Advances in Social Sciences Research Journal – Vol.6, No.3
Publication Date: Mar. 25, 2019
DoI:10.14738/assrj.63.8076.
Alshabeb, A. M. (2019). Critical Review of Learning Theories Development and CALL. *Advances in Social Sciences Research Journal, 6(3)* 421-438.

Critical Review of Learning Theories Development and CALL

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ABSTRACT
It has been claimed that traditional learning has been disappearing due to the vast changes resulting from technology, which has impacted dramatically on both education and society. Hence, socialising, which previously occurred only in the classroom, often now takes place in the virtual world. Communication is a unique aspect of social life and social media can facilitate and help to improve it. Learning English at the university level has also been impacted by many lifestyle changes that have come about from the influence of western cultures and digital convergence with local culture. Social media can act as a source for communication between tutors and students, making it suitable to be used by EFL pupils in order to augment their English knowledge. As a result, these changes have been shifting the learning theories and introducing a new era of CALL.

***Keywords*:** Learning Theories, Mobile Assisted Language Learning (MALL), Social Media, Mobile Assisted Language Learning (MALL)

INTRODUCTION

In recent years, innovations in technology have opened new horizons and sources of knowledge, with opportunities for life and business management, especially since the development of the smartphone in the 1990s. Educational and further academic environments and institutions aim to utilise technology in the most effective ways in order to enhance the teaching and learning experience. Students in developed countries studying English as a foreign language (EFL) are fortunate that they can enjoy the merits of what technology can offer to their language learning. Initially, ordinary desktop computers performed specific moderate tasks, and over time, technology has advanced to the point where there are now smart handheld mobile devices that can perform hundreds of tasks simultaneously and effectively. In the context of the use of smartphones in education, Mobile Assisted Language Learning (MALL) refers to "The study of how to harness personal and portable technologies for effective education … [and] research into technology-enabled learning across … an increasingly mobile society" (Sharples and Roschelle, 2010, p.4).

The increasing need for and use of mobile technologies in daily life and their growing affordability have changed lifestyles dramatically. Affordability of the advanced digital technology of mobile device hardware has led to their wide use and acceptance around the world, with the Arab world being no exception. The integration of technology into education practice has been national policy, with governments implementing new projects and initiatives to acquaint students with the learning value of diverse hardware ICT, including mobile devices. As a result, communication is a uniquely variable aspect of social life, conducted in a multitude of manners, and now facilitated by social media platforms that open up access to a world of opportunities, information and learning. In the education context, this provides a medium for students to interact with each other, build relationships, exchange advice and develop subject awareness, and for teachers to connect with their learners.

COLLABORATION AND INTERACTION – STUDENTS AND TEACHERS

Collaboration is a constructive means of interaction aimed at enhancing the learner's linguistic and communicative skills. Peer exchange channels and student-teacher interaction are believed to better foster students' analytical skills and thinking, problem-solving and language use (Lai and Hwang, 2014). Communications and internet technologies have been frequently used in language learning contexts to enhance students' engagement, interaction, and collaboration (Ezekoka, 2015).

On an individual basis, Beatty (2003) considers various diverse types of Computer Assisted Language Learning (CALL) applications that have the potential to support more individualised and habit-forming approaches to learning. Some are older faculties of little value in the context of significant developments in the rapidly changing digital sphere, but some remain relevant, namely in gaming, data-driven learning, email and chat facilities, online learning resources and, of course, the mobile phone. They continue to provide resources for behavioural and constructivist learning preferences, with considerable opportunity for connectivist interaction with the technology and its faculties, noted above as a fundamental of Siemens' theory.

The enhancement of the technology effectively puts the classroom computer faculty in the hands of students, somewhat permanently it may be argued, while individual and social learning needs are provided for, task and student dependent as the activity dictates (Koukopoulos and Koukopoulos, 2017). In a CALL environment, focused on the student, the teacher's role is altered as responsibility for learning is shifted, at least in part. It is not wholly relegated to the student-centred nature of some education environments in higher education. This is the approach adopted by this researcher, where the design of the study has the teacher, namely the researcher herein, as the pivot of lesson planning and manager of the feedback process that guides the preparation of the next lesson. The design and organisation of activities in the computer assisted learning process, aided by software that potentially provides immediate feedback to the student, should enable the role to be more imaginative and reflective, directing attention to weaknesses in learning that can be addressed immediately (Londono, 2014).

