Chapter 14

Experiences of using iPads in physical education teacher education

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Introduction

We live in an increasingly technology-driven world. Most individuals under the age of 25 have grown up with technology readily available to them. They are consistently having technology integrated into their personal and social lives. As such, they are comfortable with the use of technology and even expect the use of technology in most areas of their lives.

The purpose of technology for many university students is to communicate, whether through applications such as WhatsApp, Facebook, Snapchat or Instagram when communicating with peers, or through email and online student learning portals such as Moodle or Blackboard when communicating with faculty members.

This chapter explores how two initial teacher educators (ITEs) became empowered, through situated learning, to use iPads as a pedagogical tool to enhance learning in pre-service generalist teachers' elementary physical education modules. The process of learning how to integrate technology into pre-service teachers' teaching practice is complicated and can be a challenge for ITEs. We set out to provide pre-service generalist elementary teachers (PSTs) in our physical education modules with the inspiration and encouragement to employ iPads as a teaching methodology, in an authentic, creative, efficient and effective way for children to learn. The focus of this chapter is to recount how we managed, learned and integrated iPads in our teaching. Our use of technology in physical education was context bound. We had to work within the modules we were teaching and for which we had responsibility, the technology and software available to us and our technological knowledge. Underpinning the chapter, we include findings and recommendations from research undertaken over a three-year period. This research examined the use of iPads to promote quality teaching and learning in one module, the focus of which was Fundamental Movement Skills (FMS).

Quality physical education teaching and technology

The rapid increase in technological capabilities and falling costs have made the use of technology in physical education more accessible (Banville & Polifko, 2009). However, teachers today must not only be prepared to use technology, but must also know how to use technology to support children's learning (Butler et al., 2015). Teaching elementary physical education with technology in a pedagogically appropriate way, and developing knowledge to design and implement technology-infused lessons in quality physical education, should be addressed in initial teacher education programmes (Kirschner & Sellinger, 2003). Participation in quality physical education for children is essential in order to learn the 'skills, attitudes, values, knowledge, understanding and enjoyment necessary for lifelong participation in physical activity, sport and in society at large' (UNESCO 2015, p. 1).

The effective preparation of teachers in the use of educational digital technology has been extensively discussed by researchers (Butler et al., 2015; Casey & Jones, 2011; Koehler & Mishra, 2008; Liang et al., 2006). Semi and Inze (2012) suggested that 'university instructors could be better role models for technology integration' (p. 1259). Thomas, Herring, Redmond and Smaldino (2013) believe that faculties must incorporate and model technological pedagogical content knowledge (TPCK) within the teacher education curriculum to create a TPCK environment (see Chapter 1, Figure 1.1). Mishra and Koehler (2006) also recognised the importance of contextualising the learning and integration of technology into initial teacher education programmes.

In the teaching process, we recognised that it is important not only how we teach (pedagogy) and what we teach (content) but also which materials (technology) we use while teaching (Jones & Moreland, 2004). While acknowledging these findings and undertaking to incorporate technology into our teaching, we aligned our work with Mishra and Koehler (2006) who sought optimal technological integration rather than perfect technological integration.

Context for the integration of technology

Initial Teacher Education (ITE) programmes in Ireland have gone through recent substantial change. Bachelor of Education Programmes have changed in line with the criteria and guidelines for providers of programmes of ITE in Ireland (Teaching Council, 2011) while acknowledging the increasingly complex and diverse role of teachers (p. 6). The once three-year Bachelor of Education programme became a four-year programme, with approximately 1,000 students entering the Irish system each year. Numeracy and Literacy, Information Communication Technology (ICT) were identified as a key national priority area and increased attention in these areas has been

accommodated in the new programme design. We, as ITEs in elementary physical education, recognised that we were addressing numeracy and literacy in our physical education modules, but not the application of ICT in physical education. Our PSTs were encountering some technology integration in schools during their school placements and we wanted to enable them to use ICT. We allocated extensive funding (the faculty provided 25 iPads and a charging/storage trolley for use in elementary physical education modules) to develop different approaches and strategies to prepare PSTs to teach with technology in physical education.

