

Atherton, Pete (2018) More than just a quiz: how Kahoot! can help trainee teachers understand the learning process. *Teacher Education Advancement Network Journal*, 10 (2). pp. 29-39.

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**More than just a quiz - how Kahoot! can help
trainee teachers understand the learning
process**

Teacher Education Advancement
Network Journal
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University of Cumbria
Vol 10(2) pages 29-39

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Abstract

This paper evaluates the findings of a small-scale research project into how trainee teachers can use Kahoot! to help them reflect on the learning process. Kahoot! is an online collaborative learning platform - a game-based student response system (GSRS), which was launched in 2012. It is frequently used as a quiz by experienced and trainee teachers. These quizzes are frequently focused on recall and low order thinking. This paper aims to explore how teachers can design Kahoot! quizzes in a way that enables them to better understand the links between educational technologies and learning. A complementary element to the research assessed the effectiveness of Kahoot! as an example of using edtech to gather formative data and also develop their learners' own questioning techniques. Through questionnaires, focus groups, individual interviews and Kahoot! surveys, this paper gained an insight into future areas that may be worthy of pursuit.

Key words

Technology; technology enhanced learning; questioning, PGCE, edtech; elearning; formative assessment; Initial Teacher Training (ITT); Kahoot, connectivism.

Literature Review

This next section will examine the literature underpinning the study and also the study's context.

Does edtech enhance learning?

Firstly, it is necessary to define and contextualise edtech. 'Edtech' is an abbreviation of 'educational technology'. Also known as 'elearning' and 'Technology Enhanced Learning' (T.E.L), edtech is the application of information and communication technologies to teaching and learning (Kirkwood and Price, 2013). Though this definition may appear straightforward, there is significant and ongoing debate over whether applications of edtech actually *enhance* learning and advance pedagogical aims and outcomes (Kirkwood and Price, 2013; Hamilton and Friesen, 2013). This paper is concerned with how one edtech platform can do just this.

Much of the literature has attempted to categorise edtech (Ingle and Duckworth 2013; Passey, 2014), relate it to pedagogical outcomes, (Hamilton and Friesen, 2013) or critique its effectiveness (Higgins, ZhiMin Xiao and Katsipataki, 2011; Kirkwood and Price, 2013; Bayne, 2015). Some texts have focused on how teachers can help learners negotiate information in the digital age. If edtech is increasingly deployed to assess learners' progress, there are implications in terms of what teachers can help learners do with that knowledge. The skills required by learners are more likely to be problem-solving and the navigation around seemingly limitless swaths of knowledge (Donnelly, 2010). This new

Citation

Atherton, P. (2018) 'More than just a quiz - how kahoot! Can help trainee teachers understand the learning process?' *TEAN Journal*, 10(2), pp. 29-39.

learning culture is referred to as 'connectivism' (Donnelly, 2010; Siemens, 2005; Huang, Bhayani and Go, 2014). A 'connectivist' approach to learning acknowledges that information and decisions on what to do with it, are on constantly shifting sands (Siemens, 2005). The implications of this are that the emphasis may be moving away from the acquisition of fixed knowledge and more towards diverse opinions and the act of decision-making (Siemens, 2005).

One of the by-products of connectivist thinking could be a greater pleasure in the discovery of new knowledge - a *serendipity*. Huang, Bhayani and Go (2014) argued that 'serendipity learning' benefits from being informal and not goal-orientated; this is distinct from formal learning, which is teacher-centred and within tighter parameters (Huang, Bhayani and Go, 2014). Despite this apparent paradigm shift, the reality of the learning experience can sometimes remain traditional and teacher-centred (Blin and Munro, 2008, cited in Kirkwood and Price, 2013). This new fluid approach to knowledge places greater emphasis on teaching the skills to learn. Knowledge, then, could be seen as constantly flowing - as if through a pipe - and the pipe itself is more important than its contents (Siemens, 2005). This theme of serendipity is developed in the 'Discussion' section.

Despite myths that edtech creates a more democratic, collaborative learning culture, edtech can sometimes be viewed as a way to facilitate top-down communication (Lanclos, 2016). In doing so, it can merely be used to replicate tried and tested pedagogies (Blin and Munro, 2008 cited in Kirkwood and Price, 2013). Indeed, Selwyn (2011) warns against a sometimes evangelical stance made by proponents of edtech, without sufficient academic rigour (Selwyn, 2011). This tendency can be viewed as 'instrumentalism' (Bayne, 2015: 6). Instrumentalism views technology as a natural, ideologically neutral force that exists to help us reach pre-defined goals, for example learning. Such thinking could be seen to suppress debate about how technology relates to education and culture (Bayne, 2015:6). The 'Discussion' section interrogates the evidence in a way that attempts to step back from instrumentalist thinking.

