

Digital literacies in a Chinese secondary school

Xiaofan He and David Wray

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Abstract

Recent studies of the literacy practices of adolescents in a digital environment have helped us to understand how students deal with digital texts to assist learning. However, most of these studies have focused on Western countries. With the increasing use and penetration of technology into daily life, many schools, colleges and universities in China have also been integrating technology into teaching and learning. Many educators in China believe that technology can introduce a 'new direction' into the Chinese education system, which is often stereotyped as characterized by rote learning and extreme exam-orientation. Several schools in China have been engaged with the 'Electronic School Bag' (Dian Zi Shu Bao) project which has the purpose of encouraging active learning through the establishment of 'a public educational service platform'. The study reported here focuses upon one secondary school with digitised classes in Xiamen, China. Students are encouraged to bring their own devices to school and to connect to the internet and the virtual learning environment in order to be 'on-line' at any time. Two classes were studied using a range of qualitative research methods including observations and interviews. The outcomes of this case study will be used to suggest some key features of these students' literacy practices in a fully digitised learning environment. Comparisons will be made between these "Chinese" features and what is understood from research into similar situations in Western settings.

Introduction

Since the introduction of information and communication technologies (ICTs) into K-12 schools in the late 1990s in China (Gu et al. 2013), technology integration in education has attracted attention from researchers and the central government to get a better idea of learning environment transformations and the resulting technology-supported student outcomes (Ge and Ruan 2011; Lei 2010). The 'Education and Information Technology Ten-Year Development Plan' (2011-2020), issued by the China Ministry of Education, emphasises the integral role in education of information technology over the next decade. Several nationwide projects have been conducted since 2000 such as 'ICT-Accessing or Internet-Connecting Engineering Project for All Elementary and Secondary Schools' (MOE of China, 2000a), 'Curriculum of ICT

Education for All School Students' (MOE of China, 2000b), 'New Cycle of Curriculum Innovation for Basic Education and Integrating of ICT into Curriculum' (MOE of China, 2002). A large amount of investment was made on education technology to carry out these projects. By 2004, 100 billion Yuan (about \$13.2 billion) had been spent (Lei 2010; Zhao 2005).

In addition to the educational policy emphasis on information and communication technologies, China has the largest population with access to technological devices such as computers and mobile phones and the internet of any country. According to the 34th 'Statistical Survey on the Internet Development in China' issued by the Internet China Network Information Centre (CNNIC) in 2014, Internet users in China had reached 632 million by the end of June 2014 which accounts for 46.9% of the Chinese population. Based on the survey report, adolescents and young adults seemed to make up a slight majority of Internet users in China: 51.1% were adolescents and young adults, with 24.5% aged 10-19 and 30.7% aged 20-29 (CNNIC 2014).

Many studies have documented the transformation and challenge that the Chinese traditional K-12 education system is facing because of the ongoing penetration of digital technologies into the curriculum (Lee and Tsai 2004; Li and Ranieri 2010; Zhu 2003). Most studies have focussed on ICT integration into classrooms which means more attention has been paid to how teaching and learning has been affected by new technologies (Ge and Ruan 2011; Liu and Zhang 2006; Zhao 2005). Ge et al. (2012) document and analyse six major kinds of technology tools used in China classrooms. These ICTs are intended to 'cultivate students' motivation, interest, and affective development, promoting skills development, and supporting self-regulated, independent literacy learning' (ibid. p.191).

The relationship between technology and student outcomes has been examined in order to get a broader understanding of the effects of technology on teaching and learning (Lei 2010). Students' academic performance achieved with the assistance of digital devices can to some extent be used as evidence to explore whether they are 'digitally competent' (Li and Ranieri 2010). Li and Ranieri argue that teenagers who are often labelled as 'digital natives' (Prensky 2001) may not 'be able to use ICTs in a competent way' (p.1041). Lei (2010) claims that student outcomes in the digital age in China are mainly based on how much time they spend on using technology tools which means that 'technology is often examined at a very general level' (p.457). In Lei's study, the idea of 'quality of technology use' which includes study of 'how technology is used' (p.458) was introduced to examine different uses in different settings so that a better idea of how students think about reading and learning in a digital environment might be obtained.

In the latest PISA (OECD 2012) assessment, students aged 15 and 16 from Shanghai in China ranked the first in the world in mathematics, reading and science. However, this tells us little about the role of digital literacy because the area of integration of digital technology in education in China is very under-researched, especially practices outside of classrooms. Many more studies are needed if we are to understand how students see, think and deal with digital learning in different settings (in-school and out-of-school) in China.

