the-joy-of-colleague-interactions-in-schools/
1st Feb 2024	Venturing beyond the school grounds for trips and extracurricular activities can be exhausting and challenging. However, it can also bring some of the most rewarding and delightful moments in a teacher's career. Read our blog to learn about the joyful experiences other teachers have shared about their offsite adventures.	https://teachertapp.co.uk/articles/the-magic-of-school-trips-and-extracurricular-activities/
6th Feb 2024	A student's learning journey is filled with milestones that are as rewarding for teachers as they are for the students. Read our blog post with stories from teachers about the joys and triumphs of witnessing student attainment.	https://teachertapp.co.uk/articles/celebrating-the-joy-of-student-success/

Intervention – Support organisations

Teachers with very low reported wellbeing within the Support Organisations Randomised Group received a message advertising how they can get support from the charity Education Support. This advert was written in collaboration with the charity and was shown on four occasions: 17th January, 24th January, 1st February and 6th February. The wording of the advert was as follows:[13]

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[12] Message IDs are 6397, 6400, 6398, 6399
[13] Message ID is 6376

Sample and randomisation

Teachers using the Teacher Tapp app took part in the experiments if they had signed up to join the England panel by 8th November 2023, the date of randomisation into four groups. Teachers could only participate in the research study analysis if they had answered the wellbeing questions at the start of November.

Teachers were asked to consent to receive messages within the study. Overall, 86.1% of panellists consented to receive messages. There was no variation in consent by randomisation group. However, teachers with the highest reported wellbeing prior to the study were less likely to consent to receive messages in the app, as shown in the table below.

Table 3: Percentages consenting to study by prior wellbeing quartile

	% Consenting
Q1 Highest Wellbeing	83.9 %
Q2	86.6 %
Q3	86.8 %
Q4 Lowest Wellbeing	87.0 %

Measuring wellbeing and professional attachment

Our main outcome measure in the study is teacher wellbeing and we used regular survey responses to construct overall measures of teachers' current wellbeing and professional attachment using factor analysis. The wellbeing score is used to both determine the treatments that the teacher received on the app, as well as analysing changes in wellbeing.

Wellbeing attribute

Teacher Tapp asks many different questions related to teacher wellbeing, but we use only three regularly asks in this part of the study. They are chosen to represent distinct and yet correlated aspects of wellbeing. The questions are:[14]

1. Have you recently felt constantly under strain? [5-point response scale]
2. To what extent are you suffering from burnout? [5-point response scale]
3. How content are you with life at school at the moment? [7-point scale]

The proportional factor variance in the factor analysis is 0.735, which means the single extracted factor accounts for a large proportion of the variance within the data and is likely to be a strong representation of the underlying construct.

We asked these questions to generate a measure of wellbeing at three points in time for this study: Start of November, December after the gratitude journaling, March after all the interventions were completed.

Professional attachment attribute

The professional attachment attribute was also constructed using factor analysis from three survey questions. It is solely used for analysis within this study and the questions were asked once in November at the start of the study. The questions asked are:[15]

1. I would leave teaching if I could find a job that matches my salary [6-point response scale]
2. I don't seem to have as much enthusiasm now as I did when I began teacher training [4-point response scale]
3. At the moment, how often does the thought of resigning from your job cross your mind? [5-point response scale]

Results

Gratitude journaling

All teachers in the Gratitude Journaling Randomised Groups were sent a question to the app inviting them to share positive experiences at school on four occasions. However, they would only see this message if they logged on that day. Of the 1,868 panellists who did open the app on all four Fridays, 18% chose to respond to the journaling prompt on all four occasions and 39% never chose to respond to the journaling prompt. Note that a journaling response is only counted if it is longer than 4 characters, so we exclude responses such as 'Yes', 'No', 'NA', and so on.

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[14] Question IDs are 334, 2555, 12199
[15] Question IDs are 2565, 309, 12971

The table below summarises the response behaviours for those who opened the app on each of the Fridays during the experiment. It shows that the fall in the proportion electing to journal on each Friday only falls a little over the course of the experiment suggesting little response fatigue on the part of teachers.

Table 4: Responses to journaling invitation by date

	Number app opened	Proportion journaling	Average character length of response
Friday 10th November	2,614	41%	83
Friday 17th November	2,519	37%	82
Friday 24th November	2,458	38%	77
Friday 1st December	2,422	37%	92

There were differences in the teachers' decisions to journal by demographic background. Overall, secondary teachers of arts subjects, including design and technology, were most likely to choose to journal, with science and maths teachers least likely to journal, as shown in the chart below.

