Micro Note-Taking on Smartphone: The Learner Experience

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Abstract—Note-taking is considered as one of the main activities for students during lectures in the classroom. Indeed, many educators have suggested that note-taking can significantly improve students' educational performance. Therefore, there are many systems available to capture what the teacher presents or explains during the lectures. However, less attention has been paid to the great potential of integrating Web 2.0 technologies with the learning process at universities for note-taking purposes so as to make it more effective. As such, the purpose of this paper is to extend understanding of learners' experiences specifically when short text – the 140 characters, often used in social networks – was used for note-taking. The paper presents findings on learners' experiences of using such a "micro" note-taking approach involving just 140 characters and suggests a feature list for a future note-taking system. The qualitative approach focuses on learners from one university in the UK. The learners were at postgraduate level, and data were collected through focus groups with the learners. Findings indicate that the use of a short text feature leads to a positive learning experience.

Keywords— micro note-taking; smartphone; social media; UK.

I. INTRODUCTION

In recent years, there has been a considerable increase in the number of students carrying one or more mobile devices into lectures. These include laptops, smartphones and tablet devices. Sharples [1] highlighted the growth in using mobile phones amongst students as well as across all educational areas. New generations of smartphones support fast Internet connections through 3G and 4G wireless technologies in addition to faster Wi-Fi connections. Moreover, with new iPhone and Android phones providing millions of applications, there has been a dramatic increase in the interest level in using these devices for educational purposes [2]. Indeed, in the last decade, and due to these advances, researchers have shown an increased interest in using new technologies and computing devices for taking notes.

When it comes to capturing notes using traditional tools, many different forms of learners' behaviour can be observed. The majority of students intend to capture what the teacher presents or explains during the lecture, and these notes could either include specific details, or may simply record the most important points [3]. In line with this, some students attempt to capture everything presented by the teacher, while others attempt to select relevant points and a few indulge in a certain amount of doodling whilst they listen [4].

Note-taking is one of the common techniques used by learners during lectures [5], and, traditionally, this course of action is usually conducted either manually (i.e., pen and paper) or electronically, using electronic devices such as tablet PCs and PDAs. However, given the massive uptake in the use of information and communication technologies, there is great potential for integrating Web 2.0 technologies with the learning process at universities for the purposes of note-taking so as to make it more effective.

To give just a few examples of the value and benefits that can be delivered through the use of SMS features, and more specifically Twitter, in the practice of note-taking, it was found that one of the advantages of using Twitter in a classroom setting is that it offers students an additional channel for communication [6]. Scornavacca et al. [7] also found that, for the purposes of handling questions in a large classroom, using text messages is more practical and efficient than the traditional method of raising hands. However, a survey of faculty members, guests, and students on a pharmacy management course that was conducted by Fox and Varadarajan [8] showed that, although 80% of the sample found that Twitter facilitates class participation, 71% and 69% of the sample, however, indicated that Twitter was distracting, and prevented note taking, respectively. Hence, using Twitter during lectures to get involved in classroom activities may be annoying for instructors leading classes [9]. In line with this, Cherney [10] argued that students who use Twitter will lose the necessary space for thinking in depth compared to when they are taught by traditional teaching methods in classrooms. This research, therefore, contributes to the use of Web 2.0 technologies, and, more specifically, the features of Twitter, in the educational process so as to make it more effective than has been the case hitherto.

This paper reports the evaluation of a new approach which is mainly based on mobile and Web 2.0 technologies, and which relies primarily on the employment of *micro note-taking*, or so-called *micro-blogging*, a form of communication that allows people to generate content by posting short messages limited to 140 characters [11] [12]. To gain insight into the concerns of this paper, discussions with the learners who took part in the experiment were analyzed, in particular regarding their experience while using the micro note-taking approach.

The research presented in this paper aims at extending our understanding of what university-level learners' experiences are in terms of note-taking, when using just 140 characters on (Android) smartphones. Moreover, the nature of and reasons for the preferences of using this new format of notes in an educational environment was examined, as was how this prototype could be improved to support learners' note-taking practice in a classroom environment. In short, this paper describes experiences and lessons learned from a class activity that incorporated the micro note-taking approach which is mainly based on mobile and Web 2.0 technologies. It identifies the main positive and negative features of the proposed micro note-taking application and provides ideas and general design guidelines applicable to this approach.

The remainder of this paper is organized as follows: the second section describes the methodology used, the third section describes the experiment itself. In the fourth section IV findings and interpretations are covered. In the fifth and last section the conclusion closes the article.