Teaching and learning changes in Chinese classrooms

With the increasing penetration of technology into daily life, many schools, colleges and universities in China have been integrating technology into teaching, learning and instruction (Feng et al. 2011; Fu and Pow 2011; Ge et al. 2012; Gu et al. 2013; Zhang and Ma 2011; Zhao and Jiang 2010; Lai et al. 2014; Zheng et al. 2014). Many educators in China are calling for educational reform with the belief that technology would introduce a 'new direction' (Feng and Siu 2010) into the Chinese education system, which is often stereotyped as 'exam-oriented and aimed to train students to achieve high scores' (Feng et al. 2011, p.227).

Some studies have clearly documented the progress of this ICT integration from a historical point of view (Feng et al. 2011; Ge et al. 2012; Xu and Jiao 2010). Different types of ICT such as multimedia courseware, character coding and inputting systems, mobile technology and communication and collaboration tools, all used in K-12 teaching in China in the last decade have been identified as having some impact on Chinese literacy education (Ge et al. 2012). Many teachers in urban areas of China often take advantage of multimedia tools to integrate 'texts, graphics, audio, and animations' (ibid. p.186) into their teaching. Ge et al. (2012) have suggested that using multimedia courseware in the classroom can encourage students to be more motivated in language learning and help to enhance reading comprehension. Several in-service teachers have found this claim justified based on their students' outcomes after being taught in technology supported learning environments (Wang 2011). After using multimedia tools in the classroom including audio, image and video, students seem to become more motivated to learn to write Chinese characters and they perform better compared to students who have only used pen and paper (Dai 2009).

With the pervasive integration of digital technologies in class, teachers' awareness and skills have become an important consideration. In order to respond to the changing teaching and learning environment, in 2004, the Ministry of Education in China launched a tentative set of standards related to primary and secondary teachers' skills with education technologies. This was the first time that China had set a governmental standard explicitly to encourage teachers to become capable of

meeting challenges in the digital teaching and learning environment (He 2005). A series of projects have been carried out under the instruction and direction of the 'Educational Technology Skills Training Programme for Primary and Secondary Teachers' which was launched by the MoE in 2005. Teacher training projects range from traditional face-to-face seminars and workshops to fuller online training courses and have aimed to ensure that most teachers get involved in this training in some way (Li 2007). It has been recognised that professional development for teachers should be sustained and collaborative (Zhang et al. 2015) which is reflected in the national CPD programme for started in 2010 (MoE 2010). Teachers are encouraged to seek for new teaching methods involving the integration of technologies based on personal and peer practical teaching experience. Therefore, a collaborative model for CPD training has increasingly become popular and has been adopted to make sure that teaching in the digital age keeps up with social and technological changes (Liu et al. 2014). These changes, at the same time, have led to the call for new courses relating to ICT in Education in initial teacher education. Many universities introduced the course Modern Education Technology which require students to demonstrate awareness of educational technologies, skills to use these technologies in class and teaching practices with technologies (Yang et al. 2009). It is clear that teacher training and initial teacher education is being updated with the changing teaching and learning environment in the digital age.

The application of digital technology in the classroom in China has often been seen as involving changes in teachers' use of technology and teaching methods rather than changes in students' participation in digitised classrooms. It would be difficult to know whether students are digitally competent (Li and Ranieri 2010) or whether they are able to code and decode digital texts if students' experience is limited to looking at the digital texts they are shown in class.

Mobile devices such as smart phones and tablets are becoming popular in teaching and learning because of flexibility and ease of availability (Daniel and Woody 2012). Some developed cities in China such as Shanghai, Beijing, Guangzhou and Nanjing in recent years have been carrying out 'Electronic School Bag' (Dian Zi Shu Bao) projects in order to provide a ubiquitous learning environment based on the need for active learning (Chang and Sheu 2002), learning performance improvement and 'a public educational service platform' (Intel Education Research 2012, p.1). Electronic books, digital toolboxes, online digital resources, and internet access are indispensable components put into e-schoolbags to provide creative learning activities and opportunities (Chang and Sheu 2002). In 2010 Shanghai began to carry out the 'Digital Schoolbag' project throughout its kindergartens, primary and secondary schools after the completion of the 'all schools connected' to the internet and other projects during the period 2000-2010 (Intel Education Research 2012; Xiang 2013). Implementation of the digital curriculum, individualised e-learning