Figure 1: Proportion of teachers responding to journaling prompts, by subject
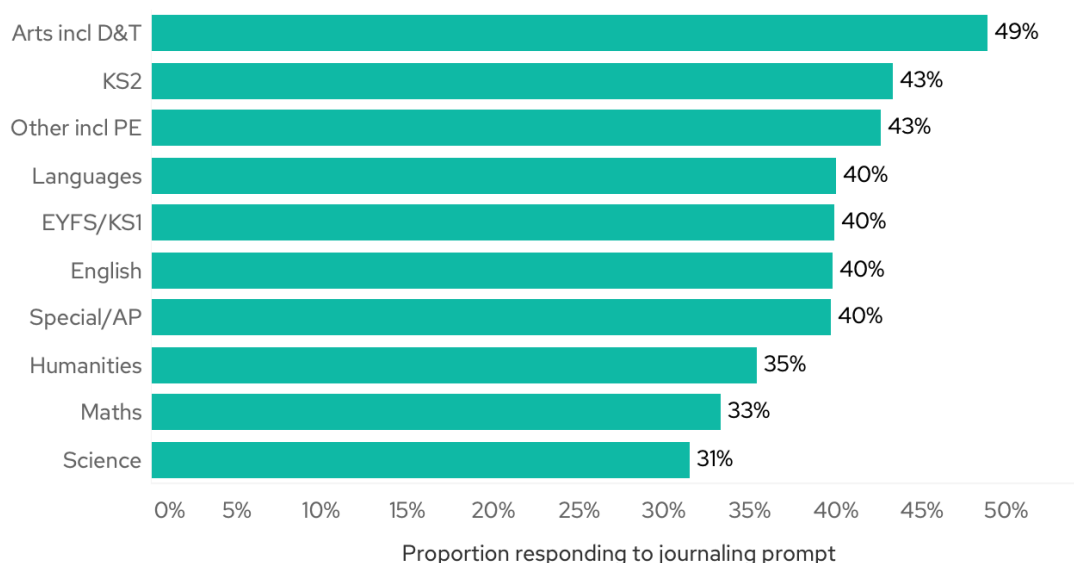
Teachers who provide a journaling response greater than 4 characters as a proportion of all those who opened the app that day, by subject. N=2,740

We look at how journaling varies by demographics in a single regression that holds constant all other characteristics. Overall, the model is not strongly predictive of the choice to journal. It shows no significant differences by gender or experience, but older teachers are generally more likely to journal. It confirms that teachers in the humanities, maths and science are

significantly less likely to journal. Assistant and deputy headteachers are less likely to journal than other teachers.

### Table 5: Regression analysis of journaling frequency, by demographics

		Coefficient	Standard error	P>|t|
Age group (ref=20s)	Age in 30s	0.0694	0.027	**0.012**
	Age in 40s	0.1007	0.030	**0.001**
	Age in 50s	0.1424	0.034	**0.000**
Sex (ref=male)	Female	0.0214	0.018	0.242
Experience (ref=Less than 5 years)	5-10 years	−0.0251	0.028	0.368
	10-20 years	−0.0121	0.030	0.689
	Over 20 years	−0.0152	0.034	0.656
Subject (ref=KS2)	Arts incl D&T	0.0314	0.038	0.412
	EYFS/KS1	−0.0379	0.031	0.219
	English	−0.0194	0.029	0.499
	Humanities	−0.0711	0.028	**0.010**
	Languages	−0.0374	0.039	0.340
	Maths	−0.0844	0.028	**0.003**
	Other incl PE	0.0000	0.033	0.998
	Science	−0.1022	0.027	**0.000**
	Special/AP	−0.0787	0.061	0.199
Seniority (ref=classroom teacher)	Middle Leader	−0.0166	0.019	0.386
	Other teacher	−0.0816	0.062	0.186
	SLT (exl head)	−0.0673	0.024	**0.006**
	Headteacher	−0.0465	0.045	0.301
Constant (ref: Age in 20s, male, less than 5 years; teaching KS2; classroom teacher)		0.3692	0.031	0.000

N= 2623; OLS Adj. R-squared=0.018

We looked across journaling responses and categorised them into the types of experiences they mentioned. 31% of responses mentioned something happening in the classroom. 30% mentioned something outside the classroom and within this group school trips, assemblies, parents and sports were frequently mentioned. 13% specifically mentioned Christmas activities, particularly on the last Friday of the experiment. 8% mentioned something related to seeing a student or student achieve or learn. 7% said they could not think of something positive that had happened during the week. (In addition, around 2% of responses were unclassifiable.)

Overall, the length of the journal responses was fairly short with a median character length of 62 and mean average length of 79. An example of a comment of median length is: "*Year 7 being really interested in the structure of the earth!*" That said, Figure 2 below shows that many teachers wrote very long responses to the journaling prompt.