The re-imagining of these ITE programmes, in Ireland (Waldron, Smith, Fitzgerald, & Dooley, 2012, p. 1) has allowed many innovations, one of these being the introduction of specialisms in a number of curricular areas including elementary physical education. The aim of the specialism is to prepare a cohort of generalist elementary teachers, annually, to teach quality programmes in specific curriculum subjects. It is expected that these teachers would champion their chosen area of specialism and model best practice in their teaching, inspiring colleagues to teach quality programmes in early childhood and elementary school settings. There are approximately 50 PSTs each year undertaking a specialism in elementary physical education since 2013 in two universities. In our university there are 430–450 undergraduate students in each year group of which 25 are accepted to study the physical education major specialism. The introduction of this specialism allowed us to initiate the integration of technology into a FMS module.

The purpose of the FMS module was that PSTs: describe how movement competencies are developed and learned; understand the cognitive, social and lifelong implications of movement competences; explore and develop formative assessment processes to enhance the performance of FMS; and finally acquire summative and formative evidence for movement performances. iPads and applications (apps) were integrated into the module. The seminars were mostly practical, based in the gymnasium or outdoors on a playing field, with a focus on athletics and gymnastics activities. Resources supporting the module included web-based checklists and video clips of children performing FMS at introductory, development and mastery level.

Pedagogical theories that shaped our work

Although our programme teaches content and methodology together in the curricular modules there are some aspects of methodology which are taught separately. These include modules in Digital Learning (DL), Special Educational Needs (SEN) and Assessment. While the DL modules increase PSTs' confidence in using technology (Foulger, Buss, Wetzel, & Lindsey, 2012), improve their attitudes toward technology (Bai & Ertmer, 2008), and develop their technical skills, it has become clear that such modules do not facilitate meaningful technology integration into PSTs' practices

(Brown & Warschauer, 2006; Wachira & Keengwe, 2011). Faculty members are expected to develop DL, SEN and Assessment further in their modules, in our case physical education, to facilitate 'meaningful integration'. This chapter highlights our own challenges and growth as ITEs, while probing some of the tensions that exist within teacher education, which embarking on a new programme demands. We sought to 'position our work to connect the past with the present and move it forward into a future state' (Guilfoyle et al., 2004, p. 1112).

Educators need support to implement the ideas, reflect on them, ask more questions, and try the technique or method again. They need someone to bounce ideas off. 'This could be a formal meeting, a quick email exchange, or an impromptu chat in the hallway to discuss a few questions' (Bretzmann, 2015, p. 14). We found that we needed each other for our learning to continue and to move out of our comfort zone. A constructivist approach to learning offered a useful framework to inform and integrate pedagogical practices in using digital technologies to enhance learning in physical education. Social constructivism, in particular, provides a useful and appropriate perspective within which to locate our learning. Knowledge and meaning are created or constructed within a social system and through interactions with that system and the people within it. Kirk and Macdonald (1998) conclude from a social constructivist perspective, 'learning is an active and creative process involving an individual's interaction with their physical environment and with other learners' (p. 377). Lave and Wenger's (1991) situated learning theory is one example of a constructivist approach to learning. They emphasise the importance of contextualised learning and suggest that practitioners should generate knowledge within the practice in which it would be required. When translated into practice the learning environment created by the learning theorists rest heavily on a pedagogy that involves the learner interacting socially with others (peer teaching, cooperative learning, creating learning communities for example). In keeping with Lave and Wenger's approach, the PSTs were introduced to digital technologies in context and through activities during the module which they would be teaching on their school placement. Although initially teaching was modelled, learning evolved and PSTs learned further from each other working through assigned tasks in pairs. Most seminars concluded with a plenary and this lead to increased sharing, the PSTs were developing into a learning community where new learning was shared and developed over the duration of the module. This supported Chambers (2011) summation, that learning occurs through engaging in shared problem-solving experiences with an ITE or with peers, and responsibility for learning gradually shifts to the learner.

We, the ITEs, actively encouraged our PSTs to construct new understandings and meanings drawing on their prior experience and learning gained from undertaking other modules, such as DL, in their ITE programme. Our pedagogical focus was practice-based: our technological tasks gave the PSTs

opportunities to practise performing FMS in pairs, using prompt cards containing teaching points, to promote quality movement. The PSTs used checklists to observe each other's movements in real time. They filmed each other's movements using iPads resulting in video recordings to playback and critically observe. We were present to assist with technical matters that arose or queries about FMS performances and observations. The PSTs were progressing towards self-directed orientated design and discovery (Wenger, 1998) in an active and energetic learning environment (Holt-Reynolds, 2000). We were acutely aware that we wished the PSTs to promote physically active lessons where physical, cognitive and social learning should occur. A key message we imparted was that the iPad should not detract but rather enhance the quality of the lesson.