based on mobile learning devices and the establishment of a public educational service platform were clarified as three key foundations of e-schoolbag programmes (Li 2013; Intel Education Research 2012). This seems to be a positive move to enhance student-centred learning with the affordances of e-schoolbags because students' learning practice can be tailored based on their previous performance and mastery level. E-schoolbags are designed to focus students' use of devices, which can lead to improvements in word recognition by using built-in dictionaries and in digital literacy skills and IT skills such as information searching and locating (Li et al. 2015). Even though the transformation from teacher-centred to student-centred has been an ongoing discussion, there are many studies that have investigated changes of teaching methods, technology application in subjects and conceptual development (e.g. Huang 2009). Relatively less discussed has been what students' think of digital texts, how they perceive reading texts through different media and changes in learning and reading strategies in the digital education environment.

Digital schoolbag projects can be a useful step towards creating active learning. However, there is a long way to go before e-schoolbags can be used with a large population of students. However, digital schoolbags are not the only way to support literacy education in the digital age. Many studies have suggested that collaborative learning and or interactive activities can improve students' reading comprehension and performance by making use of social networking services or online learning systems (Su et al. 2010; Wang and Chiu 2011; Zhang and Wang 2008; Zhao 2008). The notion of literacy as a social practice can be well supported when discussion involves interaction through digital technologies such as online discussion forums or widely accepted social media software. The idea of a knowledge building classroom, based on the concept of a 'Knowledge Building Community' (Scardamalia and Bereiter 2004), was introduced into the 'Laboratory Inquiry' in 2006 in Tsinghua University in China. With the support of Web 2.0, students' digital literacy skills including searching, locating, communication and reasoning were developed through theme-based group discussion, and resource sharing (Zhang and Wang 2008). A sociogram analysis of undergraduate students using an online discussion forum discovered that students were beginning to gain a better understanding of group learning and more willing to get involved in it after experiencing interactions in an online discussion forum (Zhao 2008). It appears to be the case that students' engagement in collaborative learning in the digital age can be investigated on the one hand based on how much time and how often they interact; on the other hand through what students talk about and in which ways they collaborate to enhance learning improvement.

Apart from some fruitful studies of how teachers adopt technology for changes of teaching methods, there have been quite a few studies of students' use or adoption of technology for reading and learning. Some studies have focussed on technology

quality, course quality and flexibility as influencing factors on learner satisfaction in an e-learning environment (e.g. Sun et al. 2008). Beliefs about technology use such as users' attitude toward technology and their self-efficacy have also been explored to try to understand the acceptance of technology for learning (Gu et al. 2013; Lai et al. 2012). Studies of collaborative learning and inquiry-based learning were used to support claims that technology could 'enhance learning and improve student achievement for all students' (U.S. Department of Education, 2000, p. 4). It is noticeable that individuals appear quickly to become embedded in digital media in different settings: however, existing studies have not provided a deep understanding of the nature of students' digital literacy practices in the context of their intensive technology usage.

The present study

Against the background of current developments in China in terms of digitisation in education, the study reported here aimed to investigate teachers' and students' practices and perceptions of teaching and learning in two classes with the assistance of digital devices, including use of the internet and specially designed software. This study was guided by the following research questions.

1. What were the learning practices with digital devices of a group of Chinese school students in class and what teaching methods and practices were employed by their teachers? The students in the digitised classrooms being studied were provided with free tablets connected to a system which included three smartboards and one computer.
2. How did teachers in the digitised classes perceive teaching and evaluation under the concept of 'educational digitisation' in a fully digitally equipped classroom and how did they perceive their roles in digitised classes?
3. What were students' perceptions of being provided with free tablets and allowed to use digital devices with an internet connection in class?

The research site

The site of this study was a secondary school with approximately 960 students in Southeast China. The school was an 'experimental school' which followed the tradition of experimental schools in China in that its brief was to try out new methods to promote teaching and learning. Digitisation education was a project with the target of 'non-paper teaching' in this school. Two classrooms were equipped with connected systems of three smartboards on the walls and one computer on a platform at the front of the classroom. Students in these classrooms were seated around round tables, 5 students to each table, instead of sitting in rows as in traditional classrooms. The size of classes were smaller than the Chinese norm, with

no more than 30 students in each class.