Digital natives and collaborative learning

This section evaluates the validity of recent theories about the changing ways in which learners work collaboratively since the new millennium. There are clearly opportunities to facilitate collaborative learning through digital technologies. Through this, the notion of creative through problem solving (Jenkins, 2009) has demonstrated significant potential for education and it is viewed as an expected behaviour of 'digital natives' (Ingle and Duckworth, 2013; Prensky, 2012). An example of one of these perceived behaviours is the idea that collaborative learning creates a democratised, formative discourse (Friesen and Lowe, 2010). The reality in many cases, though, can be less utopian; many virtual learning environments (VLEs) enable teachers to transmit information and are not conceived to stimulate problem solving, creativity or interaction (Lancos, 2016).

Much of the literature on edtech since 2000 has drawn on Prensky's work, 'Digital Natives and Digital Immigrants' (2001). 'Digital natives' - who comprised the sample for this study - are specifically people born after 1980, who have grown up around the new literacies required by the digital world (Ingle and Duckworth 2013). Unlike their descendants, 'digital immigrants' (Prensky, 2001, Ingle and Duckworth 2013), digital natives are used to, indeed expect a world of swift change and uncertainty (Prensky, 2012). Similar to native speakers of a language, their familiarity with the terminology of digital communication shows an ease of understanding of relevant acronyms and jargon. Prensky (2001),

Uygarer (2016) and Ingle and Duckworth (2013) emphasise the cognitive agility of this generation that have been defined as the 'I.M (Instant Message) generation' (Lenhart, 2001, cited in Ingle and Duckworth 2013), 'cyber humans', 'grasshopper minds' (Sahin, 2009, cited in Uygarer, 2016) and the Gamer Generation (Pedro, 2006, cited in Uygarer, 2016). The relevance of the antiquated notion of the digital native to this study is largely that the evidence and conclusion point to a need for more empirical evidence regarding the learning process, where edtech is merely a tool.

As Prensky's initial thinking was neither founded in empirical data contemporaneous to the spread of social media, it requires considerable and ongoing reassessment. Prensky himself (2012) updated his thinking by calling for 'digital wisdom', which is characterised by digital technology allowing us to access enhanced cognitive capacities and improve our natural competence (Prensky, 2012: 202). Similarly, if teachers and learners are to navigate this transitional phase successfully, they could focus more on the rationale for the impact of edtech to ensure that learning is efficient, effective and supports collaboration and interactivity (Higgins, ZhiMin Xiao and Katsipataki, 2011).

These ideas focused less on the hard evidence of the impact of digital technologies on the learning process and more on generalised notions of cognitive change.

The concept of the digital native is defined solely by age. In this way, it could be argued that the theory creates a false dichotomy, based on categories that are seemingly fixed, not fluid (Lanclos, 2016). Similarly, it could be argued that the notion simplifies and stigmatises young people, ignoring any complexities in terms of society and culture (Turvey and Pachler, 2018, cited in Luckin, 2018). Furthermore, little analysis has been conducted around how digital natives make use of and feel towards digital technologies (Lanclos, 2016). Burton, Shaw and Gibson (2015, cited in Harmes, Shaw and Gibson, 2015) argue that the notion of the digital native is a myth predicated on several outdated assumptions. One of these assumptions is that digital natives' technical competence equates to a true 'digital literacy' (cited in Harmes, Shaw and Gibson, 2015:151). If they are already digitally literate, they will not need to be told how to use new and emerging technologies (Lanclos, 2016). The debates about digital natives and connectivism are expected to be updated, as the technologies and learning cultures evolve. Prensky, for example (2012) updated his thinking by aspiring to 'digital wisdom' via a method he calls 'imag-u-cation' (2012:207). This is a strategy for engaging in frequent dialogue with learners about how they could use edtech responsibly and irresponsibly (2012:207-8). Similarly, if teachers and learners are to navigate this transitional phase successfully, they could focus more on the rationale for the impact of edtech to ensure that learning is efficient, effective and supports collaboration and interactivity (Higgins, ZhiMin Xiao and Katsipataki, 2011). Moreover, new technologies necessitate new skills, there is an ongoing challenge to ensure that learners' thinking skills are not being atrophied or eroded through excessive multitasking (Atherton, 2018:5).