II. METHODOLOGY

The goal in this section was to present learners' in-depth perspectives of their experiences with using a micro note-taking application. Specifically, this study aims to explore students' opinions about the main positive features and limitations of the proposed micro note-taking application, and of how the application could be improved to support their note-taking practices. Therefore, the decision was made to use a focus group due to the fact that it is a feasible way to represent the participants' feelings, beliefs and experiences [14]. The focus group is part of an evidence-based qualitative approach, which emerged as a distinctive approach, and which also involves in-depth interviewing, observation and projective methods among others [15]. This paper reports in depth the qualitative findings generated from two focus groups consisting of participants in an experiment aimed at enhancing the understanding of the user experience using the micro note-taking application. The two focus groups consisted of 14 users who participated in 45-minute discussions. The focus groups were audio recorded but only after all participants approved the recording. Data were then transcribed and subsequently analyzed using qualitative data analysis techniques as described by Guest et al. [16]. The main objective of the analysis was to transform data into findings but, more importantly, to make sense out of it. During the analysis, as a list of ideas emerged, those ideas were grouped based around significant headings to form the concepts. Next, related concepts were aggregated in categories to form the themes that constitute the results. The emerging themes were then examined based on their intensity, depth, and specificity with the research questions, with additional emphasis given to comments that were frequently repeated

or refuted by the interviewees. NVIVO 11.0 software was used to analyse the qualitative focus group data. NVIVO is a computer assisted qualitative data analysis package (CAQDAP), settled by QSR International [21]. This software offers a set of functions that support the coding and recovery of text. Another remarkable privilege is that it assists researches to write down memos during the analysis process [22]. In an attempt to conquer reliable and informative data out of the interviews, each single focus group has skillfully created a transcript that was saved in a distinct word processor document (i.e. two documents). This has enabled sustaining fertility of the interviews data. Afterwards, the two documents were imported in NVIVO for reading, analysis and coding. The main objective of the analysis was to transform data into findings, but more importantly was to make a sense out of it. During the analysis, recurring ideas, patterns of beliefs, and salient themes were extracted with relevant quotations that demonstrated support for these themes. The emerging themes were then examined based on their intensity, depth, and specificity with the phenomenon of interest, with additional emphasis given to comments that were frequently repeated or refuted by the interviewees [23]. The results are then presented in a narrative form granting detailed insights into the main issues related to micro note-taking practice.

Since this micro note-taking is still at the evaluation stage, some background information was required, such as language, mobile experience and Twitter experience, to see whether or not these features could influence the generated results. The participants had different levels of experience in using mobile applications as follows: 25% had no experience, 63% had experience of less than 5 years and 13% had experience of more than 5 years. Furthermore, 38% of the total participants were not very familiar with Twitter in particular. The participants were from different backgrounds and English was not the first language of most of them.

III. EXPERIMENT

The main method of data collection for learners' perspectives was focus group interviews. The experiment was conducted at the University of Warwick with the help of 14 learners' studying courses entitled "Cyber security" and "Innovation". The learners' ages ranged between 20 years and 25 years. The only commonality among the participants was that they were part of a community of interest who were following postgraduate courses in the related fields just mentioned. They were expected to have enough experience and exposure to new IT-based note-taking tools to interactively take part and subsequently convey pertinent responses during the discussion. The learners volunteered to take part in the experiment, which was conducted within 45 minutes for each session. The participants in the focus group were divided into two groups, and were of mixed gender comprising 6 males and 8 females. The two sessions of the discussion were moderated by the main researcher.

During the experiment, an average of 14 participants were randomly assigned to one of the note-taking approaches defined as: traditional pen-paper, micro note-taking and electronic Microsoft word where requested to use the different approaches to take notes while viewing the video. The participants were exposed to the different approaches over the experiment time. The note-taking experiment was based on vide played like a lecture. The use of these approaches emphases on the effect of the proposed micro note-taking.

The focus group participants were approached after using a micro note-taking application in the experiment. An open ended approach, which was related to the use of the micro note-taking approach, was conducted. The discussion was kept focused around the proposed micro note-taking application. The research aimed to answer the following questions:

  a) What are the positive features of the mobile micro note-taking approach?
  b) What are the negative features of the mobile micro note-taking approach?
  c) Would you prefer using 140 characters for writing your notes, and why?
  d) What are the difficulties you faced when using the mobile micro note-taking application in lectures?
  e) Do you think that other learners would find the application appealing, and why?
  f) What other features would you recommend to add to the mobile micro note-taking application?

IV. FINDINGS AND INTERPRETATIONS

As mentioned earlier, data were gathered from the focus group interviews and analyzed using a thematic approach [16]. Each theme addresses an issue related to the use of the proposed micro note-taking application and reflects the experience of learners regarding their use of the application. Discussion was centered on these areas in order to ensure coverage of only key areas that were closely related or clearly relevant to the study.

