

The development of a social small-scale survey instrument of UK teachers to study professional use (and not use) and attitudes to social media

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This paper documents the creation, implementation and analysis of a survey instrument designed to reveal patterns of use and attitudes towards the value of social media by UK teachers. The study was motivated to discover which teachers use social media professionally, how they use it (both personally and professionally) and attitudes to social media as a professional tool (for their students' and their own professional use). The instrument was created from verbal data from two focus group discussions regarding the use of social media in education. Attitude statements were included verbatim when practical. This instrument was placed online and practicing teachers invited to complete it (n=216). Exploratory factor analysis and hierarchical clustering identified nine factors from 54 attitude statements and five distinct teacher groups. The rich data allowed each group to be carefully defined, providing potentially invaluable information to school leaders when developing social media projects to recognise and accommodate the full range of teacher concerns and experience. The paper also addresses methodological concerns regarding instrument-creation, dealing with missing data and the impact of missing data on subsequent analysis.

Keywords: social media; teachers' attitudes; missing data; exploratory factor analysis; hierarchical clustering

Social media in society: Setting teachers in context

Technological advances have led to the proliferation of what is commonly referred to as 'social media', which have infiltrated society and the lives of professionals such as teachers. 'Social media', associated with what are also called web 2.0 technologies, may be defined as the suite of tools and platforms which are "participatory, characterised by user-generated content and peer critiquing" (Conole 2010:142). Figures for the UK, gathered from publicly available data sources for the start of 2013 (Rose 2013), reported that the most highly used platforms are Facebook, Twitter and LinkedIn. Rose's overview reports nearly 33 million Facebook accounts (an increase of approximately 3 million from 2012) with over 50 per cent of the UK population registered with Facebook. Rose estimated a similar figure of 34 million live Twitter accounts and almost 11 million LinkedIn users. Ofcom (2013) report that, in 2012, almost two in three (64 per cent) of adult internet users said they had a social networking profile, growth being driven in particular by older users (in particular the 55-64 age group, 35 per cent of whom now have profiles).

Public debate regarding educational uses of social media to date tends to focus on the ethical implications (eg. Forkosh-Baruch and Hershkovitz 2014) including teachers' 'unprofessional' use of these media, leading to calls for national codes of conduct to be developed for the profession (Bjorkelo and Almas 2011; Edwards and Jones 2009). Within education literature, there is an increasing body of research examining teachers' use of particular social media tool e.g. blogs with beginning teachers (Wood 2012; Funkhauser and Mauser 2013; Luehmann and Tinelli 2008),

wikis with Masters' students (Brass and Mercoli 2011), Twitter (Rinaldo et al 2011; Forte et al, 2012) and Facebook (Hew, 2012; Kershkovitz and Forkosh-Baruch 2014; Manca and Ranieri 2014). The majority of studies are situated 'success stories' that show how the use of social media may improve educational or vocational gains and do not focus on hard-to-capture 'anti' voices.

Social media tools are presented as an opportunity for teachers to 'scale up' their professional learning, despite commenters suggesting that this potential connectivity has not yet contributed significantly to teacher development in the profession either in terms of knowledge sharing or overcoming teacher isolation (Lieberman and Mace 2010). This is likely to be explainable both by a mixed picture of adoption of these technologies combined with variety in the effective uses of them. Uncritical adoption of new media into professional use may lead to 'banal reproduction' or 'passive consumption' of information (De Castell et al 2002). This raises questions about what those teachers who are using social media are using it for, what they perceive is the value of their use and what factors are affecting those teachers who, like a proportion of society more generally, are *not* engaging with social media.

The few studies that look holistically at teachers' attitudes to technology have revealed indications of the importance of social media to some teachers. A small-scale study of 8 teachers' use of technology in the USA found that five of the teachers' referred to online collaborative technologies as contributing to their professional development (Ottenbreit-Leftwich et al 2010). Another small-scale study of five beginning teachers in the UK has revealed the connection between teachers' personal experiences of using social media and their effectiveness in using these tools for student learning (Turvey 2012). These attitudes will therefore be important as the profession reflects on the contribution of social media to teachers' professional development and

whether to develop social media use with their students.

Theoretical Perspective

The authors work was guided by thinking about networks of teachers as they adopt social media and the impact this has on community development within these networks. This is in light of work by Wenger (1998), who describes professional development as occurring in ‘communities of practice’ in which learning occurs through mutual engagement, joint enterprise and shared repertoire. They have three principal characteristics: domain, community and practice (Wenger 2005). The domain refers to identification of shared competence to distinguish membership. Members value collective competence and recognise shared expertise. Community refers to joint activities, discussions and how information is shared. Participants learn from each other, but need not necessarily work together on a daily basis. Practice is the shared repository of resources, experiences and advice directly related to their own practice which is transformed into a shared knowledge base.

Social media can be seen as a tool which mediates connectivity, either allowing a community to migrate and develop online to create new discourses or innovative practices, or as an online space for new ‘virtual’ communities of practice to emerge. However, the application of this theoretical work to the empirical study is beyond the scope of the current paper (which is principally methodological) and will form the basis of a future article. What we are able to shed light on in this paper is an evidence base from which to reveal different *levels of engagement*, a concept central to Wenger’s notions of communities of practice (Wenger 1998). The complex nature of teachers’ networks and community membership has more recently been referred to as ‘landscapes of practice’ (Wenger 2010), accepting multiple memberships and levels of engagement.

This research explores teachers' self-reported engagement with (both in terms of use and attitudes towards) social media both personally and professionally.

'Engagement' goes beyond a definition in relation to communities of practice, although in later work we will be considering this definition, but also considers engagement with social media tools in terms of their work with students.

This study therefore developed a questionnaire instrument which was used to sample UK teachers' views on the above questions to provide data which would set teachers within wider UK society (for which there is already some survey information available, e.g. Ofcom 2008; Ofcom 2013; Rose 2013). This would provide a profession-specific evidence base about the following research question:

To what extent have teachers embraced new media literacies (social media) in school-based education and in relation to their own ongoing professional learning?