CALL environments need not be restricted to in-class language learning. They expand the potential for autonomous learning beyond physical institutional confines. Much depends on the motivation of the students to engage with the technology outside of the direct supervision of the classroom and teacher demands. This in turn is a reflection of the way students learn, seek and receive information, assimilate and recall knowledge. The process and strategy are largely based on their psychological manner of learning. This will be examined presently.

LEARNING THEORIES

The understanding of how students learn lies in the traditional psychologically-based theories and philosophies. They are not, it is suggested, mutually exclusive, but provide insights into the value they can derive as individuals, based on their preferences for learning methods and processes in using the capacities of mobile education resources. Therefore, in order to assess the value of mobile devices to student learning and retention, an understanding must be acquired of the theories developed by academics to explain how knowledge is attained and retained. Although this study does not propose to undertake a critical assessment of the application of those philosophies to individual students, or indeed the comparative advantages of the theories per se, it is pertinent to be aware of how mobile devices and apps can promote learning. Arrigo *et al*. (2016, p.36) point out, however, that mobile learning and the use of technology increase autonomy and thus change learning behaviour.

Students are not all the same, nor do they learn in the same way, although in the mass education environment of the university, there is arguably a tendency on the part of lecturers to teach in a relatively standard manner. Fry *et al*. (2009, p.8) assert that '*many lecturers know how they learnt/learn best, but do not necessarily consider how their students learn and if the way they teach is predicated on enabling learning to happen*.' This is determined to be a fundamental principle of lesson planning in the conduct of this research, enabling each student to be integrally involved in feedback sessions with the formulation of the next activity.

In the context of second language learning, Peregoy and Boyle (2017) suggest that the principal theories of learning are behaviourist, cognitive-interactionist, constructivist and innatist, each of which incorporate different learning practices adopted by students to embed vocabulary learning. This suggestion essentially describes the psychology of learning. Siemens (2004) argues that these classifications do not reflect the environmental chaos of learning opportunities provided by the digital age and the amount of information and number of sources in the new environment to which the world of education is now connected. His theory of 'connectivism' is predicated on the diverse sources of knowledge that increase the amount of information received by the learner, thus developing the ability to manage and evaluate relevance as needs change over time. Given the anticipated impact of learning theories on the strategies of knowledge accumulation adopted by students of ESL, the traditional theories must be examined, with an assessment of how Siemens' new philosophy fits into the established philosophies. The way students learn will necessarily have an impact on their assessment of mobile learning in the empirical investigation.

Behaviourism

Skinner (1974:212-3) explains the behavioural conduct of a person as inducing acceptance by neglecting to offer alternatives; a child, he avers, will eat a nutritious but unpalatable meal where no other food is available. In the context of this subject, Brown (2014:22) suggests that this means the '*behaviourist might consider effective language behaviour to be the production of correct responses to stimuli. If a particular response is reinforced, it then becomes habitual, or conditioned*'. Behaviour is arguably learned in a Pavlovian manner, either where language accumulation results in positive test outcomes or the reward is simple praise from the teacher. The primary source of information and learning in Saudi further education institutions is the teacher, the 'stimulus', and how that knowledge is presented, the 'strength of the stimulus', has a considerable effect on the way students accumulate and embed it (Wang and Shen, 2012).

In the context of mass, class-based education, and indeed as a reflection of the traditional and cultural norms throughout the Saudi schools framework, teaching practice has been teacher-led and knowledge societally controlled. Learning was a memory exercise conducted by the receptive students undertaking rote practices and textbook exercises. Low English language competence was the result of what Alarabi (2016:3) describes as '*teachers' reliance on incorrect pedagogical practice* (being) *a major problem that hinders Saudi students' competence in English and has negative consequences*.' The behaviourist learner passively imitates and repeats what he is told in a highly structured classroom setting, accepting the guidance and leadership of the provider-lecturer (Wright, 2006). Taking account of these conclusions, this research incorporates a higher level of more active learning in the accumulation of knowledge. Such formulaic learning is considered inhibitive in modern teaching practice and indeed its inadequacies are reflected in the student outcomes, with the Kingdom being second lowest in ESL achievement amongst Arab nations (Alarabi, 2016:2).