Each student was provided with a tablet which could be connected to the classroom system. The connection offered students the chance to get synchronous access to what the teacher demonstrated on the smartboards. Teachers, at the same time, could get immediate insights into students' performance on set work as this was done using the connected tablets.

The database was planned to work as an important platform among students, teachers and parents to make sure all participants were connected to each other. With the assistance of the database, students were expected to get access to online resources at any time and their practices could be observed online by teachers and parents.

Participants, Methods and Data Collection

The two teachers who were in charge of these classes were considered to be participants in this case. Another teacher, who taught in both digitised classes and traditional classes, would also be a participant in an attempt to gain some understanding of the differences between the two types of classes in terms of teaching methods.

Following discussion with the teachers, three students (one girl and two boys) Hong, Ming and Lei (pseudonyms), all 16 years old, were identified as showing diverse use of digital devices and software in learning. Hong, the girl, claimed to carry her smart phone with her all day long. She regarded herself as a 'heavy user' of digital devices. She said that she could make full use of digital devices with good self-control without being addicted to them. Ming, one of the boys, viewed himself as a reluctant user of software on the provided devices due to a dissatisfaction with the usefulness. Lei, the second boy, had been forbidden to use personal devices in school time for a period of time because some of his teachers realised that he used digital devices more as an entertainment tool than a learning tool.

Qualitative case study techniques (Stake 2000) were employed in this study including classroom observations, and individual interviews with participating teachers and students. Students' notes and diary entries about using the provided digital devices for learning were also collected to try to understand potential learning patterns, beliefs about the usefulness of using digital devices in class and recognised obstacles within the new learning environment. In addition, students' feedback on and evaluation of the classes they experienced were also obtained. Table 1 below summarises the activities observed within the three subject areas during the study.

<i>History</i>	<i>Chemistry</i>	<i>Politics</i>
Students' 5-minute test of last lesson on tablet (not in every lesson)	Students' 5-minute test of last lesson on tablet (not in every lesson)	Students' 5-minute test of last lesson on tablet (not in every lesson)
Teacher lecturing for about 20 minutes	Teacher lecturing throughout the whole lesson including using video clips	Teacher lecturing for about 20 minutes
Students using tablets to search for relative information online	Students doing quizzes regarding specific knowledge points on tablets	Students doing quizzes on tablets
Students' discussion in group regarding information they had found and that obtained from teacher	Teacher varying quizzes based on students' grasp of knowledge and performance on the last quiz	Teacher's analysis of students' outcome of quizzes
Students' talk based on the discussion in class	Students' discussion in group regarding practical applications in real life	Students using tablets to search for the latest news related to the lesson
Teacher's comments and other online learning material shared	Students' using tablets to search for some chemical reactions	Students' discussion in group based on what they had searched
5-minute text on tablets about the lesson (Not in every class)	Students' using tablets to search for examples to support their talk	Students' talk in class according to the discussion
Teacher assigning homework	Teacher's comments on students' talk	Teacher's comments on students' talk
	Teacher assigning homework	Teacher assigning homework

Table 1: Observed Classroom Activities

Findings

Teacher-student relationships in the digitised classes

From the classroom observations, students appeared to be given a good deal of autonomy in the class in terms of accessing and using digital devices. They did not spend their time simply looking at the smartboards where the teacher demonstrated an instructional point. They were, instead, given time to use their tablets to search for what they needed for the class. Discussions among students were also encouraged in class based on what they had found through searching on a specific topic. The teachers, meanwhile, were transformed from a total instructor to a guide in class. They were not, when they were observed, simply delivering a lecture and questioning the whole class. It appeared, therefore, that they were no longer taking the authority role in terms of knowledge and technology in class. Interactions between teachers and students were also observed when both parties were using software through the tablets and the connected system.

Practices across subjects

Teachers' teaching practices and students' learning practices in digitised classes were found to be different from subject to subject. Based on observations of the teaching of the three participating teachers in this case study (teaching Chemistry, Politics and History respectively), the Chemistry teacher tended to allocate less time to students to search for information on a subject. Instead, software installed on both tablets and on the system was used more frequently. This teacher claimed to be able to tell the students' grasp of knowledge as soon as they had finished their exercises using the software. New material was set based upon this analysis of the students' performances.

However, the History and Politics teachers were more willing to ask students to search for related subject information to broaden their knowledge and boost their critical thinking. These teachers tended to provide technical and academic support in the class. Their students often used the tablets for information and some students continued their work after school time.