There may now be more of a need for the literature to move away from theories about and categories of edtech and instead focus more on evidence-based conclusions regarding the impact of edtech on learning. An example of this is Luckin's *Enhancing Learning and Teaching with Technology – What the Research Says* (2018). To explore the evidence of the impact of edtech on learning, Baume and Scanlon (2018) select a series of conditions under which effective learning takes place. Among these are a clearly defined structure of support, activities, collaboration and feedback and learners being active and aspiring to high standards (Baume and Scanlon, 2018, cited in Luckin, 2018). Here, the emphasis

is on learning first and technology second – a proposed coexistence of analogue and digital skills. The use of Kahoot! Surveys and in-depth questionnaires to gather empirical data for this study have helped provide valuable data in terms of offering a more pertinent grasp of how trainees can use G.S.R.S like Kahoot! to help their learners and develop their own practice. The case studies revealed some specific strengths in terms of the accelerating progress in the role of Learning Analytics, or formative data (Luckin, 2018).

This Research Project

This paper centres on the use of Kahoot! with a cohort of trainee teachers. The study was supported by two universities in the north of England.

The broader aims of this paper are:

- To provide a concrete example of how one edtech platform can be more than a mere distraction and can form part of a rich and holistic learning experience.
- To critique the notion of connectivism.
- To assess how distant ideas about edtech are from the digital natives debate.
- To explore the value of one online tool in the development of trainee teachers.

Research design

The research explores the impact of a small-scale piece of action research and its significance in relation to teachers' future use of edtech to assess students. The study follows the principles of action research in that it was part of a reflective cycle, which was designed to implement change and aid understanding of emerging or persistent issues (Burton and Bartlett, 2009). The pilot study was conducted with twenty three trainee teachers on a one year PGCE course. They answered questions on the Kahoot! website on their smartphones, via an access code. The results were then exported to an Excel file and summarised numerically. There were eighteen questions in total. The questionnaires did generate both contradictory and irrelevant material. This became an advantage, as it helped provide a tighter focus to the in-depth interviews and enabled triangulation between questionnaires and interviews (Bassegy, 2007).

Further research was conducted using a sample of six Secondary English trainees, who were chosen for the interest that they had shown in Kahoot!. This method was intended to clarify both the strategy and research design (Punch, 2014) but was limited by the relatively small sample. They were asked to participate in a Kahoot! quiz about grammar that was designed especially for this study. Though the participants were postgraduate English trainees, the questions were pitched high to try out the 'Ghost Mode' function and trainees' expectations were managed accordingly, so they expected a low score from the first quiz. In 'Ghost Mode', Kahoot! players are given the chance to play for a second time against themselves and improve on their previous scores. A crucial part of playing in 'Ghost Mode' was asking participants to reflect on the reasons for their answers, whether right or wrong. The six participants then answered in depth questionnaires about how Kahoot! helped them learn, the questions for which are listed in the 'Findings' section. Additional qualitative data were gleaned from individual interviews with eight trainee teachers. The interviews used the same questions as the questionnaires. This study was limited to the data that were drawn from twenty to thirty minute interviews with trainees who had been selected for the interest they had shown in Kahoot!

The need for ethical approval arises from the need for protection from potential misrepresentation or even litigation. Indeed, to quote Sikes (2006), research is neither neutral nor innocent (Sikes, 2006:1). To ensure neutrality and transparency, it was necessary to complete and submit a Participant Observation Sheet. Not only was this a part of the ethical approval process, it helped formalise and legitimise the input from participants (Sikes, 2006). The research did not present any major issues in terms of morals; the compliance with all Codes of Practice and transparency and accountability about the work would make it more likely to possess a sense of moral responsibility (Sieber 1993). In accordance with the BERA guidelines (2011), the research succeeded in treating participants with respect, conforming to democratic values. To echo Diener and Crandell, (1978, cited in Cohen, Manion and Morrison, 2002) informed consent is about following procedures that provide facts that influence their decision about whether or not to participate in the study. Informed consent had been provided by all participants after receiving comprehensive and open details of the research (Crow, Wiles, Heath and Charles, 2006:83, cited in Brooks et al., 2014). Their anonymity was preserved by omitting names from all activities, whether they were taking part in Kahoot! Quizzes, Kahoot! Surveys, questionnaires or interviews. The ethical responsibility of the research was ensured by declaring on the Participant Observation Sheets that all who took part had the right to withdraw at any time. Indeed, some trainees did not participate in the final in-depth interviews and they were not pursued. Prior to conducting any activities, the terms of participation were discussed (Mauthner, 2002).