Figure 2: Length of responses (in characters) to the journaling prompt

Length (characters) of journalling entry on 17th November (grouped to nearest 10)
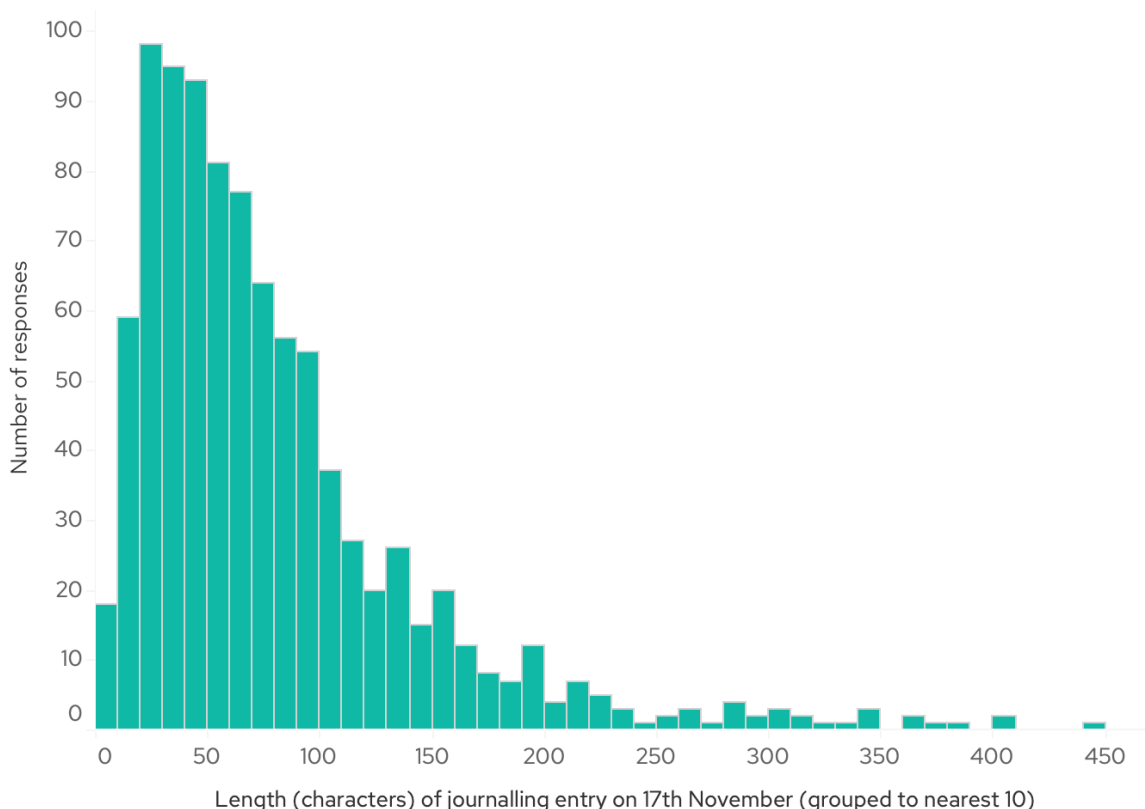
After the four journaling invitations had completed, we gave teachers the open-ended question to learn how they felt about journaling. We received just over a 1,000 responses from teachers and we analysed the sentiment of their responses. To analyse the sentiment of a set of statements, we used the SentimentIntensityAnalyzer from the VADER (Valence Aware Dictionary and sEntiment Reasoner) module in the NLTK (Natural Language Toolkit) library. This tool breaks down text into individual words and phrases, assigns each a sentiment score (positive, negative, or neutral), and adjusts these scores based on context, including punctuation and negations. It then combines these scores to provide a metric of sentiment ranging from –1 (most negative) to +1 (most positive).

To give an example of how the values of sentiments relate to typical responses, here are some examples:

- Most positive sentiment (0.96): It's a nice psychological approach to focus me/us on the positives of the week so we go into the weekend thinking about the good. Would

be great to have an app to share daily positives. The research really shows this as a great way to refocus away from the negatives.

- Average sentiment (0.27): Ok. Sometimes hard to remember!
- Negative sentiment (−0.54): Reminds me of the bad things each week

Most of the strongly negative sentiments were related to teachers who felt their job was currently very difficult and unpleasant. Perhaps it is no surprise that those who chose to journal the most frequently were the most positive in their comments about it and those who chose not to journal at all were the most negative.

None of the teacher demographic characteristics were associated with their sentiment score. Figure 3 shows that those with the lowest wellbeing before the experiment started were least positive about the act of gratitude journaling. This may just reflect "dispositional pessimism", i.e. the general tendency of this group to view life events in a most negative light. However, the nature of their responses do reveal the difficulty that if, genuinely, there were no positive experiences during the week, then it is upsetting to be reminded of this in a gratitude journal prompt.

Figure 3: Sentiment of attitude to journaling, by prior wellbeing quartile
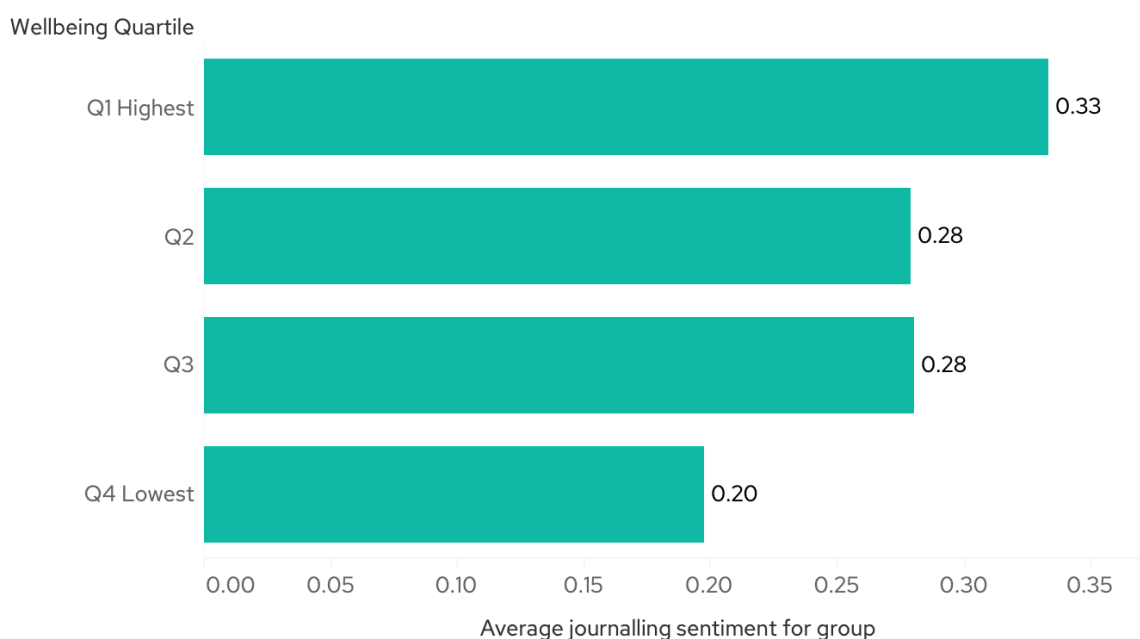
We now review whether the journaling group experienced an improvement in wellbeing as a result of these four journaling episodes. It is important to note that the propensity to journal is not strongly associated with prior levels of wellbeing, as shown in Figure 4.