As a singular learning theory upon which teaching is based, Brown (2014:36) argues that:

> *'today virtually no one would agree that Skinner's model of verbal behaviour adequately accounts for the capacity to acquire language, for language development itself, for the abstract nature of language, or for a theory of meaning.'*

Such acceptance is however only a more recent development in Saudi education, and it is anticipated that behaviourism and its associated practices of repetition and instruction continues to provide a sound, albeit insufficient basis for student education.

Cognitive-interactionist and Constructivist Learning

Memory exercises arguably do little to develop 'communicative competence', a learning activity that requires practice through interaction, either with people or social, even individual, contexts of language use (Savignon, 2018). This requires the active accumulation and construction of vocabulary by students, interacting with each other in an educational environment, whether inside or outside of the classroom. Simple assimilation of teacher-provided information is not conducive to learning or retention (Kadirire, 2009). It is this process that is undertaken in this research, requiring communication between students and the teacher by means of social media, facilitated by the ubiquitous smartphone or some other mobile device compatible with the activity development. Taking account of the assertions of Sauvignon (2018) and Kadirire (2009), and indeed it will be noted, of Siemens (2009), it is not considered necessary for this study to examine the precise differentiation between cognitivist and constructionist interactive learners.

Nevertheless, the cognitivist is more likely to seek knowledge through investigating opportunities for learning, highly motivated and open to guidance and advice rather than a simple behaviourist presentation (Ertmer and Newby, 2013). Sahinkarakas *et al.* (2010) suggest that such students will be more autonomous in their learning behaviour, seeking knowledge rather than simply waiting for it. Further, Priebe *et al.* (2011) assert that cognitivists will seek new knowledge and add it to their framework of the old through interaction with others. Indeed it is worth noting that Lightbown and Spada (2013:23) consider cognitivism to be a skill that can be learned. In the context of mobile learning, this associates the theory as an element of the broader connectivism of Siemens: '*hearing a word brings to mind the object and seeing the object brings to mind the word or phrase.*'

Although the Sarem and Shirzadi study considered the benefit of interaction with native English speakers, it is argued that the same principle applies in ESL, enhancing the quality of learning experiences, stimulating a broader vocabulary bank through use (Long and Porter, 1985). Swain (1995:131) talks of the importance of quality input being essential to the value of the learning output, not simply evidenced by retention, but use of language.

Connectivism

This theory of learning proved an attractive option upon which to base methodology planning, although research on the concept did highlight arguments that it is not, essentially, a 'free-standing' philosophy. Although apparently outside of the traditional theories, it does nevertheless encompass the fundamentals of those ways of learning in the context of the diverse opportunities afforded by new technology. It does however require further exploration of its component factors to explain how it applies to research planning.

Connectivism is a learning theory developed by George Siemens and Stephen Downes, both of whom did substantial work in the areas of networking and connectedness in online learning and the interpretative nature of knowledge (Bell, 2009). According to Siemens (2005), it is a learning theory for the digital age, a successor to behaviourism, cognitivism, and

constructivism to accommodate their limitations. He argues that prior theoretical models only focus on the "interpersonality" and individuality of learning, rather than viewing it as a social activity, suggesting that even social-constructivist views promote individual brain-based learning. They fail to address learning that occurs outside of the personal sphere of experience, via technology and organisations, and are too centred on the actual process of learning rather than the value judgments in knowledge-rich environments:

> *In today's environment, action is often needed without personal learning; that is, we need to act by drawing information outside of our primary knowledge. The ability to synthesise and recognize connections and patterns is a valuable skill. (Siemens, 2005: para. 13).*

Bell (2011, p.101) nevertheless argues that social constructivists greatly emphasise the importance of social interactions in influencing the generation of the individual's knowledge, "the whole is greater than the sum of the parts, and knowledge becomes a cultural artefact, associated with groups within a specific context". This means that learning theories must incorporate the promotion of learning by (a) social and group-based processing of knowledge, (b) networked knowledge construction, and (c) the ability to incorporate different approaches and personal skills, from digitally mediated environments and networks. These attributes are incorporated into the empirical research programme involving a group of students interacting with digital technology to seek solutions to pre-set activity problems, thereafter explaining their individual approaches in feedback sessions.