Shulman's (1987) work on knowledge also informed our practice. Throughout our teaching we battled with switching foci between physical education content knowledge (CK), technological content knowledge (TK), pedagogical knowledge (PK) and pedagogical content knowledge (PCK) (both physical education and technology) until we began to understand and master technological pedagogical content (physical education) knowledge (TPCK) (Mishra & Koehler, 2006) (see Chapter 1, Figure 1.1). We had to constantly remind ourselves in our planning that our purpose was to ensure our PSTs were successful in their teaching and both content and pedagogy were addressed simultaneously. We needed to ensure that the technology was being used to make learning in physical education more accessible. Just as aspects of pedagogical content knowledge is described by Schulman as 'illustrations, examples, explanations and demonstrations', to make a subject more accessible and clearer for the learner, these aspects can be represented using technology. Technological pedagogical content knowledge (TPCK) is the basis of good teaching with technology and requires an understanding of the representation of concepts and technologies; pedagogical techniques that use the technology in a constructive way to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that learners face; and knowledge of how technology can be used to build on existing knowledge (Mishra & Koehler, 2006). Therefore, planning to integrate technology into teaching and learning required intricate weaving of technology, pedagogy and physical education content. The TPCK framework guided our planning and helped us create coherent learning environments within a meaningful context. Central to this was the notion of situated learning.

Learning, managing and integrating the technology

This section outlines our experiences with technology and how this knowledge affected both our administrative work and our teaching and learning in elementary physical education.

Teachers' confidence (self-efficacy) and motivation (outcome expectations) with regards to integrating technology in education are considered important variables in teaching effectiveness (Niederhauser & Perkmen, 2010). Graham et al. (2004) believe that like students, ITEs also have a diverse range of technology skills. However, many do not feel comfortable teaching technology applications to students. Although high on outcome expectations, armed with what we believed was a reasonable degree of self-efficacy we were conscious that our experience with technology, in the pedagogical sense, was minimal. We had limited integration of technology in our teaching previously. Digital software applications influencing our work over the years included PowerPoint, Photo Story, filming and editing, Facebook, Twitter, Skype and Google Hangouts as a means of personal, professional and social communication. In the teaching and learning environment, technological advances such as Adobe classroom and Loop have facilitated online lectures, discussion fora and assessments. It has also become the repository for hosting physical education related materials and resources for our PSTs.

Our interest in integrating digital technologies into our modules emerged from our personal use of these technologies and professional belief that to enhance learning in physical education at a basic level requires us to observe movement. Digital observation tools such as video, utilising the replay mode, or capturing the movement with an iPad and applications (Apps) like BAM Video Delay (an app which gives instant visual feedback of what you are doing, hands free) are more accessible and easy to use for school purposes than complicated and expensive movement analysis software.

Our engagement with the literature coupled with our understandings of strengths and limitations in TPCK encouraged us to explore ways to increase our technological content knowledge and subsequently our technological pedagogical content knowledge. This was further underpinned by an ethos of collegial collaboration and cooperation. Setting out, one of us suggested that 'we are going to learn from each other as problems arise and there should be a laugh or two as well'.

In addition to our existing workload we had not anticipated the amount of time managing the technology (25 iPads, storage/charging trolley, Mac mini, Apple TV and Wi-Fi Airport) and learning the technology would take. There were several practical and logistical issues which had to be dealt with. These included PST 'ownership' of the iPads in each module each week and saving PSTs' work securely on the iPad and ultimately on a secure server. Wi-fi access was an issue in the initial year with no wi-fi in the areas in which we taught our modules. This was resolved by using an Apple AirPort (a specific router for Apple hardware) to enable access to localised Wi-Fi. Secure storage and charging of the iPads required consideration as space was at a premium. Management of updates, App uploading and general maintenance was also carried out by us. Some 'set up' support was offered

by the iPad suppliers, as our university at the time did not offer support for Apple products.