Figure 4: Rates of journaling, by prior wellbeing quartile
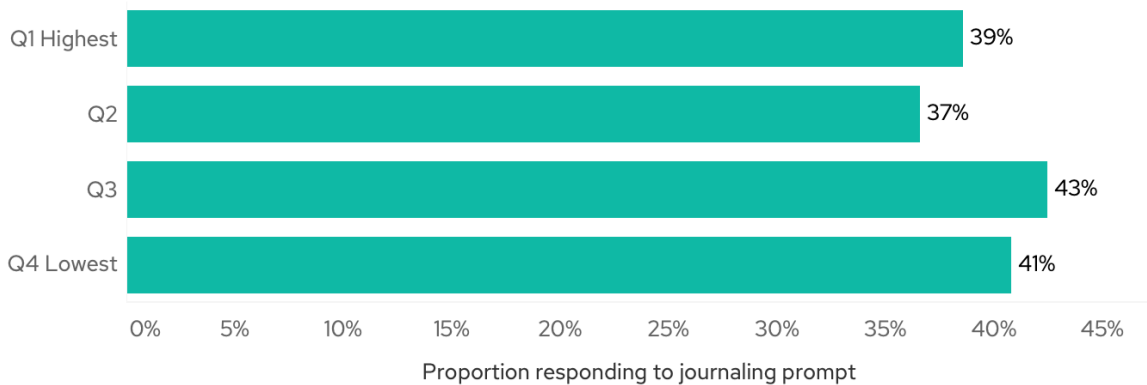
Teachers who provide a journaling response greater than 4 characters as a proportion of all those who opened the app that day, by subject. N=2,161

Figure 5 shows levels of wellbeing for those in the Gratitude Journaling and Control Randomised Groups. It shows that before the experiment, average wellbeing was close to zero for both groups (i.e. the randomisation worked). Wellbeing fell for both groups – this typically happens over the course of a teacher's term as they become more tired so is not surprising. Whilst the journaling group had better wellbeing by the end of term, the difference between them and the control group is not statistically significant. Moreover, the gratitude journaling questions did not affect the rate of long-term use on the Teacher Tapp app.

Figure 5: Wellbeing before and after journaling, by randomised group
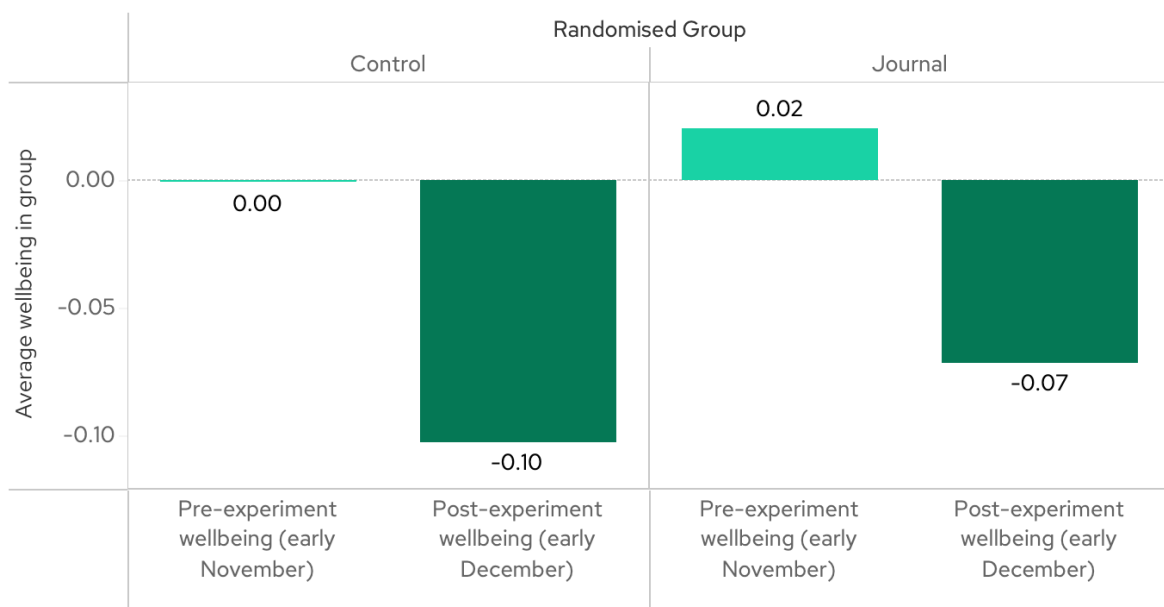
Control group N=1,923; Journal group N=1,964.

Positive affirmation messaging

The positive messages were placed on the app for those who were in the Positive Messaging Randomised Group and who were in the bottom two quartiles of wellbeing, as measured at the start of the experiment.

All those who consented to participate were presented with the positive message as part of the Teacher Tapp home screen when they completed their day's survey questions. They then had a choice as to whether to click through to read the full positive affirmation messaging post. Table 6 shows the proportions seeing the positive message and choosing to read the blog post on each of the four days.

Table 6: Proportion of teachers viewing positive affirmation message and reading blog post

	Number viewing message	Number viewing blog post
17th Jan 2024	858	17
24th Jan 2024	842	14
1st Feb 2024	846	1
6th Feb 2024	813	14

The proportion of teachers choosing to click through and read the blog posts was very low. It should be noted that they were displayed on a home page with other options, such as reading posts relevant to their professional development. Chi-squared tests for each demographic variable (age, gender, experience, subject, seniority) shows no association between teacher characteristics and propensity to read the post.