Connectivists characterise knowledge as a flow of information that passes through networks of human and non-human channel "artefacts" or actions and networks consisting of connections between "nodes". The nodes may be individuals, groups, systems, resources or communities (Bell, 2009). Connectivism then is defined as "the integration of principles explored by chaos, network, and complexity and self-organisation theories. Learning is a process that occurs within nebulous environments of shifting core elements not entirely under the control of the individual" (Siemens, 2005:24). This suggests a fluidity dependent on experience and opportunity. Learning is based on networks of information, contacts and resources that are meant to solve problems, and so requires individuals to gather, classify and prioritise information (Wright, 2010). Taking account of these findings, the methods of data gathering have been devised to facilitate a flow of information and exchange of ideas and potential solutions.

Connectivism is predicated on the following principles postulated by Siemens (2005: para 26), namely that learning and knowledge

i. rests in diversity of opinions,
ii. is a process of connecting specialised nodes or information sources accumulated in different ways through formal education courses as well as email, communities, conversations, web search, email lists, reading blogs; courses need not be the primary conduit for learning,
iii. may reside in non-human appliances such as technology,
iv. has a capacity to know things more critical than what is currently known, through accumulating knowledge from the environment,
v. involves nurturing and maintaining connections to facilitate continual learning as a knowledge creation process, not only knowledge consumption, and thus tools and design methodologies should seek to capitalise on this characteristic of learning. It also has the ability to see connections between fields, ideas, and concepts as a core skill, where organisational and personal learning are integrated tasks, the latter feeding into

organisations and institutions, which in turn feed back into the personal network and continue to provide learning for the individual,

vi. is 'currency', where the gathering of accurate, up-to-date knowledge is the purpose and intent of all connectivist learning activities,

vii. impacts on the decision-making process, in itself a learning process, where choosing what to learn and the meaning of information is seen through the lens of a shifting reality where answers and knowledge change with continuing input.

In reflection on research planning and data gathering, each of these constituent factors were examined in methodology development, and the result of this is expressed in the design plan.

Learning has an end goal, suggests Siemens, namely the increased ability to "do something", whilst also being subject to the changing inputs of context and availability of knowledge. It may be practical in nature, be it increased competence in the use of a new software tool or learning how to skate, or the ability to function more effectively in a knowledge era, with improved self-awareness and personal information management. It is essentially an actuation, or indeed activation, of the knowledge gained where thinking and emotions influence each other. Exclusion of the theoretical consideration of the effect of one part of the human experience means a significant part of understanding is lost. This is a close and accurate assessment of what is sought to be achieved herein.

Landgraf (2007, p.64) outlines the individuality of contextual and interactive learning:

> *While there may be a common set of academic expectations for all students, the individual may have a different best path to achieving those expectations. Creative thinking skills can be developed across multiple academic subjects. Individual growth is most likely to occur within the context of the learner's talents and background knowledge. One student may have a propensity to develop creative skills through music, another through creative writing. Each student should have an opportunity to develop cross-content skills within the multiple content areas and form a position of a natural talent and background knowledge.*

Thus, the accumulation of learning through prior knowledge will make it difficult for a teacher, for example, to determine what sort of knowledge (or understanding thereof) students have before they meet in a classroom or online. Nevertheless it can be argued that prior knowledge of a field of learning will facilitate further accumulation and understanding as it develops.