Findings

This section summarises the findings that originated from the in-depth questionnaires and one to one interviews. Respondents were asked about playing Kahoot! in different contexts, for example as a team, through the option of a Blind Kahoot! and in 'Ghost Mode'. They were also asked about how Kahoot! helped them learn and also plan questions.

Table 1. The importance playing a Kahoot! quiz in a team.

Question	Response
How important is it to play Kahoot! In a team?	'It helps learners share knowledge.' 'Learners support each other's thinking processes.' 'Think, pair and share enables learners to feel more confident in their answers because they have someone they can agree with.' 'Learners can confer and pool ideas.' 'Playing in a team could reduce the level of challenge and not give learners an accurate picture of their skills.'

The trainees surveyed clearly saw many positives to this, from providing learners with the ability to share knowledge through collaboration, to supporting each other's acquisition of knowledge and

thinking processes. Some felt that a more engaged class could collaborate to facilitate answering questions by building confidence. They could learn from their peers and build their social skills. The weaknesses voiced by the individuals in the sample were as follows: responses to questions are not always shared, so the level of knowledge is not always consistent. The feedback on that could create conflict and divisions. Additionally, trainees would need to pay close attention to the varying abilities and needs of their learners; if quizzes become too competitive, the learning motive can be lost and winning, not learning, becomes the motivation.

Table 2. Playing a 'Blind Kahoot!' (i.e., a Kahoot! Quiz with little or no prior knowledge).

Question	Response
Evaluate the Positives and Negatives of a 'Blind Kahoot!'.	<p>'I have already done something similar with flash cards to introduce a new topic'.</p> <p>'They could also be employed as a diagnostic test, designed to dictate future support and necessary interventions.'</p> <p>'If the time given to answering questions were extended, she felt that this could help develop high order thinking.'</p> <p>'The potential limitations were that some learners will already know the answers, which would not encourage inclusivity'.</p> <p>'My main concern is the fear of answering incorrectly.'</p> <p>'A 'Blind Kahoot!' would be likely to encourage interest in a new topic.'</p> <p>'They could be a stepping stone to a deeper understanding.'</p> <p>'Learners could become disengaged if the fear of being wrong took over.'</p>

The feedback on this feature, in which players are given questions with little chance of knowing the answers, was overwhelmingly positive. One English trainee praised the potential to learn new vocabulary this way. Another emphasised how this feature forces us to use abstract thought, draw on distant stores of knowledge and make neural connections. A further respondent argued that a Blind Kahoot! gives a chance to recognise what learners do not know; reinforces new knowledge and cements learning.

Table 3. Playing again in ‘Ghost Mode’ (i.e., competing against your previous score).

Question	Response
Evaluate the Positives and Negatives of Playing in Ghost Mode	‘Repetition and recall are the ways in which Kahoot! can create and consolidate learning.’ ‘The motivation arises from beating the previous score.’ ‘Ghost Mode’ gives learners the opportunity to analyse, with more time, why the answer is correct and why the other was not.’ ‘Ghost Mode’ encourages self-efficacy through giving a chance to improve and monitor your own progress.’

The participants were open to the notion that playing against their previous score was more could improve recall but could also improve metacognition and self-efficacy.

Table 4. Learning through Kahoot! Quizzes.

Question	Response
What did you learn from the Kahoot! quizzes and how?	‘Getting the answer wrong as the most effective way of learning through Kahoot!.’ ‘I used more areas of my brain to see if I had learnt things previously and make connections.’ ‘Learners now receive far too much scaffolding and it is de-skilling them.’ ‘The quizzes have emphasised what learners are not good at; they are designed to demonstrate that being wrong is how you learn.’

The sample identified that they learn more by getting things wrong. Again, this suggested that trainees may wish to develop this research to look more closely at how they can empower their learners to embrace being wrong as an integral part of their learning. The notion of serendipity was praised by another – the pleasure of learning something unexpectedly, rather than reading or being told about it.

Table 5. Planning questions.

Question	Response
Does Kahoot! Help you plan your questions?	<p>'Planning of questions on Kahoot! helps develop learners' skills and analysis'.</p> <p>'Kahoot! will provide me with further opportunities to progress in terms of her questioning techniques.'</p>

In summary, the dataset demonstrates that the participants have used the study to reflect on how their own planning of questions can have significant impact on how their learners acquire and retain knowledge and understanding.

Discussion

After scrutinising the pilot study, questionnaires and case studies, several broad themes emerged:

1. Before this study, little thought had been given by trainees to the benefits of preparing questions in advance.
2. Kahoot! helps learners accept that they can learn from being wrong.
3. Kahoot! can help trainees develop their learners' metacognitive skills.
4. The importance of collaborative learning with Kahoot!.