Perceived usefulness of the digital approaches

The students in this case study viewed themselves as 'digital natives' (Prensky 2001), that is, born and brought up with digital technologies, and they believed that digital devices were useful tools for expanding knowledge and solving problems in school work. Some applications downloaded by students were frequently used because, as they argued, this was a quick way to get answers with detailed analysis

of questions.

The teachers, however, stated that technology was a new method which could be attractive for students. Digital devices and educational software were regarded as supplementary to instruction and were thought to deepen students' understanding of knowledge. Teaching methods within the digital environment had been explored and adjusted in order to gain the expected learning and teaching outcomes.

Acceptance of new technology

The acceptance of technology in education should be explored from aspects including availability (Hutchison and Reinking 2011) of hardware and software, ease of use (McGill and Hobbs 2008), and personal competencies (Li and Ranieri 2010). In this case study, one teacher tended not to use the installed software because he admitted that it was not well developed and suffered from a poor internet connection which could waste a lot of time when the software stopped because of technological problems. Some teachers in the digitised classes admitted that they were not yet fully competent at using digital devices which could hinder their acceptance of new methods in teaching. The students' developed skills of using digital devices and applications were helping them embrace this new way of learning with excitement and curiosity even though they also found that the installed software is not user-friendly at some points.

Emerging and potential obstacles

The teachers in this case study indicated that their judgements about students' performance in the new digital learning environment were hampered by a lack of suitable methods of evaluation. Traditional assessment such as paper-based exams was the only approach to evaluating students' skills and performance that they had experience of. There had been discussion among teachers in the school concerning possible new forms of assessment to measure students' learning outcomes.

The school policy concerning students' use of digital devices and the internet was not well settled before the project began, which resulted in some inappropriate use in school in periods when students could find some time. Students also demonstrated that they were not always able to control themselves not to use these devices for the purpose of entertainment because they could reach them at any time without restriction and the teacher could not trace what they were doing on devices if they were not using the database.

Discussion

This study has offered a panoramic picture of the perceptions of some teachers and students about various aspects of literacy practices in digitised classes in a Chinese secondary school. The study has revealed that new teaching methods with educational software were being employed and that students were able to learn within an always 'on-line' environment. The exploration of perceptions of availability and usefulness and of the obstacles to successful teaching and learning have suggested some factors that might be essential for the 'digitisation of education' in China. This case study, therefore, extends previous studies of integration of technologies into education in China. Some key issues have emerged.

Regarding students' practices of using digital devices with autonomy in class, the findings suggested that students were allocated more time during class for searching for information about the topic of the class. The teacher of the class was often invited to join students' discussion to provide support when they came across problems in using the educational software or digital devices. The influence of the traditional Confucian heritage (Lau and Chen 2013; Zhang 2008a,b), to some extent, appeared less noticeable in the digital teaching and learning environment even though teachers remained in charge of a digital system which was used for instruction. Digitised classes in this case study tended to adopt student-centred approaches (Zhong 2006) to promote students' abilities to gather information and to think critically. Student autonomy appeared to be at a much higher level than usually found in traditional classes (Lau and Chen 2013).

However, it has been argued that too much freedom for students in class could cause ineffective teaching (Lau and Chen 2013; Wang 2008). From classroom observations and an interview with the teacher who was teaching History in both digitised classes and traditional classes, effective teaching could be delivered as long as the connection between the school software system and students' tablets was working well without technological problems.

From the observation of classrooms, each group of 5 students in this case study were arranged to be seated around a round table. This promoted greater opportunities for group discussions than would have been afforded by students sitting in rows in traditional classrooms. Chinese students in highly competitive environments are found to have high extrinsic motivation (Lau and Chen 2013). In this case study, however, intrinsic motivation appeared to be operating. Students indicated that the discussion of their online searches for a specific topic encouraged them to understand others' thoughts about this topic. As the students attested, sharing learning resources via digital devices through online groups in both in-school and out-of-school settings stimulated their desire to learn more and help to cultivate

the habit of learning at any time at any place.