Connectivism has been criticised as a standalone learning theory, and simply complementary to the more established philosophies, particularly connectivism (Ally, 2008). It is even excluded as a branded development that effectively ignores the application of pre-existing theories, notes Bell (2011). Verhagen (2006, p.) argues that it is simply a "pedagogical view", a way by which students and their teachers interact in the pursuit of knowledge rather than a foundation of learning. Kerr (2007) in turn claims that the other established learning theories sufficiently account for the impact of technology evolvement on learning and connectivism that "has either already been claimed by others or has been better done by others". Further, Kop and Hill (2008) conclude that connectivism is not effectively a separate learning theory, but they do suggest that it plays a significant role in generating new pedagogies of the shifting focus of learning from the teacher to more student-centred learning approaches. Whilst these criticisms are not ignored, it was considered that, as a relatively novel theory to deal with the vastly increased diversity of digital sources and consequent need for knowledge management, it was an attractive basis for this investigation.

Its proponents characterise it as a learning theory that implements a diverse interaction of learning and knowledge theories within a uniquely changeable environment of education, engaged with the potential of emerging technologies (Bell, 2011). Ally (2008), who also recognises today's connectedness and networks of technology and claims that past learning theories were developed before networked learning was widely utilised and so are less significant in the digital age, believes that educators should indeed adopt their combination with connectivist principles. He concludes that "what is needed is not a new stand-alone theory for the digital age, but a model that integrates the different theories to guide the design of online learning materials" (Ally, 2008, p.18). It arguably undermines the rather simplified categorising of the way students learn. Learning strategies and theories must adapt to changes and technological advancement, which open more opportunities to learn, and the feedback sessions of this research offer the chance for individuals to examine their own knowledge management processes.

Schunk (2015) indeed acknowledges that '(cognitive) theories reflect environmental phenomena'. 'Connectivism' adds to the pantheon of learning theories, and given the nature of this study, an opportunity to investigate its aptness was considered appropriate, without the need to lose sight of the impact of student memorisation and retention techniques, self-motivation, inquiry and knowledge organisation. Arguably, tradition is adaptable to the production of new ideas and philosophies. Gonzalez (2004) indeed suggests that with rapid technological change, new sources of learning appear and must be accommodated. Information has a 'half-life'; it is temporary and must be replaced. Siemens' (2004) perception and theory relies more on the intrapersonal existence of knowledge and awareness than a more individually based system of learning represented by the traditional philosophies. Much more emphasis is based on the effect of technology on opening avenues to new information, which has considerable implications in the Saudi social and educational context of more controlled learning.

It is not possible, nor is it within the remit of this study, to examine this assessment of 'connectivism'. That would require a different methodological process and arguably a different topic. This does not however preclude its use in this research planning. Although Kop and Hill (2008) suggest connectivism is a product of the shift in educational resource availability rather than a challenge to behaviourist and cognitive-interactive theories, this is very close to the plans for this research. The mobile phone may be simply an additional resource of knowledge, avers Sharples (2007), but it does have considerable implications for information management, and future learning by students. This forms an essential part of the design plan of this study, as students provide feedback on their activity experiences. Connectivism will also be shown to have application in the MALL and SMALL principles of this research. Emergence and Phases of Computer Assisted Language Learning (CALL)

The 21st century language classroom has developed far beyond anything that would have been recognisable only a few decades ago. Teacher-led presentation practices and textbook guides focused on memorisation of vocabulary and correct grammar before their technological and cultural shift into the world of knowledge and diversity (Eaton, 2010).

Language learning and teaching styles have changed substantially with the advent of the most basic of computer assisted language learning (CALL) programmes in the 1960s (Warschauer, 2000). Levy (1997) defines CALL as "the search for and study of applications of the computer in language teaching and learning". As long ago as 1982, Davies and Higgins asserted the word 'computer' would envision a bulky desktop device, but it should not ignore the Information Communication Technology (ICT) capacity for use in learning and teaching a foreign language.

Its development as a tool of learning can, it is suggested, be identified in three phases, (i) behaviourist, (ii) communicative and (iii) integrative CALL (Warschauer, 1996; Warschauer and Healey, 1998).