Figure 6 shows levels of wellbeing for those in the Positive Messaging and Control Randomised Groups, for those in the lowest two quartiles of wellbeing prior to the experiment. The first two columns show wellbeing before the experiment (in November and December). The last column shows average wellbeing in March, after the experiment closed. It clearly shows no differences in wellbeing between the groups, and this is confirmed by regression analysis (not reported here). Moreover, the positive messaging did not affect the rate of long-term use on the Teacher Tapp app.

Figure 6: Wellbeing before and after the positive affirmation messaging
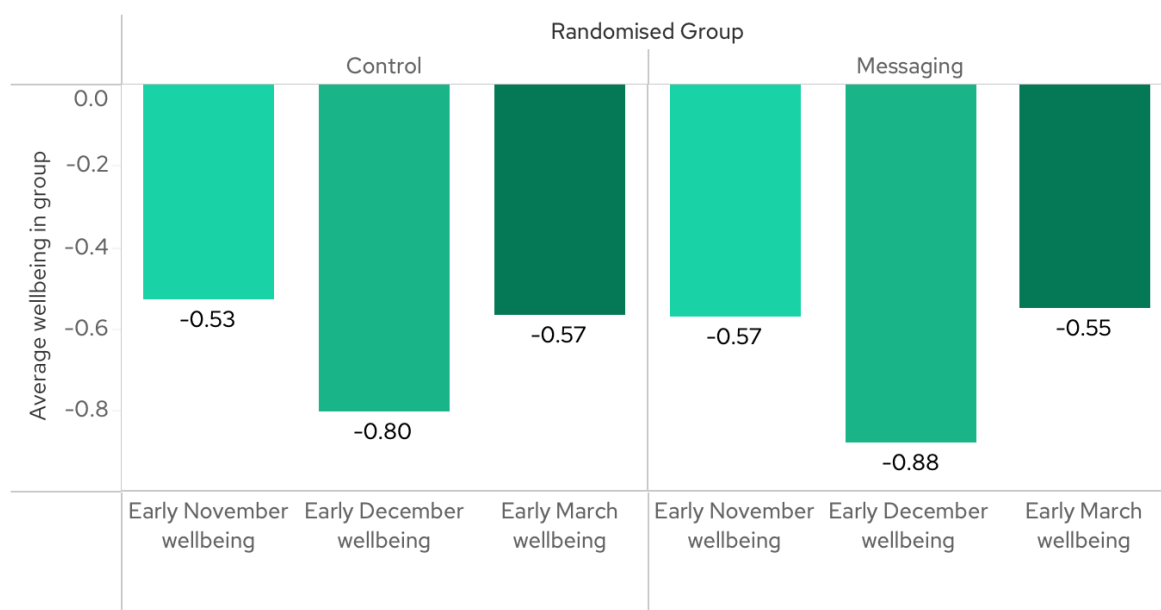
Control group N=750; Journal group N=742.

Support organisations

The support organisation messages were placed on the app for those who were in the Support Randomised Group and who were in the bottom quartiles of wellbeing, as measured at the start of the experiment.

All those who consented to participate were presented with the support message as part of the Teacher Tapp home screen when they completed their day's survey questions. They then had a choice as to whether to click through to learn more from the support organisation advertising. Table 7 shows the proportion seeing the message and choosing to click through on each of the four days.

**Table 7: Proportion of teachers viewing support message and clicking through**

	Number viewing message	Number clicking URL
17th Jan 2024	492	3
24th Jan 2024	485	6
1st Feb 2024	488	3
6th Feb 2024	482	4

The proportion of teachers choosing to click through and look at the support organisation's website was very low. It should be noted that they were displayed on a home page with other options, such as reading posts relevant to their professional development. Chi-squared tests

for each demographic variable (age, gender, experience, subject, seniority) shows no association between teacher characteristics and propensity to click through.

Figure 7 shows levels of wellbeing for those in the Support Organisation and Control Randomised Groups, for those in the lowest quartile of wellbeing prior to the experiment. The first two columns show wellbeing before the experiment (in November and December). The last column shows average wellbeing in March, after the experiment closed. It clearly shows no differences in wellbeing between the groups, and this is confirmed by regression analysis (not reported here). Moreover, the support messaging did not affect the rate of long-term use on the Teacher Tapp app.