The practices of the teachers and students in this case study showed that technologies were not simply integrated into teaching instruction in that the teachers 'simply find ways to use ICTs to complete tasks they previously did without ICTs' (Stolle 2008, p. 66). Students were not simply sitting in rows, looking at a demonstration on the big white screen, which would have indicated an integration but not a transformative one. From the beginning, however, the digitised classes project in this school was guided by the concept of interactions among students, teachers and parents and self-regulated learning. Based on this, students were required to do good preparation and prevision for the class because the teacher would only spend 15 minutes on lecturing. After the teacher finished the planned teaching task of the class, 30 minutes would then be allocated to students to search for information related to the specific topic of the class and for discussions with others based on the information that they had located from the internet or the database. This may not sound like transformation, but in the context of Chinese schooling, it represents a huge change to normal classroom practice.

Teaching methods appeared to differ depending upon the subject being taught. The software system and the database were used as resources to meet students' needs for expanding information in subjects such as Chinese, English, Politics and History. In class, teachers of these subjects often used the installed software to boost the richness of information when lecturing. Students were allowed to use the digital devices when they had problems after the teaching task was completed. Teaching and learning practices in Science classes, however, were designed differently. When the teacher had finished the direct teaching part of the class, students were required to answer some questions including multiple choices, blank filling, calculating and application of knowledge on tablets which were transmitted from the software system controlled by the teacher. Students' performance was analysed by the system and the result could be used to assess students' grasp of knowledge.

Students, meanwhile, appeared to be becoming more familiar with using different learning methods to suit the needs of a subject. Students in traditional classes who have access to various digital texts are still regarded as rote learners (Ho et al. 2001) because students have little chance to generate their own thoughts about the class and school work. In this case study, students had begun to get into the habit of finding weaknesses in their learning and grasp of knowledge through the records kept by the system and database. The interactions among students and teachers mediated by technologies in both in-class and after-class were also helpful for students to get beyond traditional stereotypes of Chinese students as passive rote learners (Zhang and Wu 2009). Thus, technologies were not only used as a vehicle to demonstrate digital texts for study. A range of uses of technologies were being

developed based on the needs of the subject but with the aim of encouraging intrinsic motivation, group work, interaction and self-regulated learning.

Teenagers are often regarded as 'digital natives' because they have grown up with digital devices. Teachers, however, have been labelled as 'digital immigrants' (Prensky 2001) as they have had to transform themselves to take account of a digital environment. Although this distinction is not universally accepted, it does suggest that the use and acceptance of new technologies in education might differ between students and teachers (Gu et al. 2013). The outcomes of this case study suggest that the gap in terms of acceptance of new technologies between students and teachers is not huge, as both groups had had to accept new ways of teaching and learning in their digitised classes. The availability of digital devices, software, applications and the internet appeared to have encouraged teachers to integrate technologies into their teaching (Hutchison and Reinking 2011), albeit in different ways. Most teachers in the digitised classes in this study showed the tendency to make use of digital technologies in teaching. They explained that various functions of technologies and the potential promotion of learning performance drove them to teach digitally within the network which was mediated by technologies. Technological skills, however, did hinder the degree of acceptance of new ways of teaching and learning. Teachers who were not skilled with technologies and the software in this study were more reluctant users of the new technology. Some of the ways in which these teachers made use of technologies in digitised classes made their students feel there was little difference from learning in the traditional way.

Even though these teachers and students had accepted, to different degrees, a new teaching and learning environment with new technologies, their beliefs about usefulness, ease of use and the internet did affect their acceptance. The unreliability of a poor internet connection often pushed teachers to give up employing new methods. Internet disconnection caused uneasiness among both teachers and students resulting not only in wasting time but also in the disorganisation of teaching and learning tasks. In addition, the incompatibility caused by not well developed software required teachers to spend more time on preparation for the class. Students sometime became confused because what appeared on their tablets was not the same as the teacher was demonstrating on the smartboard.

System unreliability was just one of the obstacles in the way of successful technology integration. Consensus about the effects of various obstacles to the integration of technologies into teaching has not proved easy to reach (Hutchison and Reinking 2011). Factors that affect the degree of acceptance might be common for the integration of technologies or simply for any new methods in education (Sun et al. 2008). In this case study, the project of digitalising education had encountered several obstacles. One teacher who was teaching in both digitised and traditional

classes realised that students from digitised classes were not satisfied with the way that their performance was evaluated. Paper-based examinations were still the most frequent used methods to evaluate students' performance even though these were e-learners within a fully digitally equipped environment. Diversity in assessment (Thurmond et al. 2002) within a digital learning environment may potentially make students think that their efforts are well assessed (Sun et al. 2008) and their overall performance is valued. Teachers in this study often received feedback from students about the need for them to pay attention to their efforts outside of class. One participating student explained that interactions between students and teachers had been promoted overall; however, students were still classified as a certain group of people based on their scores in exams. He then decided not to use tablets unless he was required because what he had done was not 'invisible' to teachers and parents. Spending more time on doing paper-based work was regarded as the best and easiest way to be classified as a good student.