In preparation for the integration of technology we found that 'time' was our most valuable commodity. All planning, preparation, upskilling, personal learning, development in regards to engaging with and integrating the technology was self-initiated. A brief two-hour workshop which addressed our technological knowledge (TK) was provided by the iPads' suppliers. Further technological knowledge was gained through online tutorials and two practical workshops. Face-to-face workshops were sourced where technological pedagogical content knowledge (TPCK) and physical education were the focus. Professional learning was key to building competence and putting this learning into practice increased confidence. 'To be honest I felt a bit overwhelmed that I had to be an expert in all of this' is not an uncommon feeling when fundamental questions about content and pedagogy are raised (Mishra & Koehler, 2006; Obrusnikova & Rattigan, 2016) even by experienced ITEs. According to Lei (2009) we were 'digital immigrants' as we did not have the technological knowledge, skills and experiences necessary for teaching. We had not grown up with technology and therefore were not taught with technology. Being open to the integration of technology (Fielding et al., 2005) we questioned our self-efficacy rather than our motivation to integrate technology in education (Niederhauser & Perkmen, 2010). Being able to voice these concerns was reassuring during the learning process and having collegial support proved valuable.

We began to integrate technology by introducing TPCK to twenty-five second year PSTs. This commenced in their first module of the specialism in elementary physical education as a teaching methodology to ensure quality physical education. Second year PSTs' prior knowledge consisted of a module including games, dance, gymnastics, outdoor and adventure activities and athletics strands. Previously our physical education core modules employed technology such as stopwatches, pedometers, and videos, of children undertaking tasks related to physical education, filmed and edited by us.

Using a social constructivist approach, the PSTs' module's summative assessment was to observe and analyse their performances of FMS using iPads. They represented the teaching of one fundamental movement skill in a two-minute video clip. This included demonstrating fun activities, to support the development and practice of the skill. FMS language had to underpin the audio descriptions. PST's used the iPad collaboratively to collect digital media (pictures, video and audio) combining them to create a digital story with a narrative. Obrusnikova and Rattigan (2016) have described the benefits of using video recordings in physical education lessons to promote quality movement performance of FMS in children. They illustrated how most children enjoy watching videos and they can act as a novel but predictable stimuli which may motivate children to learn. They also outline how a child can watch a video clip, on a laptop in a corner of the activity space,

where they are not easily distracted and therefore can focus on the correctly performed elements of a skill. O'Loughlin, Ní Chróinín and O'Grady (2013) reported that self-assessment using digital video impacted positively on children's performance of basketball skills. Mitchell (2001) has highlighted the value that children gain from viewing their videotaped skill performance in conjunction with teacher-cueing where the teacher provides a word or a phrase that communicates the significant aspects of the skill they wish the child to focus on. Situated learning through 'exploration' and 'problem solving' was the methodology we used initially, in order to familiarise the PSTs with the device. The module seminars included showing PST's how to use the apps available to them for the purpose of observing and assessing FMS, namely BAM video delay, the video camera and Explain Everything. The PSTs were also guided in basic iPad operating gestures. Technical difficulties that arose, while the PSTs engaged with the task, included discovering that there was no zoom capability while filming, and how to upload video to other Apps or to a shared folder. The difficulties provided us with learning opportunities and our technological knowledge improved, even if it was time consuming. Overall the PSTs believed, 'it was a great experience' and 'mixing PE and DL was new and exciting'.

Flutter (2007) highlights 'engaging with the student voice affords teachers an opportunity to refocus their attention on what really matters learners and how they learn best' (p. 345). Following the introduction of the iPads we acknowledged that the PST voice was crucial in our knowledge development. It was important that the process of learning was flexible ensuring it allowed for collective participation and reflection on all aspects of the module. On completion of exit questionnaires PSTs reported using the iPads and observation apps enhanced their awareness of their ability to demonstrate skills to children. One PST reflected 'I thought I was conscious of my ability. But when I saw my movements on the iPad I became more conscious.' The majority of the PSTs in the specialism group (92%) reported that they would 'try' to use a digital technology device in part of future physical education lessons on school placement. However, they also reported that they would require more opportunities to practice using an iPad before attempting to use it in a physical education lesson. A PST wrote 'I found the various different Apps were very useful and I found the module interesting and didn't realise the importance of FMS development as much as I am aware now.' From this PST's response we can see that PSTs valued the ITEs modelling their use of the iPad, followed by practice using the iPads. This increased both the ITEs and the PST's technological and technological pedagogical content knowledge and also their physical education content knowledge.