This question would be addressed via the following three sub-questions:

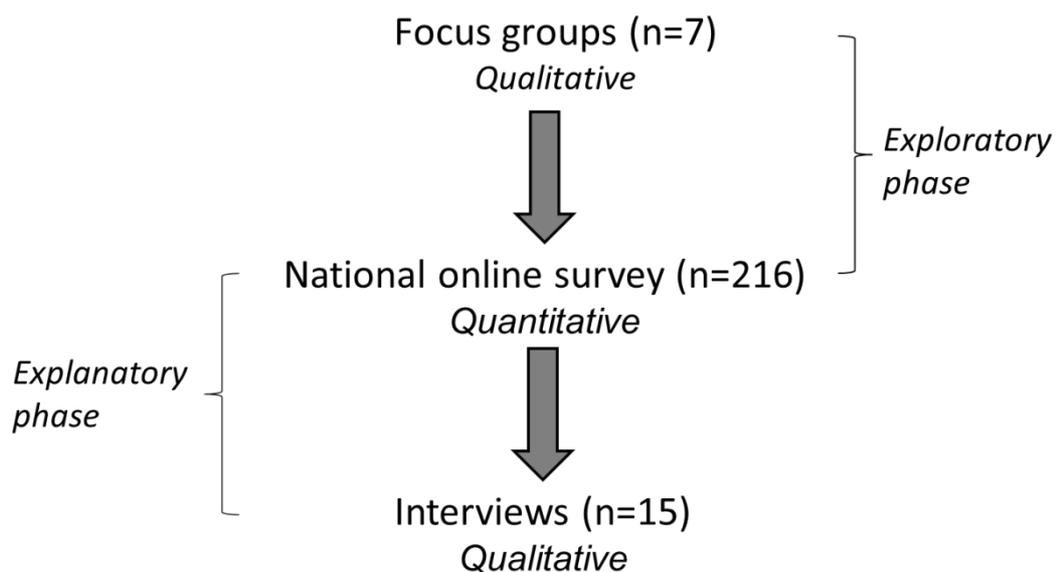
- (1) Which teachers are using social media professionally (and which not)?
- (2) How do they use it professionally? (and does professional use map to personal use)?
- (3) What are teachers' attitudes to social media as a professional tool? (for their students' and their own learning)?

Research overview

To address these research questions a study was designed which would reveal data from teachers' perspectives. The study was interested in the perspectives of primary, secondary and college-based teachers. A sequential mixed methods design was

used, which would gather self-reported data on uses and attitudes in both qualitative and quantitative forms. Firstly, from focus groups (to ground the survey design in authentic teachers' views), secondly from a questionnaire distributed online (to look for patterns of use and attitude to social media in response and to invite participants to interview) and thirdly, individual interviews with volunteers from the survey (to explore more deeply and broadly awareness, experience, attitudes towards social media use. Preliminary analysis was built into the design between each data collection stage to inform the next to form an initial exploratory phase (focus groups > survey), then secondary explanatory phase (survey > individual interviews) sequential design (Burke Johnson and Onwuegbuzie 2004) (figure 1). We report only the first phase in this paper. The qualitative data from the focus groups and interviews would work synergistically with the quantitative data generated from the survey in addressing the research questions (Day, Sammons and Gu 2008).

Figure 1. Phases of the ongoing research project.



Insert figure 1 here

Focus groups as an interview strategy are used to gather collective views (Thomas 2009). Our use of these groups to inform the design of the survey was a particular application of this strategy, which we felt was required in the absence of published research and due to the fact that none of the researchers were currently school-based teachers. This was considered a valuable approach to exploring the scope of the subsequent questionnaire, to generate potential items, and to establish *a priori* the number of expected factors that influence teachers' attitudes towards social media (whilst accepting the limitation of the number of voices consulted).

In terms of the survey reported in this paper, descriptive self-reported data informed research questions 1 and 2, whilst research question 3 was addressed by individual responses to attitude statements generated by the focus groups and presented using a five-point Likert-type scale, grouped into possible factors as indicated from the early literature review. Evidence for these factors would be generated via exploratory factor analysis (Field 2005) and new, empirically-based factors generated to best describe the data collected. The strength of this evidence is evaluated via internal reliability analysis of individual factors (Cronbach's α) and a multiple imputation (MI) procedure (Peugh and Enders 2004) used to evaluate the extent to which missing data compromised factor loadings of individual items. Identifying groups of teachers in relation to their attitude towards emergent factors was then achieved through K-means and hierarchical clustering (Hair et al 2006). Clustering also informed research question 2 by identifying those teachers whose attitude towards professional use of social media is informed by their personal experience.

The plans for the research study were ethically appraised using a framework developed by Stutchbury and Fox (2009) and then gained formal ethical approval from

the University. All respondents remained anonymous and all data, in particular from the focus groups and interviews, is currently held securely on the central University server.

Stage 1 – Focus groups

Focus group participants were recruited from part-time Masters students in their final year of study, who were all employed as teachers and, although mainly living in the Midlands, also covered a wide geographical spread in England. Two focus group discussions were arranged for teachers to explore their views related to teachers’ use of social media; one in the Midlands (to which six teachers agreed to attend) and one in the London area (for four teachers). Particular emphasis in the recruitment of participants was placed on hearing the views of both social media users and non-users. The composition of the focus groups is included in Table 1:

Table 1. Focus group participants.

<i>Focus group</i>	<i>Gender</i>	<i>Role</i>	<i>Type of school (ages)</i>	<i>Self-reported use of social media</i>
A(Midlands)	Female	Special needs co-ordinator	Primary (4-11)	Non-user
	Female	Headteacher	Primary(4-11)	Cautious user
	Female	Senior teacher	Primary (4-11)	Non-user
	Male	Management consultant	Secondary schools (11-18)	Enthusiast
	Female	Teacher	Special School (3-13)	Cautious user
	Female	Teacher	High School	Cautious user
B(London area)	Male	Deputy headteacher	Pupil referral unit	Enthusiast

The focus group schedule was devised around a number of interactive tasks to identify aspects of social media use that were relevant to the experiences of teachers more generally and which could then be included in the main instrument, thus creating a

bottom-up instrument giving agency to teacher voice, which allowed opportunity for them to shape the agenda for the final survey. Focus groups were led by the researchers, who asked teachers to brainstorm their ideas related to social media on post-it notes. Teachers were then asked to arrange these thematically. Thus, the individual sections of the final instrument emerged, relating to device ownership, platforms used and frequency of use.

As can be seen from table 1, potential participants self-assessed their use and awareness of social media prior to the discussions, which revealed a range of experience. This was important to ensure the language of the subsequent questionnaire was accessible to those less experienced in using social media and to include their views in the questionnaire items. The focus group schedule comprised four areas: what is meant by ‘social media’?; which tools and platforms are teachers aware of?; what issues are associated with their own use of social media and that of their colleagues?; and finally, how do they conceive of the utility of social media for professional learning? Focus group members were also asked to consider the practices and expressed views and practices of their colleagues when contributing to ensure that as wide a basis of experiences as possible was represented. This is the value of focus groups and their remit to offer a collective view: consensus was not expected; rather representativeness is of greater importance. Focus group A was held in October 2012 with six participants, and B in November 2012, with only a single teacher able to attend on the day. This session became a structured interview rather than a focus group as it was not defined by participant interaction, the format and schema remained consistent with focus group A. The participant in focus group B had extensive experience of incorporating social media into their professional practice and their current role as a senior leader led them to have an awareness of a wide range of colleagues’ experiences. Two researchers were present

at each focus group: One whose role was to lead the planned activities and the other to take notes. An audio recording was also made. Each of the focus group discussions began by asking participants to brainstorm what they understood by the term 'social media' and the platforms they were both aware of and had experience of using.