A. Perceptions of positive features of the mobile micro note-taking application

Initially, participants were asked about the positive features they found using the prototype of the mobile micro note-taking application that is described in [11]. The results were consistent with those reported in the current state of the art as in [17], where learners reported as positive features the ease of use and that it is a "handy tool". For example, participant 1 described the proposed micro note-taking application by saying that "*it's simple, no previous experience required, affordable, easily accessible, all have a mobile in class*". Participant 4 also agreed with this by stating that "*there is no previous experience required*".

Participant 7 mentioned "*it's an easy tool for note-taking*". Another positive point that emerged from the analysis is that the proposed tool is useful and handy, and participant 3 confirmed this point by stating "*you don't need a paper and pen also there is no need to carry the heavy laptop to start typing, really handy*". Participant 13 affirmed what his colleagues said "*it's simple to your eye, anyone can use it even people who don't have experience*".

Another positive feature is the applicability of using the micro note-taking application for quick revision. This capability has been explicitly expressed in the words of Participant 10, who stated: "*self-revision, jotting down important notes and bringing them before the examination, quick review, revision of any last minute study or some test*". Participant 2 affirmed what his colleagues said: "*I think it's good for revision for a quick review of any last minute study or some test, something like that is good*".

Most people use a mobile device such as a smartphone to support their personal and professional functions [17]. Technology is becoming a ubiquitous part of the academic environment generally and the process of note-taking in particular [18]. Mobile devices can be valuable in academic areas for higher education [17], and the results of a study by Ward and Tatsukawa [19] suggest that taking notes using such a system is feasible. Another study by Motiwalla [20] highlighted the fact that learners liked the ease-of-use and convenience of using mobile applications in learning. Consistently, in this paper, participants also revealed that the main positive feature of the micro note-taking application is that the application is affordable, convenient and accessible. Participant 9 said that: "*it's very affordable and is easily accessible because we all have mobiles, but nowadays mobiles are present everywhere. So like it's affordable; it's the best thing that I've had*". Participant 3 confirmed this point by saying "*mobile micro note-taking is affordable*". As for accessibility, participant 12 stated: "*… read the thing and you can do it anywhere even on the bus or when travelling*". Participant 6 also concurred: " *Because it's mobile, it can be easy to carry wherever you go*", as did participant 14: "*Because it's mobile, it can be easy to carry wherever you go. So I think it's appealing to the young generation because they only use or bring their mobiles everywhere*". These positive features of the micro note-taking application also have been explicitly expressed as Participant 1 stated: "*I think people feel comfortable using phones to take notes these days, and they are easy to carry around rather than the laptop or pen and paper and it's faster to take notes on. So it's easier to capture what you exactly want. I think it could be useful to have something like this. Definitely*".

B. Perceptions of negative features of the mobile micro note-taking application

When the participants were asked about what the limitations of the micro note-taking application are, they reported that, although the application includes many positive features, it does have a number of limitations. These include the small interface size and lack of a usable keypad on some actual smart phones, and also difficulties such as

slow typing that can be connected to usability issues (although they had stated earlier that the application is easy to use). Moreover, they suggested that this tool may lead to students being distracted during a lecture and that there are usability issues due to lack of experience.. For example, Participant 7 stated: "*on the device itself, the keyboard is quite small to type actually*". Participant 11 also gave his opinion "*I think because we're not used to typing quickly, I'm speaking for myself, but otherwise it's okay especially I think with the new generation they are quicker in typing*". Similarly, Participant 8 said that: "*because when I concentrate on listening, and I just continue typing, I did not realize that actually the limit is already 140. So, when I look back, actually there's some missing words or sentences already*". Participant 6 found it might be a source of distraction during lectures and expressed these reservations by stating: "*make sure that they take it seriously and they are just not playing around with it*". Participant 13 concurred with this by saying: "*I found I was constantly having to look at what I'm doing so I lost a bit of concentration. That's because it was more distracting*". Only one student, Participant 8, mentioned that the lack of experience about how to use a micro note-taking application could lead to limited use of such application, she mentioned that: "*I think the difficulties I faced just because it's the first time to use it. So, I face a lot of problems and most of my notes wouldn't save because I've just done a mistake, so I didn't save or I just put back and then it's not saved. So I think just because we're not familiar with most of the difficulties*". To overcome this limitation, Participant 6 suggested: "*I think we need to do some kind of an introduction to the system before get to take notes*". Based on these results, we can conclude that unfamiliarity with using the micro note-taking application and Twitter is what leads to such negative outcomes.