Figure 7: Wellbeing before and after the support organisation messaging
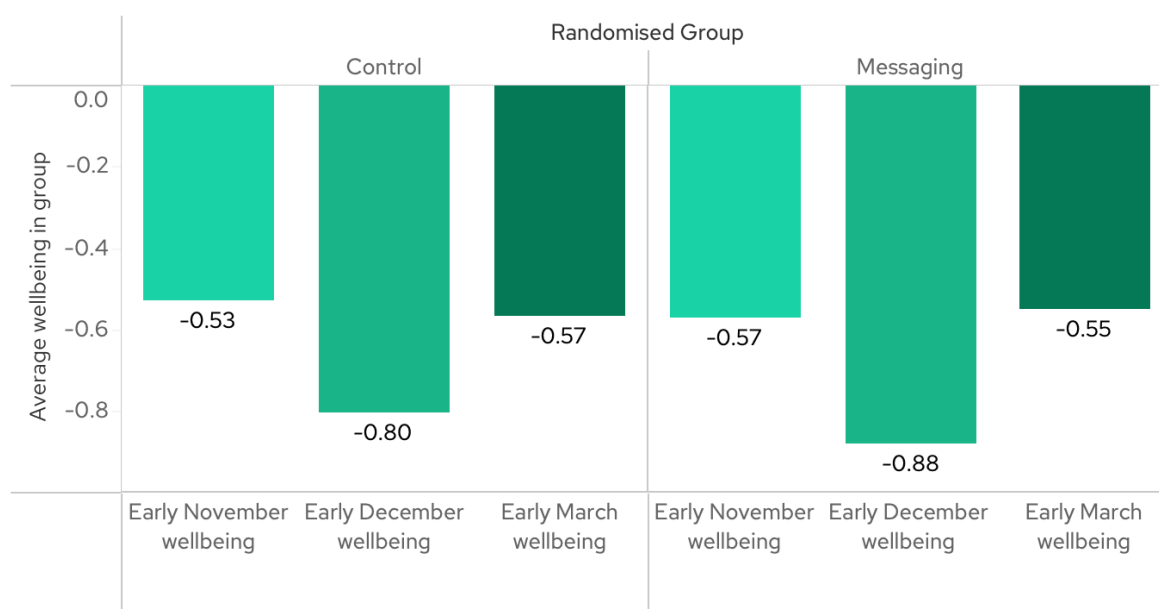
Control group N=750; Journal group N=742.

Discussion

1. Whilst nothing improved wellbeing we did learn some things
2. Gratitude journaling was well-participated and quite popular across all demographic groups. We should consider doing this, perhaps irregularly for everyone.
3. If we wanted to try and measure a positive effect of gratitude journaling we should:
    - Do it daily for 4 weeks – opt in and then randomise within that group
    - Maybe tweak the wellbeing measure
4. Whilst positive affirmation messages and support organisation messages were viewed on the app there was very low click through. It is possible that the way we show messages on the app isn't great because the page is cluttered and so should review this.

Appendix – wellbeing attribute

Question selection

To ensure the measure is not burdensome for teachers to answer, we wanted to distil down the construct 'wellbeing' into 3 questions. The initial shortlist contained the following questions:

- Have you recently lost much sleep over worry?
- Have you recently felt constantly under strain?
- Have you recently been feeling reasonably happy, all things considered?
- The balance between my personal and professional commitments is about right
- To what extent are you suffering from burnout?
- Taking everything about life at school into consideration, I am currently...

After reviewing the aspects of wellbeing contained within the questions, it was clear that all the questions were, in some form, asking about: contentedness; job satisfaction; and workload. To that end, we chose the final three questions:

Table 8: Wellbeing question text

Questions	Answers
Have you recently felt constantly under strain?	- All of the time - Most of the time - Some of the time - A little of the time - None of the time - Not relevant / cannot answer

To what extent are you suffering from burnout?	- I am almost always happy at work right now and have no feelings of burnout
	- Occasionally I feel under stress at work right now, but I don't feel burned out
	- I am experiencing some feelings of burnout at work, such as physical or emotional exhaustion
	- I am experiencing symptoms of burnout at work that won't go away and are on my mind a lot
	- I feel completely burned out and often wonder if I can go on with this job. I am at the point where I may need some changes or may need to seek some sort of help
	- I cannot answer because I don't know what burnout is
	- Not relevant / cannot answer
Taking everything about life at school into consideration, I am currently...	- 7 – Extremely content
	- 6
	- 5
	- 4
	- 3
	- 2
	- 1 – Extremely discontent
	- Not relevant / cannot answer

We chose these questions because they both explore the relevant aspects of wellbeing and contain enough variation within the questions to produce a valid latent measure.

Latent variable estimation:

Each question had a single response on an answer scale, making the numeric positions of the responses suitable to be used as variables for the factor analysis. As the questions were all asked on the same day, we used only full cases where users had answers to all 3 questions.

Under the assumption that 'wellbeing' was a single latent variable, we only extracted 1 factor – using the principal factor extraction method. This resulted in the following loadings on the questions:

Table 9: Wellbeing latent variable loadings

| Question	Loading	Communalities
Have you recently felt constantly under strain?	0.847	0.717
To what extent are you suffering from burnout?	-0.894	0.799
Taking everything about life at school into consideration, I am currently...	-0.830	0.688

The proportional factor variance is 0.735, suggesting the factor is a strong representation of the underlying construct and also (along with high communalities) that the single factor accounts for a large proportion of the variance within the data.

These model parameters are then saved and used for all future wellbeing calculations, to ensure consistency within the measures.

Problems – timings, distributions

As the three questions assessing teacher well-being were asked on a single day, we observed a clustering effect in the responses. This is because a single event or mood on the day of the survey influenced the teachers' answers to all three questions, leading to a lack of expected variability in the responses. Consequently, the distribution of the well-being measure deviates slightly from a normal distribution. This effect is not seen when the questions are asked on separate days, but for the purposes of this study we remain consistent in asking on the same day. Practically, this has implications when defining the quantiles of wellbeing, which dictate which wellbeing interventions users receive.