Participants were provided with sheets of A3 paper, sticky notes and pens to map out their discussions. Pictures were taken of their output and recordings made of their discussion. Researchers were aware that it was important to hear the voices of all participants and to be conscious and respond to situations where certain perspectives began to dominate (Thomas 2009). This was the case in the first focus group when the discussion moved onto discussing social media platforms and the participants who considered themselves non-users started to look very uncomfortable. This was where it was of value to have two researchers as one could continue the mainstream activity and the other move to reassure and reintroduce the participants who had been disengaging. The discussion was stopped, the issue raised and the group (now more attuned to the range of views beyond their own) shifted their discussions to be more inclusive around the tensions associated with social media. Discussions were subsequently transcribed; each of which lasted approximately 90 minutes. The images and transcriptions were used to identify relevant platforms and hardware that teachers reported being aware of and/or using. Additionally, variables that may impact upon teachers' engagement with social media were identified, and verbatim quotes typifying the range of views used to form attitude statements.

Stage 2 – Instrument Design

All aspects of the instrument were designed based upon the content of focus group data. Part 1 covered personal usage of internet-enabled devices and associated

social media platforms. Claims and frequency of platform use were incorporated into the instrument via a series of check-box tables. Supplementary nested questions related to Facebook and Twitter were included to further explore levels of engagement given that, in society and in the opinion of the focus group participants, these were likely to be the most used social media tools at this time. Part 2 consisted of a series of attitude statements and areas of professional development divided into two sections – *'attitude towards social media'* and *'the potential of social media'*. Part 2 was separated into two sections to determine whether those teachers who were currently negative towards social media were nonetheless open to the possibility of its use for teaching and professional development. Statements in the first section were arranged alongside a five-point Likert-type scale. Although there is no clear consensus on the preferable number of categories on a Likert scale, it is vital that participants are able to distinguish between the categories in terms of the psychological trait being measured (Wakita et al 2012). We did not wish to overwhelm participants with too many options, given that we wanted to attract the 'non-user' voice. We also wanted participants to be free to express ambivalence or uncertainty. Also, given that the instrument was fairly lengthy, we wanted participants to be able to answer quickly and feel satisfied with their responses (Preston and Colman 2000). For these reasons, a five-point scale was chosen.

Where possible, attitude statements made by participants were incorporated verbatim into the instrument. Statements were only amended if lack of context or negative-wording caused ambiguity. The final question was a chance for participants to reflect on how they would summarise their attitudes once they had completed the instrument.

Due to time constraints, opportunities for piloting the instrument were limited. Instead, an additional cycle of validity was incorporated into the research design. Once

a tentative instrument had been designed, two senior teachers from a local sixth-form college were invited to the University to complete the questionnaire verbally in a ‘think-aloud’ format (Ericsson and Simon 1993). Participants were informed that the nature of the exercise was to scrutinise the instrument rather than their responses. With the researchers present, the teachers progressed verbally together through the instrument item by item, ensuring understanding and clarity of the items. Participants were able to ask questions related to the items and questionnaire design. Comments and recommendations that emerged were taken in note form. This led to the instrument being refined and shortened, as several instances of redundancy emerged. For example, ‘workload management’ was removed as an item in the section ‘the potential of social media for teachers’ as this was adequately covered by existing items.

The final instrument was composed of 42 questions, each with a number of sub-items. Questions 1-21 are composed of checkbox items for participants to self-report device ownership and use. Questions 22-29 included a number of sub-questions (Likert items) designed to capture specific information about teachers’ attitudes towards social media. Each question represented hypothesised groupings, which were subsequently explored in factor analysis. The instrument included a mixture of closed-response, open-response, multiple-choice items and tables. The final design included the following elements:

Part 1

- Q1-4 (Guidance and classroom hardware use)
- Q5-21 (Hardware and platforms owned; personal/professional use of these platforms)

Part 2

- Q22-27 (Attitudes towards social media)
- Q28-29 (potential of social media to enhancing learning)
- Q30-41 (demographic/personal information)
- Q42 (reflective attitude towards social media)

An abridged version of the instrument, detailing the factor structure of the attitude statements may be seen in Appendix 1 (items are arranged according to emergent factors as this reflects the intended future design of the instrument). The instrument was uploaded to Bristol Online Survey (www.survey.bris.ac.uk). A ‘window’ was established in which data would be collected, lasting approximately three months between February and May 2013. An online questionnaire was regarded as easier to distribute to large numbers of people and would encourage a greater response rate by reducing the response burden on participants. Similarly, it reduced the burden on gatekeepers with whom we negotiated access to particular schools. One gatekeeper in particular was adamant that the only way that they felt they could promote participation would be if the instrument were distributed online.

The Sample

In total there were 216 responses from a self-selecting sample. Initially, a stratified sampling strategy was employed with schools in the Leicestershire area. Access was negotiated with specific gatekeepers. This recruitment strategy proved ineffective in recruiting enough participants to conduct meaningful analysis, so the scope of the research was widened to a national level. The survey was advertised on Facebook, Twitter and the Think, Educate, Share (TES) forums. Although this

potentially skewed the sample towards social media users, it was justified on the basis that respondents would not all be positive regarding the role of social media in education. The sampling strategy was beneficial in that respondents were motivated to complete the questionnaire by having an interest in the topic. However, it is recognised that this did bias the sample. Bias analysis was not possible as no information is available regarding non-respondents in a vast online community of this kind. The self-identity item (Q42) suggested the sample was skewed towards social media enthusiasts. 56.5 per cent of respondents identified with this category. 21.8 per cent identified as ‘sceptics’, 14.4 per cent as agnostics and 7.4 per cent as ‘conscious luddites’ (IT proficient individuals who eschew social media). The following demographic data represents responses to questions 30-41 of the instrument.

All participants were practicing teachers from England, Wales and Scotland. One respondent works in the Falkland Islands. Males were under-represented, as 71 per cent of respondents were female. The 46-50 age group was the most represented (19 per cent). Overall, respondents represented a wide variety of age groups (between 20 and 65). Assuming a normally-distributed population, the 36-40 age group was underrepresented (only 11 per cent of respondents). 72 per cent of the sample held a subject-specific Bachelor’s degree as their highest qualification (not including specific postgraduate teaching qualifications); 21 per cent held a Master’s degree and 3 per cent held a doctorate. That one in four respondents held a postgraduate qualification suggests that the cohort came from the more highly-educated end of the population distribution. The level of work experience in the sample reflects the spread of ages. Between 6 and 10 years’ experience was the most common response (21 per cent). The sample includes beginning teachers (17 per cent had 0-5 years’ experience) and highly-experienced (7 per cent with more than 30 years’ experience).

Fifty-seven of the participants teach in primary education (children aged 4-11 years), 121 in secondary (children aged 11-16 or 11-18 years) and 23 in 6th form colleges or further education (those studying usually aged 16-19 years). Eight teachers stated that they work in all-through or multi-age schools, two teachers work in higher-education, and one teacher each responded from a pupil referral unit (PRU); a school for pupils with behavioural, emotional and social difficulties (BESD), and a special school for pupils with severe learning difficulties (SLD). One participant simply stated that they work in a 'specialist school', offering no further details, and one respondent declined to provide this information.