C. Perceptions of using 140 characters for writing students' notes

Based on the analysis, two perspectives have emerged when the participants were asked about their preference for using 140 characters for writing their notes. The majority of participants explained that the limited notes of only 140 characters (i.e., similar to Twitter posts) could improve the ability to take short notes that can be easily managed and recalled later. For example, Participant 1 stated that*: "using just 140 characters helps us to think of what we want to write"*. Participant 14 was also totally in agreement*: "I was not distracted as there was no option but to take only important points with limited words"*. However, a few participants found that the restricted notes of only 140 characters might affect notes in terms of continuity. This concern has been explicitly expressed by Participant 10: "*For me it's the continuity of our notes because it's only 140 characters, so if we write something, you know, the sentence would be hanging*". Therefore, participant 5 suggested: "*… during a lecture I prefer more than 140 characters because during the lecture we just take any notes the lecturer speaks, so we don't have time to think about what is important and what is not – just take any notes*".

According to the findings of this study, it can be said that a 140 character note was a generally useful format for note-taking practice by learners, providing a positive note-taking experience but with some important reservations.

D. Suggestions to improve the mobile micro note-taking application

The participants were asked to share their experience about the micro note-taking application and suggest additional features so that it can be improved. Based on the analysis, Table 1 shows a list of the valuable features and functionalities that have been suggested by participants. All participants' suggestions were taken into consideration in the updated version of the micro note-taking application.

TABLE I. SUGGESTED FEATURES AND FUNCTIONALITIES

Feature	Suggested by
Use visual presentation that represents certain words. So each picture has correlated notes	Participant 5: *"Just make it a bit more appealing because it's very abstract from a point a view and you can use this drag-and-drop thing, like you can give them pictures and this can open up instead of just making it as simple and abstract as ….give them more options, more features and make them on icon thing so they just touch it and a note opens up or, for example, an annotation opens up, or a shape opens up."*
Provide a feature to organize notes (e.g. folders or according to subjects)	Participant 3: *"I'm not sure if the pictures are already there or not but may be if it would be helpful if you could organize a note in folders or according to subjects because it seems if you have like different subjects, you could organize all the notes in one folders so it will be easy to access – I think this is one thing."*
Annotate the content itself by providing different shapes based on the type of content. For example, for learner's notes, it is a rectangle, for lecture notes, it is a circle…	Participant 2: *"Basically we're talking about annotating the content itself, because sometimes you need to post somewhere and put a note there. So I think shapes make more sense. Beforehand you can divide the content into shapes and based on shapes we can take notes and annotate that directly on the shape or the subject or the idea within the class, just to making random notes and then putting*

Feature	Suggested by
	them altogether and you might not remember what it was related to. So it more like correlating what notes have been taken with the actual content. That would help a lot"
Provide options to have short notes and long notes	Participant 1: *"May be there should be an option to have short notes and long notes."*
Integrate Web 2.0 features (e.g. sharing, hashtags)	Participants 10 and 12: *"Maybe for sharing. Let's say we have three of us here…then we can share. So maybe it might be the notes that we take."* *"I think may be also having the feature of hashtag. So having hashtag would help you to organize notes so whenever you use this hashtags to retrieve all the notes which have this hashtag so that would maybe useful."*

Table 1 highlighted the features that should be considered to improve the note-taking system. These features are mainly related to the interface and functionalities.

V. CONCLUSION

The main aim of conducting the focus group was to extend the understanding of the learner's experience of using the proposed micro note-taking application, as an approach for note-taking practice in lectures. The findings of this study reflected the perspectives of students regarding their experiences of using such a tool. Positive features, limitations and suggestions for future improvement were identified. Based on the analysis, positive features of the micro note-taking application include: ease of use, the applicability of using the application for quick revision, improved access everywhere, any time (i.e., ubiquity) and affordability. However, as with all applications, the micro note-taking application is not free from limitations, which include: usability issues, learners' distraction during lectures, and lack of experience regarding how to use the application. The limitations of the current application provide opportunities for further improvements, and students suggested valuable functionalities that could be added to improve the proposed tool. These include: integrating Web 2.0 features such as sharing and hashtags, providing options to have short notes and long notes, providing a feature to organize notes into folders, and visually presenting notes in symbols. The proposed approach discussed qualitatively through the paper suggested an innovative approach for note-taking. The findings of this research add value to the current state of the art concerned with connecting mobile learning with the social feature of limiting the note taking to 140 characters

using Twitter like states. This finding would have an impact on the academic areas to consider applying modern technologies for the current learners' age and facilitating their learning. However, as with all studies, this study is not free of limitations. The major limitation is derived from the sample size and the geographical location of the sample which is limited to only 14 participants located in the UK.

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