As we became more proficient with the iPads and explored new apps, we began to see opportunities to use the iPads in alternative ways for group assessments, for example using the Socrative app. This app provided us

with an exit quiz to ascertain PSTs (n=23) level of competence and confidence using the iPads. Over half the cohort (n=12) rated themselves as confident or very confident, which was encouraging given that the PSTs had just completed their first semester of second year. The iPads provided the PSTs with the opportunity to observe the same movement a number of times and in slow motion if required: 'they [iPads] allow the teacher to view the children doing the FMS in slow motion and pick up any difficulties'. Baert and Stewart (2014) found that students at the later stage of their programmes reported higher perception levels of TPCK in relation to usage of digital technologies. We were evidencing in our work Macdonald and Hay's (2010) identification of the use of technologies in physical education in the context of four main purposes: (1) to assist children improve their ability to move; (2) to generate information for the application and evaluation of movement principles; (3) to develop formative assessment processes, and (4) to acquire summative assessment evidence for movement performances.

After two years of self-directed learning and as a consequence of our increase in knowledge we began to critically consider what Apps to embrace, with an elementary physical education focus. Armed with this knowledge, the iPads and relevant Apps, we proceeded to integrate the iPads into further modules with a range of year groups. An underpinning message when integrating technology is that PSTs and teachers should not limit children's physical activity time in the physical education lesson (Mears, 2009) with technological skills but rather communicate information using technology (Clarke, 2008; Hall, 2012; Mears, 2013). This resonated with us and we kept reminding each other to concentrate on achieving the outcomes of the module rather than improving our own and PST's technological skills alone. Our focus was to ensure PSTs teaching and learning with the technology or the iPad could simply become a gadget.

By year three of integrating iPads, we were including them in almost all our module seminars. All PSTs were provided with opportunities to use BaM Video Delay to observe and analyse each other's movement skills. For most seminars only a couple of iPads were used as this was easier to organise and manage. It also imparted the message that a class set of iPads was not necessary, one or two iPads used efficiently could be effective. The outcome of our engagement with iPads is that we are more confident, competent and experienced integrating technology. We continue to take risks and continue to learn with curiosity rather than with pressure.

The technological context of our workplace underwent a number of progressive changes. Currently we have access to wi-fi in all teaching spaces and we have administrative and technical support in updating and maintaining the iPads, and the iPads are connected to the university network. Increasing our technological knowledge is not a priority for us as we have this support in our workplace with technicians immediately able to respond to our queries and requests. These advances have streamlined the management

of the technology and increased time for additional TPCK professional development, enabling us to plan authentic, engaging and meaningful learning experiences for our PSTs. We still require time to continuously 'learn' the technology and absorb and embrace the continual technological developments. Thomas et al. (2013) reported that a quality TPCK rich environment is created where infrastructure is provided including time as a resource. Unkefer, Shinde and McMaster (2009) believed that staff requires time to practice using devices to allow the innovation and change to happen at university level. Ciampa and Gallagher (2013) went further than simply providing release time to learn how to use technology for instruction. They emphasised the importance of time to think, to engage in discourse and to reflect in a context specific and safe environment.

The National Council for Accreditation of Teacher Education (1997) believes that ITEs must experiment with the effective application of technology for teaching and learning in their own contexts to inform PSTs' skill development. They must develop a positive attitude in PSTs in relation to developing their technological skills and applications. It can be risky delivering a seminar and being unsure how to use the technology (Fielding et al., 2005), especially if there is no support available if something goes amiss.

What are the practical, applied implications to our work?

We as ITEs aspire to ensure our PSTs experience quality physical education instruction, which, in turn, impacts the learning process and their ability to develop expertise. Our work is designed to promote reflexive practice for us as ITEs and for our PSTs, where learning can be reflected upon in order that PSTs can integrate their knowledge and develop deeper understandings of how that knowledge is put into practice. As explained earlier in the chapter we worked together as ITEs to learn and increase our knowledge in technology leading to TPCK. Then we engaged with our PSTs as a learning community to develop their knowledge and understanding of TPCK.