Findings and Discussion

The findings and discussion section will principally focus on methodological issues, although a summary of the substantive findings is included to show what was possible to draw out from this methodological approach. Then issues related to each data collection method are reviewed to tease out the limitations of what can be concluded and what had been learnt about the value and practice of using these methods that might be of interest to other researchers.

Summary of findings

The cohort was IT proficient as measured in terms of number of internet-enabled devices owned and the number of platforms participants engage with. Twitter is viewed as a more useful platform for professional use than Facebook by the cohort.

Despite the high proficiency levels of participants, guidance regarding teachers' use of social media remains underdeveloped. Those who self-identified as non-users of social media expressed greater willingness to engage with social media in the future for

professional use than for social purposes. Factor analysis of Likert items revealed that attitude towards social media and respondents' perception of the potential value of social media closely mapped to each other. Attitudes mapped more closely to personal usage than professional usage. Cluster analysis revealed five distinct groups of teachers in terms of their attitudes towards social media, revealing different levels of engagement that is more complex than a user/non-user distinction.

Descriptive Findings

The cohort demonstrated a high level of IT proficiency in terms of the number of internet-enabled devices they reported owning. The median number of devices owned is three (mean = 3.32) of a normally-distributed spread. One individual reported owning eight devices. Only two individuals claimed that they owned no internet-enabled devices from an available selection of twelve in the instrument.

Teachers reported using a variety of online platforms. In the focus groups, teachers mentioned Facebook, Twitter, LinkedIn, YouTube, Wikis, VLEs, personal and public blogs, internet forums and RSS feeds. All of these platforms subsequently recorded positive responses in the questionnaire, suggesting teachers have adopted a wide variety of tools. Virtual learning environments (VLEs) were the most widely-used platform to disseminate homework (102 respondents, 47 per cent), although there appears to be slow uptake of this often-advocated platform – 71 (33 per cent) teachers stated that they were aware of the use of VLEs, but stated that they did not use them themselves.

Data Reduction

Questions 22-29 represent attitude statements made by focus group participants. These were grouped thematically. Data reduction was performed to determine the accuracy of these groupings and to sum grouped items to form a Likert scale. Response patterns for different groups of teachers could then be compared. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (.90) and the Bartlett's Test of Sphericity statistic (7302.4, d.f. = 1378, $p < .01$) suggested exploratory factor analysis could ascertain whether each of the questions (22-29) loaded on individual factors. Once factors were extracted from the dataset, Cronbach's Alpha was calculated to measure the internal reliability of each factor (table 2). Factors were then examined to identify appropriate factor labels. Responses for each participant were summed for each factor to create a Likert scale for cluster analysis and subsequent hypothesis testing.

Table 2. Reliability and descriptive data for 9 factors.

Factor	Name	N-size	Number of items	Items	Cronbach's α	Mean (pooled)	SD	SE
1	Potential advantages of social media for teachers	210	11	28 (a-k)	.94	3.40	.74	.05
2	Teachers' professional use of social media	209	5	25 (a-e)	.92	4.07	.72	.05
3	Potential advantages of social media for students (skills & learning)	209	7	29 (f-l)	.92	2.36	.70	.05
4	Potential advantages of social media for students (facilitate learning)	200	5	29 (a-e)	.88	4.12	1.19	.08
5	Teachers' IT literacy	205	5	22 (a-d), 22 (f)	.82	3.67	.69	.05
6	Social media and students' skills (reading, writing, verbal, homework completion)	214	4	27 (a-d)	.89	1.95	.68	.05
7	Social media and society	210	5	23 (b-d), 24 (d), 26 (b)	.76	4.14	.98	.07
8	Personal versus professional use	212	3	24 (a-c)	.81	4.04	.65	.04
9	Students, social media and online safety	210	3	26 (c-e)	.76	2.53	.74	.05

The factor analysis returned an initial eleven-factor solution. Grouped items for each factor may be seen in Appendix 1. Factors 10 and 11 were single-item factors (Q26f and Q22g respectively) and were therefore dismissed from further analysis, yielding a nine-factor solution, accounting for 68.1 per cent of total variance.

Factor 1 included Q25 (a-e) and Q28 (a-k). These two questions aimed to address differing underlying themes – the potential usefulness of social media and the advantages as they currently exist from their perspective. This is an unsurprising finding as people's attitudes towards potential use will almost certainly be determined by their current usage. Nonetheless, Q25 and Q28 remained separate for subsequent cluster

analysis and hypothesis testing to explore this relationship in more detail.

Cluster analysis

Hierarchical cluster analysis using Ward's method was used to estimate the number of homogenous sub-samples of participants based on their response patterns to the attitude statements (Q22-29) (Cohen et al 2011). Non-hierarchical k-means clustering was then used with the identified number of clusters. Hierarchical clustering initially treats each individual as a unique cluster and ultimately links all individuals to form a single cluster, with the fusion or linkage distance between each agglomeration used to determine the number of clusters within the sample. Ward's method (Ward, 1963) was used to minimise within-group variance within each cluster. Summed factors were transformed to standardised z-scores with a mean of zero and standard deviation of 1 as part of the clustering procedure. Post-hoc tests (one-way ANOVA and Tukey HSD) were then used to verify statistically significant differences between cluster groupings in relation to the factors identified in data reduction.

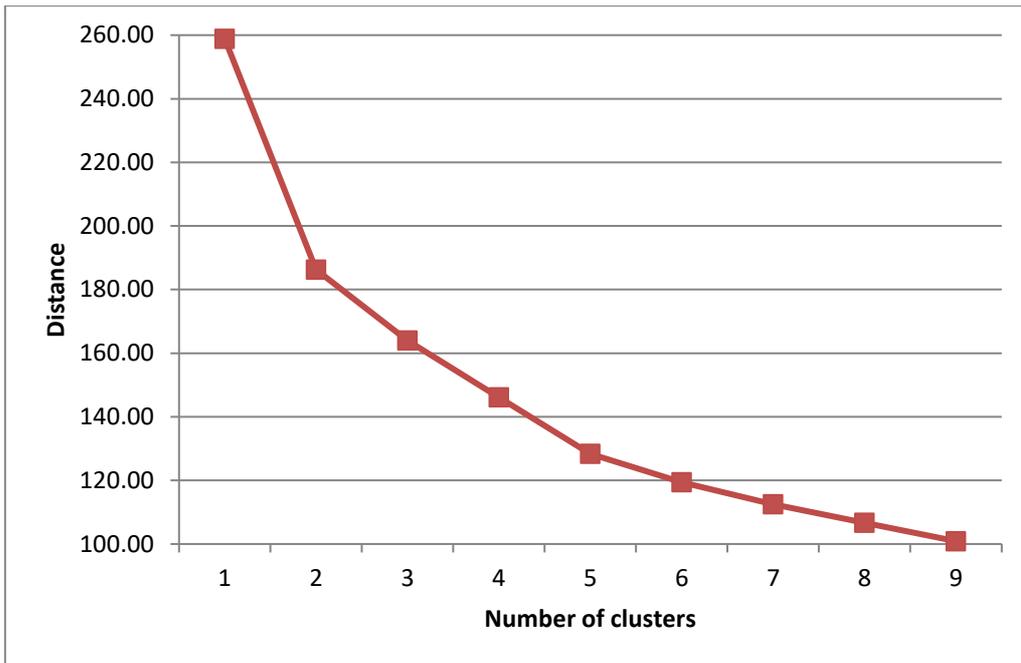
The dendrogram (not included) suggested a binary response pattern between users and non-users of social media; the two major groupings were linked at a fusion value of 25 with a coefficient change of 72.56 between clusters 2 and 3. Within-cluster linkages in these two groups occurred at fusion values of between 1 and 10. The agglomeration schedule displaying cluster solutions of between 2 and 10 is outlined in table 3:

Table 3. Agglomeration schedule.

<i>Number of clusters</i>	<i>Agglomeration last step</i>	<i>Coefficient this step</i>	<i>Change</i>
2	258.85	186.29	72.56
3	186.29	164.02	22.26
4	164.02	146.11	17.91
5	146.11	128.37	17.74
6	128.37	119.44	8.93
7	119.44	112.50	6.94
8	112.50	106.63	5.86
9	106.63	100.89	5.74
10	100.89	95.22	5.67

Coefficients for 4 and 5 cluster solutions (17.91 and 17.74 respectively) suggested that a two-cluster solution may disguise important findings. This is also evident in the scree plot (figure 2) which displays a second ‘elbow’ at cluster 5, indicating a five-cluster solution warranted further investigation.

Figure 2. Scree plot.



Cluster centres for the five cluster solution for each of the factors (on the 1-5 Likert-type scale) may be seen below (table 4). Table 5 displays the mean Euclidean distance of each individual from the cluster centre as well as the number of participants assigned to each cluster in a five-cluster solution. Cluster sizes were uneven, ranging from 13 to 74. Identifying differences between clusters with these sample sizes therefore needed to be tentative (the sample size of 174 reflected listwise deletion). K-means clustering was then run with two and five cluster solutions.

Table 4. Final cluster centres.

Factor		Cluster				
		1	2	3	4	5
1	<i>Potential advantages of social media for teachers</i>	3.08	4.71	3.84	2.03	3.18
2	<i>Teachers' professional use of social media</i>	2.86	4.66	3.91	1.79	2.81
3	<i>Potential advantages of social media for students (skills & learning)</i>	3.22	4.05	3.38	2.03	2.12
4	<i>Potential advantages of social media for students (facilitate learning)</i>	3.51	4.57	3.97	2.68	3.50
5	<i>Teachers' IT literacy</i>	3.93	4.65	4.20	3.90	3.87
6	<i>Social media and students' skills (reading, writing, verbal, homework completion)</i>	2.57	3.08	2.91	1.50	1.81
7	<i>Social media and society</i>	3.50	2.49	2.98	3.90	3.67
8	<i>Personal versus professional use</i>	3.55	2.33	3.16	4.16	3.56
9	<i>Students, social media and online safety</i>	3.94	3.95	3.85	4.21	4.39

Table 5. Average Euclidean Distance of Case from its Cluster Centre (five-cluster solution)

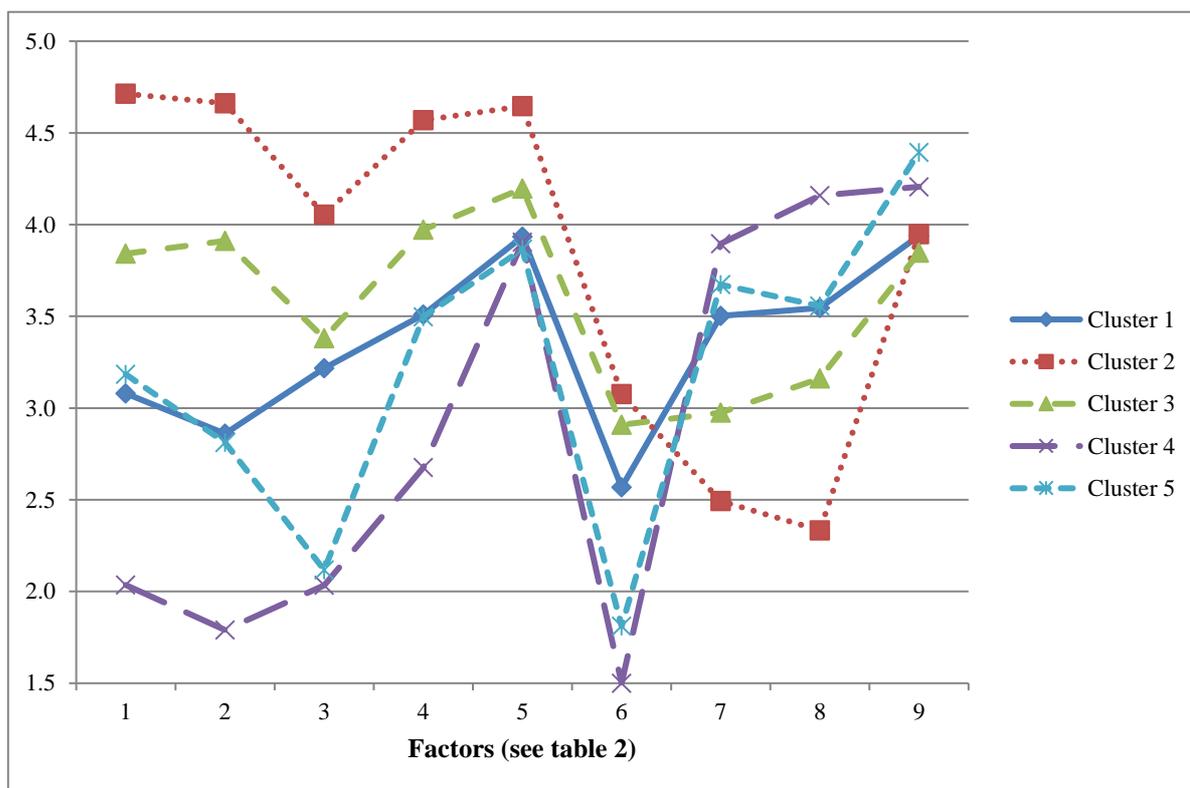
Cluster	N	Mean	SD	SE
1	33	7.29	2.87	0.50
2	13	9.04	3.39	0.94
3	74	8.32	2.53	0.29
4	21	9.89	3.03	0.66
5	33	8.26	2.44	0.42
Total	174			

A two-cluster solution was determined to be theoretically uninteresting, as it simply differentiated between those who were more and less enthusiastic regarding the potential of and use of social media and could not represent subtleties in difference of opinion between participants. A five-cluster solution (table 5) yielded multiple groupings across the nine factors which revealed far more nuanced understandings of the motivations and variables which impact upon participant attitudes towards social media, and provided evidence of the extent to which these attitudes are related directly to their use of social media.