Figure 8: Distribution of wellbeing latent variable
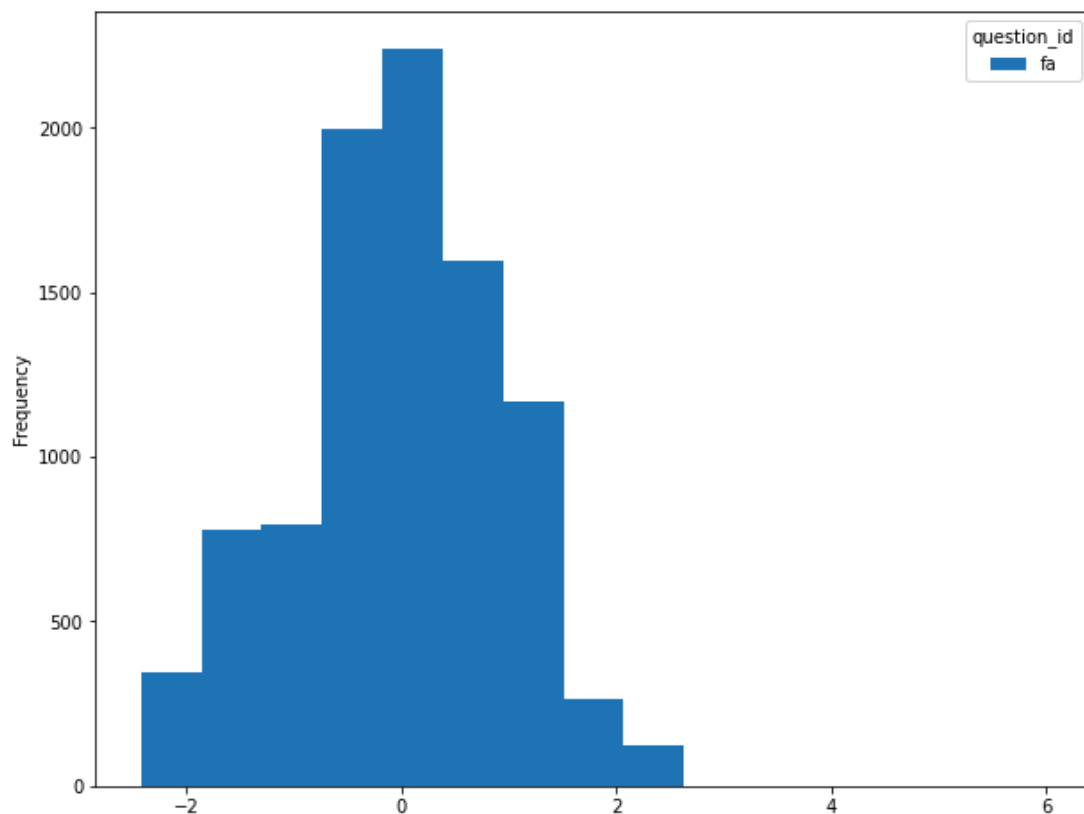
Appendix – professional attachment

Question selection:

Similarly to the wellbeing measure, we wanted to distil down the construct 'professional attachment' into 3 questions. The initial shortlist were drawn from a previous research project on teacher retention. These questions were:

- "I don't seem to have as much enthusiasm now as I did when I began teacher training"
- Do you expect to be a teacher in three years' time?
- If you could go back in time, would you choose to train to be a teacher or not?
- Do you feel that your morale as a teacher is higher or lower than it was a year ago?
- How much do you agree with the following statement: "I would leave teaching if I could find a job that matched my salary."
- At the moment, how often does the thought of resigning from your job cross your
- mind?

The major themes amongst these questions are around enthusiasm and commitment, so we narrowed it down to these 3 questions:

Table 10: Professional attachment question text

Questions	Answers
At the moment, how often does the thought of resigning from your job cross your mind?	- Constantly - Often - Sometimes - Rarely - Never - Not relevant / cannot answer
How much do you agree with the following statement: "I would leave teaching if I could find a job that matched my salary."	- Strongly agree - Somewhat agree - Slightly agree - Slightly disagree - Somewhat disagree - Strongly disagree - Not relevant / cannot answer
"I don't seem to have as much enthusiasm now as I did when I began teacher training"	- Strongly agree - Somewhat agree - Somewhat disagree - Strongly disagree - Not relevant / cannot answer

Latent variable estimation:

Each question had a single response on an answer scale, making the numeric positions of the responses suitable to be used as variables for the factor analysis. All of the questions were asked across 2 days, so we used only full cases where users had answers to all 3 questions.

Under the assumption that 'professional attachment' was a single latent variable, we only extracted 1 factor – using the principal factor extraction method. This resulted in the following loadings on the questions:

Table 11: Professional attachment latent variable loadings

Question	Loading	Communalities
At the moment, how often does the thought of resigning from your job cross your mind?	-0.701	0.491
How much do you agree with the following statement: "I would leave teaching if I could find a job that matched my salary."	-0.735	0.541
"I don't seem to have as much enthusiasm now as I did when I began teacher training"	-0.809	0.654

Therefore, the proportional factor variance is 0.562, suggesting the factor is a strong representation of the underlying construct and also (along with high communalities) that the single factor accounts for a large proportion of the variance within the data.

These model parameters are then saved and used for all future professional attachment calculations, to ensure consistency within the measures.