Based on students' feedback about the lack of diversity in assessment, the teachers were considering using other ways to evaluate students' efforts both in-class and after-class. However, due to the highly competitive educational system in China (Mok et al. 2007), newly added evaluation practices might negatively influence students' final results in the national examinations because they are senior secondary school students under the 'influence of high-stake public examination' (Lau and Chen 2013, p.1096). As the teachers in this case study explained, changes of evaluation or assessment of students' performance is a long way away in China which holds back the pace of reform in education in China. In this case, frequent feedback from teachers to students worked as a helpful way of promoting students' motivation to employ new learning methods. Nevertheless, even then, several students were reluctant to fully engage in this. Therefore, evaluation practices within the digital environment probably need to be amended based on students' experience and feedback.

The findings suggest that there was little regulation in terms of guiding students' use of digital devices in after-class time. It seemed to be quite easy for some students to get addicted to using digital devices for entertainment. One case study student, who thought himself addicted to games and surfing the internet, admitted that access to digital devices with the internet connection at any time in school had offered him the chance to access anything for fun. This suggests that appropriate guidance in using digital devices needs to be available, especially when students are undergoing the transformation from paper-based studying to digital-based learning.

Limitations

This case study was carried out within a short period of time and clearly may not fully

cover teachers' and students' practices in both in-class and after-class settings with the use of digital devices and the system. Transformation of rote learning and traditional teaching methods cannot be well explored within such a limited time-scale and using such a limited range of methods. Recent studies of digital learning, focussed upon diverse subjects, using large scale samples and employing various methods (Bauer and Kenton 2005; Honan 2008; Hutchison and Reinking 2011; Stolle, 2008) have highlighted the need for a more complete understanding of education in the digital age. Additionally, a longitudinal study may well have been able to explore changes in beliefs, perceptions, practices and interactions among teachers, students and parents with improvements of software and regulations. Newer methods, such as the use of students' diaries recording their use of digital devices in digitised classes, may be required for a more detailed and full record of learning practices.

Due to the limits of time and the difficulties inherent in getting into contact with parents, how parents perceive their children learning in the digital environment is still unknown. Parents' attitudes and beliefs toward the use of digital devices may to some extent influence students' choices of learning methods. In depth interviews with parents would need to be included in a further study.

Conclusion and Implications

This case study provided an overview of teaching and learning practices in two digitised classes in a secondary school in China. The findings of the present study will, hopefully, have enriched understandings of digital practices in education, perceptions of digitisation of education and of the obstacles in the way of this in China, against the background of educational reform in the 21st century.

From the case study discussed here, it seems that the application of digital teaching has a subtle influence on the relationship between teachers and students and between students and students. Teachers gradually move from their traditional role as authority. In addition, students' autonomy in digital learning in class boosts interactions and intrinsic motivation. Since education in China is deeply influenced by the Confucian heritage, the degree of students' autonomy needs be carefully monitored so that effective learning can be guaranteed.

Digitisation of education is not simply using technologies as supplementary tools for presenting material. Teaching practices vary from subject to subject which may imply that teaching methods and the use of digital devices should be designed based on the task of the class. Studies of digital teaching and learning within specific subjects are required to help us understand differences in practice in more detail. The acceptance of digital teaching and learning appears to be positively related to

perceptions of its usefulness, its availability and of teachers' personal competencies. Only when all dimensions of technologies, users and the overall educational environment (Sun et al. 2008) are well prepared, can acceptance be achieved to promote the desired educational outcomes.

Understanding the obstacles identified in this case study can be useful to other projects concerned with the digitisation of education in China. More efforts need to be put into research how to help students make a stable transformation from traditional to digital learners. Parents as potential participants in digital education should also be studied to understand how the digitisation of education can work to link learning and living in the digital age.

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Author Affiliations

Xiaofan He
Centre for Education Studies
University of Warwick
Coventry, United Kingdom
Email: x.he@warwick.ac.uk

David Wray
Centre for Education Studies
University of Warwick
Coventry, United Kingdom
Email: d.j.wray@warwick.ac.uk