Hypothesis testing

One-way analysis of variance confirmed the five-cluster solution as appropriate for describing the data as there were significant differences between clusters (d.f. = 173, $p < .01$) across all nine factors, although the practical significance of group differences varied dramatically. Effect size for IT literacy was .09, compared to .84 for potential advantages of social media (Appendix 2). A series of post-hoc Tukey HSD tests were performed to identify where statistically-significant differences between clusters emerged for each of the factors. Figure 3 displays the cluster patterns for each of the summed factors on the five-point attitude scale. Higher scores indicate more positive responses in relation to that factor. The final three factors addressed concerns related to social media and its role in society. Thus higher scores in the final three factors indicate *a more negative attitude* towards social media.

Figure 3. Cluster patterns for each factor.



Factors 1 and 2 display similar patterns – those who use social media have similar attitudes towards its potential, reinforcing the initial factor analysis which placed teachers’ use (Q25) with the potential for use (Q28) in a single factor. These two factors also represent the greatest divergence in opinion between the clusters, ranging from an average of below 2 to greater than 4.5. Thus each of the clusters may immediately be labelled in relation to their enthusiasm for social media both as an educational tool and a tool for potential professional development. Attitudes broadly speaking map to usage for all clusters. Four distinct clusters emerge in relation to these two factors as clusters 1 and 5 share almost identical patterns. Clusters 1 (n=33) and 5 (n=33) are relatively similar in their response patterns for eight of the nine factors. However, a large difference emerges in relation to factor 3, the potential use of social media to improve students’ skills. These two clusters are ambivalent about the potential of social media

either for teachers or students, although teachers in cluster 5 are more pessimistic about the value of social media in enhancing student learning.

There is general agreement across the clusters that teachers appear not to find social media useful in improving students' literacy or ensuring homework completion (factor 6 in figure 3). Therefore the attitudes reported in factor 1 are aligned with teachers' beliefs about the value of social media in facilitating teaching and their own personal use rather than learning. The disparity between factors 1 and 6 indicates that, despite encouragement, there remains a gap between teachers' use, their understanding of its potential for professional learning, their attitude towards social media as a platform for student learning and actual use in students' education. The final three factors relate to concerns about the use of social media in education. Thus, users are less concerned about its use compared to non-users, as expected. Nonetheless, in relation to online safety, all teachers, regardless of their attitude towards social media, expressed high levels of concern. There appears to be little difference between the clusters in terms of IT literacy. Social media sceptics reported high levels of IT literacy, averaging 3.90 in self-reported proficiency.

Cluster Identification

Cluster two represents the *social media enthusiasts*; a group of 13 teachers who self-report high levels of use of social media for professional use (such as for networking, lesson planning, finding resources, learning new skills), are optimistic about its potential to continue to be useful to them in the future and for students, in a range of ways (from being part of online learning communities through to tackling bullying). They had lower concerns about social media's role in society than other clusters and in the balancing between their professional and personal use of social

media but still expressed concerned about online safety regarding students' use of social media. This group also reported the highest level of IT literacy.

Cluster three represents the *social media engagers*; the largest cluster, containing 74 teachers. This cluster's response pattern closely matches the enthusiasts for the first five factors, albeit at approximately 0.5-1 point lower on the Likert-type scale. This group has adopted social media for personal and professional uses, but is more circumspect about its uses than the enthusiasts. They share opinions with cluster two regarding the effect of social media on students' core skills (reading, writing, verbal skills), but their opinion diverges from the enthusiasts regarding the effects of social media on society and are more keen to maintain a distance between their personal and professional use of social media. The self-reported difference between clusters 2 and 3 for IT literacy was not statistically significant.

Clusters one and five may be characterised as *social media sceptics*. Each contains 33 members. Their response patterns map very closely together, with the exception of factor three. Statistically significant differences between these clusters emerge for factors 3, 6 and 9, with the greatest difference in factor 3. These differences suggest that cluster one may be more accurately characterised as *social media impartial*s, and cluster five as *social media sceptics*. Cluster one represents those who have a moderate regard for the potential of social media for improving students' core skills and have a high level of self-reported proficiency (factors 3 and 5), but are yet to be convinced of the utility for their own professional use, and thus do not demonstrate the same level of uptake as the enthusiasts or engagers (factors 1 and 2). Cluster five, however (the *sceptics*), display considerable negativity of the effects of social media on students' core skills (factor 3); suggesting their uptake of social media is more

pragmatic; they operate in a professional environment where uptake is encouraged despite their own personal misgivings.

In contrast to these pragmatic users, the final cluster is composed of 21 individuals who are sceptical of the benefits of social media either for students or teachers and demonstrate considerably lower levels of uptake. Cluster four is the least enthusiastic towards social media, yet report similar levels of IT literacy as clusters 1, 3 and 5. Therefore their antipathy towards social media is not due to their lack of IT proficiency or lack of ownership of internet-enabled devices. They may be characterised as *conscious luddites*, used non-pejoratively to highlight their intellectual rejection of social media platforms. Those teachers who are not engaging with social media cannot be said to ‘anti-technology’, or ‘non-participants’ in their community of practice, but simply that they have chosen not to participate via this network). Evidence presented here suggests that cluster 4 is not technically inexperienced, and that their rejection is either due to concerns about safety or that they are intellectual rejecters. If these individuals are characterised as ‘luddites’, then it is because they perceive the new technology to not be beneficial to existing practice, or as an active hindrance to it. They are not loom-smashing technophobes, but more likely concerned at the potential conflict with their existing identity from their community of practice in which they have invested much energy. Bryson and De Castell (1998) note that luddites are not anti-technology but instead resistant to the loss of ownership of their own labour and the means of production and the movement of production towards factory assembly lines. They were concerned with the preservation of their professional culture.

Cluster 4 demonstrated the greatest concern for the effects of social media, considering it detrimental to students’ work and progress. Response patterns towards factor 9 displays awareness amongst all members of the cohort towards online safety

and the potential harm that social media may cause to both teachers and students. That all clusters display high levels of awareness of the issues surrounding the safety of social media, but many of the cohort still choose to adopt it, further suggests that cluster 4 more likely to be *intellectual rejecters*. Follow-up interviews with members of this cluster may confirm this supposition.

Methodological reflections

Missing Data

Before exploratory factor analysis was conducted on part 2 of the instrument, strategies to account for missing data were considered. Listwise deletion of cases with missing values resulted in a sample size of 174 from 216 for data reduction analysis of questions 22-29 and corresponding loss of statistical power. There were 194 missing data points representing 1.7 per cent of the total. 42 respondents recorded one or more missing data points. A significant minority of respondents recorded only a few missing datapoints, meaning that listwise deletion would involve the loss of a substantial amount of information. Missing data ranged between 0% and 6% for each variable. The majority of the missing values occurred in question 29 (between 4.2 and 6%) suggesting that fatigue or impatience on the part of the participants may have resulted in fewer responses.