Currently we provide all our PSTs with the opportunity to develop their TPCK in a variety of situations (Fazey et al., 2005). PSTs have been enabled to integrate technology as a teaching methodology, a demonstration tool (e.g. YouTube), an observation tool (e.g. BaM Video Delay), an assessment tool (Socrative) and a feedback tool (e.g. iMovie). In some cases, the iPad is used for self-directed learning purposes (e.g. Stretch It App; Balance It App;). Other apps are used to support a learning activity. An example here is KlikaKlu, which is an excellent app for scavenger/treasure hunting as part of the Outdoor and Adventure Activities strand in the Physical Education Curriculum (Government of Ireland, 1999). Our PSTs are now using iPads in modules, where they are being mentored by ITEs teaching dance, athletics and gymnastics to children from local schools in an unexamined context.

The iPads and apps we utilise prompt PSTs' critical thinking and demonstrate how they can support children to learn in a meaningful way. Apple TV in conjunction with the iPads is used as an additional, useful resource to view demonstrations of skills and PSTs own movements on a large screen.

Situated learning has allowed us to examine our understanding of the possibilities of iPad integration in physical education. Incorporating the iPad in a variety of ways in a range of contexts had the effect of generating a group learning dynamic for us as ITEs and our PSTs. Experimentation, discussion, review and application in an open environment have had a profound effect on our initial doubts, doubts that drove us as a group to question our ability in teaching, confidence in teaching and how effective our teaching could be using new technology. Our interaction, and self and group learning, generated a new found knowledge that has removed the doubts.

Reflection on action (reflecting on how our practice can be developed/changed after the event) and reflection in action (reflecting on the incident while it can still benefit that situation rather than reflecting on how you can do things differently in the future) (Schon, 1983) were hugely important in our knowledge development. Having the support of a colleague while teaching, who could act as a sounding board or a problem solver while the seminar continued, was crucial in this learning process both as a support and as a critical friend. Initially, deciding to research our practice gave us the framework to methodically reflect, analyse and plan forward as we progressed in our learning. This reflective practice throughout the learning process helped both of us develop competence and contributed to effective practice. We learned valuable lessons about the use and integration of technology and worked through any issues that confronted us. We were driven as professionals to keep up with innovations in society and ensure that our subject was not ignored in the drive to integrate technology in elementary education. We were also driven by our commitment to each other to learn together and support each other in our learning. Although we progressed dramatically we are still developing our TPCK and our philosophy of practice in relation to the integration of technology into quality teaching and learning of physical education.

The conclusions which were reached following the integration of iPads in our work to ensure efficacy include:

- The need to understand the context and what technology and physical education the PSTs have been exposed to previously, and know what their current practices are;
- Knowledge to develop a realistic module as without resources (for example, the technology itself, technological support, collegial support) the likelihood of PSTs considering teaching physical education and integrating digital technology will be reduced;
- The importance of funding to provide ITEs and teachers with ongoing professional development in the integration of digital technologies;

- Content (PE and technology) knowledge should be given as a precursor to pedagogical content (PE and technology) knowledge leading to technological pedagogical content (PE) knowledge. Improving content knowledge is vital for the PST, but it must be supported by showing how this new knowledge is applied in a relevant teaching context;
- Integrating digital technologies must be valued both by faculty and schools.

ITEs have the potential to inspire a passion for technology infused physical education. They are in a position to develop meaningful, worthwhile and relevant programmes for PSTs, which in turn allows the teachers of the future to design meaningful and inspirational learning experiences that help develop physically active children. Butler et al. (2013) believe that digital technologies can make things possible; however, it is people that make things happen.

Discussion questions:

1. What are your considerations when choosing digital technology in teaching physical education?
2. What key messages have you taken from this chapter regarding using iPads as a teaching tool?
3. How can modelling be used as an effective strategy for increasing PST confidence when teaching with iPads?
4. Should an ITEs approach differ when working with a PST compared to a teacher working with a child? Why?
5. How would you optimise opportunities to work with other ITEs both new and experienced in the integration of technology and physical education?
6. How might ITEs and teachers deal with the challenge of the continuous advancements in digital technologies?
7. What role does reflection have for the development of TPCK? How might this reflection be facilitated?

Further reading

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