This produced a measure with the following distribution:

Figure 9: Distribution of professional attachment latent variable
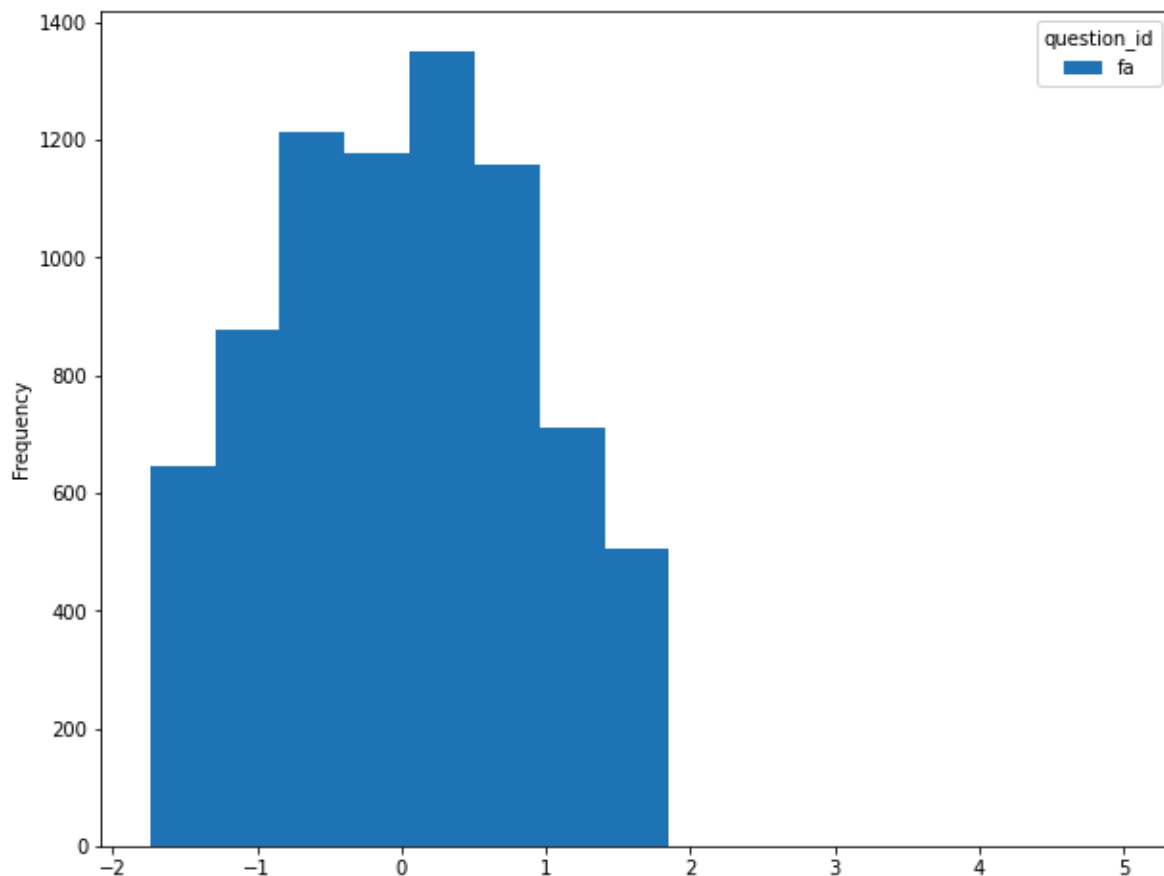
Appendix – Sentiment analysis

We carried out a sentiment analysis on the open-text responses to collect teacher feelings about journaling. The code for the sentiment analysis was as follows:

```
def preprocess_text(text):
    tokens = word_tokenize(text.lower())
    filtered_tokens = [token for token in tokens if token not in
stopwords.words('english')]
    lemmatizer = WordNetLemmatizer()
    lemmatized_tokens = [lemmatizer.lemmatize(token) for token in
filtered_tokens]
    processed_text = ' '.join(lemmatized_tokens)
    return processed_text

analyzer = SentimentIntensityAnalyzer()
all_journal_users['sentiment_about_journalling'] =
[analyzer.polarity_scores(preprocess_text(x))['compound'] if not
pd.isnull(x) else np.nan for x in
all_journal_users['2023-12-01_18161']]
```

These are the following sources for learning more about the tools we used:

- SentimentIntensityAnalyzer – https://www.nltk.org/_modules/nltk/sentiment/vader.html#SentimentIntensityAnalyzer
- word_tokenize – https://www.nltk.org/_modules/nltk/tokenize.html#word_tokenize
- WordNetLemmatizer – https://www.nltk.org/_modules/nltk/stem/wordnet.html#WordNetLemmatizer

Appendix – Teacher Tapp sample

The Teacher Tapp survey panel comprises teachers across the state and private sectors in England who download a mobile app, provide valid teacher credentials and allow it to notify them of new questions at 3:30pm. Teachers are recruited to panel via social and traditional media, promotion at CPD events, and via word of mouth in schools. All questions asked are multiple and single response questions.

How randomisation was applied

All users who had signed up to Teacher Tapp before 8th November 2023 were randomly assigned to one of four groups. In order to be given a group, the user must have self-selected that they are in England. The code to randomise the group that the users were in is below.

Once randomisation occurred, a visual check was carried out to ensure, firstly, all users had been roughly split into four evenly-sized groups and secondary, that users who had responded within the past six months were also in four evenly-sized groups.

Any user who signed up to Teacher Tapp on or after 8th November 2023 was not given any group and, therefore, should be excluded from all subsequent analysis of the interventions.

Randomisation Code

```
WITH all_users AS(SELECT *, RAND() AS group_rand FROM
`teacher-tapp-60b20.users.users` usr
LEFT JOIN (SELECT user_id, MAX(question_valid_at) AS most_recent_answer FROM
`analysis-331810.teacher_tapp.responses_england` GROUP BY user_id) res ON
res.user_id = usr.firebase_id
WHERE panel_id = 1)

SELECT *, CASE WHEN group_rand < 0.25 THEN 'Control'
WHEN group_rand < 0.5 THEN 'Journal'
WHEN group_rand < 0.75 THEN 'Messaging'
WHEN group_rand >= 0.75 THEN 'Support' END AS group_number FROM all_users
```