A Markov chain Monte Carlo (MCMC) multiple imputation (MI) procedure was performed in SPSS (IBM v. 20) in order to impute the missing data to examine the impact of missing data on the emergent factors. Little's Missing Completely at Random (MCAR) test gave a Chi-square statistic of 1295.39 (d.f. = 1411, $p = .987$) suggesting that the 'missing at random' assumption was plausible. Independent variables in the imputation model included gender, age, experience (years), their self-identified attitude

towards social media (Q42) and two binary measures of participant engagement with social media (whether or not they had Twitter and Facebook accounts). Remaining variables from the dataset were predominantly binary and measured patterns of usage and ownership of software and hardware. Questions were nested so that those who responded affirmatively to an initial item were presented with subsidiary items. This data was therefore not deemed suitable for imputation as non-responses represented a legitimate design feature of the survey.

MI was used as a form of secondary analysis to test the robustness of the original dataset (using listwise deletion) against complete case analysis. Imputed datasets were created across 500 iterations, with imputations made at every 100th iteration, creating five complete datasets (each with n=216). Each of the datasets was included in subsequent factor analysis using varimax rotation, as was the original dataset of individuals with missing values (n=174). Outcomes for each factor analysis were directly compared across datasets to identify any discrepancies in the output and determine the level of impact of missing data on the findings. Differences emerged both in cross-loadings and factor membership of items.

The purpose of multiple imputation is to obtain unbiased estimates of the missing values in the dataset for subsequent post-hoc analysis. Data reduction techniques then allow for summing items prior to specific hypothesis testing. MI will increase the sample size for computing group means, standard deviations and standard error. However, MI is a parameter estimation technique; the data demonstrated a lack of rotational clarity in exploratory analysis conducted on multiple imputed datasets. These findings suggest that the use of MI as an approach to the issue of missing data in instrument development needs to be approached with caution if the research programme devised for that instrument involves exploratory factor analysis. Imputed datasets failed

to resolve ambiguities for five of the eight items. Therefore, for data reduction strategies (exploratory factor analysis), the original dataset was utilised with listwise deletion and post-hoc analysis conducted with the reduced sample size of 174.

The significance of using focus groups

The questionnaire used in this survey was developed from focus group exploratory data. We recommend the use of this approach as a way to explore issues relevant to the target survey population and to generate authentically located questionnaire items, increasing validity claims for the questionnaire when used with the larger sample of that population. In our case this was used in the absence of published work but could also be used to explore with a group of the target population the relevance of theoretically derived concepts. However, confidence is needed in the focus groups, in particular in representing a range of possible views.

This is partly related to the number of voices heard and partly related to the range of views represented. We felt that the latter was likely to be the hardest to achieve, concerned that by mentioning something as specific and as socially stigmatized as 'social media' in our advertising could be divisive in terms of recruitment. We feel that it was important that our advertising of the invitation to be involved in the focus groups was face-to-face, was based on a full explanation of the scope of the project and showed enthusiasm for hearing all views. The self-identification of potential participant's social media use was a useful check on whether we had been successful in our recruitment strategy. We were less successful in our recruitment of two reasonably sized focus groups. Despite travelling to the London area from the Midlands to hold focus group B, as it was more convenient for the participants, only one of the 4 individuals recruited could make the focus group on the day due to a combination of

work and travel issues outside of our control. We accept that more individuals in this second focus group would have enriched the discussions in that group and therefore the focus group data set as a whole.

We would also advocate the presence of two researchers in the operation of focus groups. Although this seems like potentially over-specification there are definite advantages in offering two roles for the researchers. In the case of focus group one, as outlined earlier, this allowed management of the group to attend to individual as well as group engagement. In the case of focus group two, where only one participant attended, two lines of questioning were possible with a group discussion simulated.

Issues associated with questionnaire design

Consequently, items hypothesised as valid attitude statements need to be carefully piloted. One of the considerations is to ensure that understanding is not dependent on context. A second is clarity of and shared understanding of the language used in the questionnaire. Rejected items from the survey were disregarded as subsequent analysis revealed ambiguities in meaning and wording that resulted in response patterns that were difficult to interpret. Stronger piloting would have eliminated redundancy further in the final instrument. Similarly, as several of the focus group members provided examples of social media use that were highly pertinent to their own context, these could have been omitted if larger-scale piloting had determined that the response patterns to particular items was unlikely to demonstrate internal consistency. Both actions would have shortened the instrument and helped to eliminate the problem of missing data and subsequent listwise deletion in the cluster analysis.

Insights about sampling strategy for the survey

The sampling strategy was an aspect of the research design which was accepted to have been problematic. A stratified approach involving negotiating access with relevant gatekeepers to gain a representative sample of teachers was indeed more desirable than convenience sampling, although this proved unworkable in practice. It is likely that a stratified sampling approach would identify new clusters. A five-cluster solution should not be regarded as a definitive description that encompasses all possible teacher attitudes towards social media. We had intended to know something about the

location and types of schools represented by teachers and hoped that gatekeepers might increase response rates within each school. This would have allowed us to say something more specific about our sample population. However, with such low recruitment using this strategy, we needed to change strategy mid-way through the survey period to try to reach more participants, regardless of who and where they were located. We have already noted how, by using social media to gain access to more participants, we were potentially biasing our sample to social media users. However, based on the self-identification question (Q42) in the questionnaire, it did appear that at least a range of attitudes were expressed. The final sample size was still limited in number, given that by using a portal, such as the TES forum, a large number of teachers nationally might have been expected to see the invitation to participate. Generalising claims from the study would require a significantly larger, more representative sample than the study was able to obtain in order to mitigate the impact of ‘social desirability’ of responses or of negative perspectives skewing participants’ interpretation of their own usage. Direct evidence of this emerged in the focus group discussion. One participant stated *‘I am definitely IT-illiterate compared to you [other members of focus group A]’*, yet when asked to elaborate her experience of IT and social media, stated that she used email and Facebook to maintain contact with relatives living abroad. Restrictions in data collection due to practicality and ethical considerations are not uncommon (Adcock, 1997). Any restrictions on data collection will also hinder the replicability of further research seeking to build upon earlier studies.

Conclusions and Further plans

Integrating qualitative and quantitative data from phase 1 of our survey design (figure 1) allowed us to develop a questionnaire instrument to make claims about whether teachers have, and how they engage with social media, as well as their attitudes to social media both in a personal and professional capacity. A think-aloud approach to piloting afforded an opportunity to include additional elements that were not previously apparent from the focus group discussions and ensure clarity of specific items.