This evidence could suggest that problem-solving and dialogic, collaborative teaching can be developed by Kahoot! in a way that creates a more serendipitous way of learning (Huang, Bhayani and Go, 2014). This small-scale study was conducted among a select cohort of trainee teachers in two universities in the north west of England. The paper, however, fits into the wider body of research that is emerging from school and learning communities, of which trainee teachers are increasingly a part. This study is significant in that it led to the publication of a book – '50 Ways to Use Technology Enhanced Learning in the Classroom' (Atherton, 2018), which will be on the reading list for ITT (Initial Teacher Training) at least two universities. The findings will also be used to develop a piece of research with a London university on how to build bridges between the edtech and education communities.

In terms of further study, analysing questioning techniques in a connectivist classroom, where knowledge is not fixed but fluid (Siemens, 2005) could help trainees focus more on this crucial aspect of their ITT course. This could help cement Kahoot!'s place in a connectivist context (Siemens, 2005). In doing so, it could help learners navigate away from a binary system of right and wrong towards the more serene waters of an understanding of the importance of multiple right answers. One of the responses in the in-depth interviews praised the way that 'Blind Kahoot!'s can create a sense of serendipity, or unexpected learning. 'Serendipity learning', then, benefits from being informal and not goal-orientated; it is distinct from formal, instructional learning, which is teacher-centred and within tight parameters (Huang, Bhayani and Go, 2014). Where the research findings differ from Huang,

Bhayani and Go (2014) is in the evidence that Kahoot! quizzes do not offer the full exploratory autonomy associated with Technology Enhanced Learning. Subsequently, it could be argued that Kahoot! quizzes are still tightly controlled and teacher-centred. This could be addressed, though, by allowing learners temporary access to the username and password of the Kahoot! account, so they could design additional questions themselves. This may aid the transition into a more 'connectivist' classroom, which is democratised by learners working collaboratively and dialogically with not only their teachers but peers of varying abilities, levels of achievement and social status (Friesen and Lowe, 2010, McGloughlin and Lee, 2008, Donnelly, 2010). This could only work, the participant argued, if teachers took the time to understand their learners and to plan differentiated questions.

The main limitation of the study has been the relatively narrow sample for the action research. In addition to this, persistent obstacles that any researcher may face in this area are the transitory, fluid nature of digital technologies and the complexities related to their classification (Bayne, 2015; Hamilton and Friesen, 2013; Higgins, Zhi Min Xiao and Katsipataki, 2011; Ingle and Duckworth 2013; Kirkwood and Price, 2013; Passey, 2014).

Conclusion

The aim of this paper was to explore how Kahoot! an edtech platform, could help develop trainee teachers' understanding of the learning process. Further strands that could demonstrate the impact of the findings are the evidence that Kahoot! could help trainee teachers build confidence in their learners to embrace being wrong, thus developing their metacognition. The findings also emphasised the importance of learning collaboratively through Kahoot!. The implications of this are the need to adapt questioning techniques to help learners navigate seemingly limitless swaths of knowledge (Donnelly, 2010). In doing so, trainees' questioning could help create a culture of serendipity. In encouraging these connectivist notions, the paper backs up the work of Donnelly (2010) and Siemens (2005). The focus on specific aspects of pedagogy in relation to edtech develop considerably from the one size fits all notion of the digital native (Prensky, 2001, 2012). Furthermore, this paper was inspired by observing teacher-centred Kahoot! quizzes comprised of largely low order questions. The findings reinforce the need for teachers to develop their digital pedagogy alongside carefully scaffolded tasks. These should be aligned to the design of specific edtech platforms and teachers' learning objectives (Baume and Scanlon, 2018, cited in Luckin, 2018; Atherton, 2018).

Furthermore, the findings could be shared as an accompaniment to my book, '50 Ways to Use Technology Enhanced Learning in the Classroom' (Atherton, 2018). They could also be disseminated to the partner settings that help deliver initial teacher training (ITT), as they are increasingly expected to work collaboratively and share resources. To follow up this research, I intend to focus on how reflection models can help teachers use social media platforms for formative assessment. The renewed perspectives on edtech and questioning, metacognition and collaborative learning could help two HEIs revalidate part of their PGCE course delivery and strengthen their relationships with partner settings.

Acknowledgements

I would like to thank Alison Jackson for her faith and patience. I would like to thank the trainees at the two universities who participated in this study.

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