The five distinct clusters of teachers revealed in our survey are a result of analysing 174 teacher responses to a questionnaire about use of and attitudes to social media. This is helpful in visualizing the spread of teacher perspectives on social media, not only in current practice but also of its potential. The diversity mirrors that known about in society more generally but, because of the survey questions being focused on and relevant to teachers' concerns and practices, the survey reveals a nuanced description of the range of teachers' attitudes and uses. The 9 factors best describing the spread of survey data similarly offered a guide to the distinctive features of teachers' attitudes and views which could replace the cruder section headings of the original questionnaire to distinguish between responses. What is needed next, and has been built into the overall sequential design, is a richer understanding of teachers' experiences with or related to social media which help explain these patterns. The final question of the questionnaire was to invite participants to be interviewed. 22 participants responded by providing their email addresses. 15 of these have been subsequently interviewed, with at least one participant from each of the five clusters. The cluster analysis is proving helpful in locating individual teachers within the broader survey population. We met with teachers working across a wide geographical area in the Midlands and West of England to complete these interviews, which included a network mapping exercise (Fox et al 2011) asking them to explain how social media fitted into these

networks and a discussion to explore their relationship with social media. The conceptual lens being used, in keeping with the interested in notions of communities of practice and networking outlined earlier, is a sociocultural one which has guided the interview schedule design and covers the following strands:

- social – the role of social media in teachers’ connectivity (both in terms of looser networks and communities of practice membership);
- historical – the initiation and change of social media use and;
- cultural – factors affecting teachers’ social media use and attitude to use.

As indicated earlier two foci are being examined. Firstly, the particular interplay between teachers’ identity development and social media use and secondly, thinking around the adoption (or non-adoption) of social media for pedagogical use as an example of teacher engagement with technological developments. One implication of the diversity revealed in the substantive findings is that schools wishing to actively develop social media use by teachers should expect to find a range of current experience and attitudes to these tools, which they will need to accommodate. For example, we have been approached by a school who is aware of the survey results and wishes to spread thinking about whether and how to use Twitter in their sixth-form teaching (16-19 year olds). We have recommended that they adopt a joint practice development approach (Sebba et al 2005) in which teachers, with initially different views and attitudes to social media, discuss and develop sessions integrating Twitter use together. This project includes collecting student feedback on the value of using Twitter. Student voice as a contribution to teachers’ reflections on the potential value and key concerns of using social media for education purposes through a process of student consultation

(Ruddock et al, 2003) reveal the value of accessing their thoughts on how pedagogical developments impact on their learning. This is a project we as academics are collaborating with the teachers such that, as the school focuses on exploring the pedagogical potential for Twitter use, we jointly explore the experience of debating the potential for social media in terms of their professional learning.

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Appendix 1

Attitudes towards Social Media

For each item, please tick the box that best reflects your feelings. These items all relate to comments expressed by teachers in focus group discussions.

Factor 1 - Potential advantages of social media for teachers

29. Section 1 – For teachers	Hindrance	Not useful	Neutral (uncertain)	Positive	Extremely positive
a) Improving communication between staff					
b) Improving teachers' IT skills					
c) Improving teachers' organisational skills					
d) Communicating with parents					
e) Sharing resources with colleagues					
f) Sharing ideas with colleagues					
g) Supporting colleagues					
h) Networking					
i) Career development					
j) Lesson planning					
k) Workload management					

Factor 2 - Teachers' professional use of social media

25.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a) Social media is useful for professional support					
b) Social media is useful for networking					
c) Social media is useful for lesson planning					
d) Social media is useful for finding resources					
e) Social media helps teachers to learn new skills					

Factor 3 - Potential advantages of social media for students (skills & learning)

29. Section 2 – for students:	Hindrance	Not useful	Neutral (uncertain)	Positive	Extremely positive
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f) Improving students' reading					
g) Improving students' writing					
h) Improving students' study skills					
i) Improving students' motivation towards learning					
j) Improving students' verbal communication					
k) Tackling bullying					
l) Teaching e-safety					

Factor 4 - Potential advantages of social media for students (facilitate learning)

29. Section 2 – for students:	Hindrance	Not useful	Neutral (uncertain)	Positive	Extremely positive
a) Creating online learning communities for students					
b) Improving students' IT skills					
c) Assisting students with homework (answering queries)					
d) Sending students reminders (e.g. homework deadlines, PE kit)					
e) Student project work					

Factor 5 - Teachers' IT literacy

22.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a) I consider myself IT literate					
b) I feel comfortable using ICT (information & communication technology)					
c) I like learning about new technology					
d) New technology is intimidating					
f) I don't have time to learn about social media					

Factor 6 - Social media and students' skills (reading, writing, verbal, homework completion)

27.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a) Social media improves students' writing					
b) Social media improves students' reading					
c) Social media improves students' verbal					

skills					
d) Social media is useful for completing homework					

Factor 7 - Social media and society

23.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
b) Social media is too public					
c) Mobile devices are making manners worse					
d) People will regret their use of social media in the future					
24. d) I am concerned about my personal privacy online					
26. b) Students' proficiency in social media undermines teacher authority					

Factor 8 - Personal versus professional use

24.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a) I don't wish to share my social time with work colleagues					
b) I like to maintain clear boundaries between my social and professional life					
c) I am happy for colleagues to see my uploaded pictures					

Factor 9 - Students, social media and online safety

26.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
c) Students don't consider the consequences of the material they upload to social media sites					
d) Students are careless with who they speak to online					
e) Cyber-bullying is a big problem					

Appendix 2

		Sum of Squares	df	Mean Square	F	Sig.	η^2
Potential advantages of social media for teachers	Between Groups	9781.950	4	2445.487	221.098	.000	0.84
	Within Groups	1869.251	169	11.061			
	Total	11651.201	173				
Teachers' professional use of social media	Between Groups	2844.594	4	711.149	75.833	.000	0.64
	Within Groups	1584.854	169	9.378			
	Total	4429.448	173				
Potential advantages of social media for students (skills & learning)	Between Groups	3530.356	4	882.589	74.856	.000	0.64
	Within Groups	1992.592	169	11.790			
	Total	5522.948	173				
Potential advantages of social media for students (facilitate learning)	Between Groups	996.489	4	249.122	42.539	.000	0.50
	Within Groups	989.718	169	5.856			
	Total	1986.207	173				
Teachers' IT literacy	Between Groups	201.008	4	50.252	4.388	.002	0.09
	Within Groups	1935.199	169	11.451			
	Total	2136.207	173				
Social media and students' skills (reading, writing, verbal, homework completion)	Between Groups	855.183	4	213.796	31.569	.000	0.43
	Within Groups	1144.524	169	6.772			
	Total	1999.707	173				
Social media and society	Between Groups	739.954	4	184.988	15.598	.000	0.27
	Within Groups	2004.253	169	11.859			
	Total	2744.207	173				
Social media and society	Between Groups	291.444	4	72.861	9.171	.000	0.18
	Within Groups	1342.694	169	7.945			
	Total	1634.138	173				
Personal and professional use	Between Groups	70.584	4	17.646	4.850	.001	0.10
	Within Groups	614.841	169	3.638			
	Total	685.425	173				