Behaviourist CALL is based on the philosophy of learning behaviour promulgated by Skinner (1938), the conditioning of the brain to respond to environmental, reinforcement stimuli. In the context of CALL, the computer was considered to assist the role of the presentational teaching style, rewarding compliance with instructions on how to conduct standard memorisation and rote learning practices (Taylor, 1980). It was the most common computer assisted learning programme in the 1960s and early 1970s. The pedagogical material was delivered in monotonous and repetitive language drills with grammar, vocabulary and translation tests (Taylor, 1980). Warschauer (1996) noted that emphasis was placed on repetition of the same material believed to be fundamental to learn, a task suited to the impersonal, unfeeling and never tired computer. Students could process the input and acquire a new language at their own individual pace. It became less popular in the late 1970s as language learning shifted from a simple process of repetitive drills and advancements in software and hardware, particularly the microcomputer, which promised a range of different modes of learning (Warschauer, 1996).

This, it is suggested, does not mean it has no educational value in mobile learning. Students still learn though repetition and list-based exercises, and these form a part of traditional classroom and textbook lessons in Saudi Arabia. Although in reflection on the methods of data gathering in this research, they do not specifically include planned behaviourist exercises that may change depending on the feedback discussions. Mobile digital activities are indeed simply conducted, perhaps as a short time-filler, with the benefit of an immediacy of feedback, which it has been shown that learners appreciate.

The ***Communicative CALL*** phase was more focused on the act of communicating in the target language, and "all CALL courseware and activities should build on intrinsic motivation and should foster interactivity—both learner-computer and learner-learner" (Han, 2009:41). It reflected a change in perception of a method of learning that extended beyond simple rote, as computers became more popular, affordable and incorporated greater capacities than before (Collis and Muir, 1984).

As forms of language learning and communicative use replaced the rigid grammar rule learning, repetition of given structures of the second language were abandoned (Underwood, 1984). Students were given the opportunity to interact and to choose and control their choices in programmes that aimed to enhance the language skills in games and text reconstructions (Healey and Johnson, 1995). It lost impetus at the end of the 1980s when language educators realised that the limitations of the software meant it could not live up to the all-embracing promises of developers concerning the capacities of their programmes (Kenning and Kenning, 1990; Pusack and Otto, 1990; Rüschoff, 1993).

Integrative CALL. The establishment of multimedia and the Internet has led to the emergence of the last and current phase of CALL (Levy, 1997). Multimedia is a general description of types of communication-based media such as motion videos, sound, text, or graphics displayed by a computer. These opened a range of various possibilities for language learning via images, interactive activities and visual challenges (Hu and Deng, 2007; Schmid, 2008).

Andersen (1999:31) noted that "language is no longer just a list of grammatical paradigms or lexical items. Rather, it is intimately associated with all kinds of verbal and paraverbal

behaviours, an acoustic and visual context that is indistinguishable from the larger societal context in which the words are uttered". The learners could become involved in a virtual world that they could adapt to their own needs and preferences.

Dina and Cironei (2013) assert that language learning and teaching is enhanced by the use of the world-wide-web, an internet of innumerable, developing and changing resources. They can communicate with the world of learning and practice in an authentic environment in which interaction is facilitated in a manner that cannot be achieved by simple texts, encouraging involvement in learning, not just receipt thereof. It enables students to more readily identify their skills and needs for improvement, learning at their own pace and in a manner that best suits their changing preferences. Their level of motivation grows as their personal choices are met by a rich variety of resources, with opportunities to connect with native speakers and share learning materials with others (Dina and Cironei, 2013).

The introduction of the computer essentially revolutionised language learning for EFL students;

> *It originated on the mainframe as a tutor that delivers language drills or skill practice. With the advent of multimedia technology on the personal computer, it serves as a space in which to explore and creatively influence microworlds. And with the development of computer networks, it now serves as a medium of local and global communication and a source of authentic materials. (Kern and Warschauer, 2000:13)*

However, the desktop computer created its own 'bubble' of learning, physically separating students from each other until they logged in to cyberspace (Traxler, 2016:196). Times and places have to be arranged for access, with largely fixed schedules. The advent of mobile devices, programmed with software that matched the capabilities of the fixed stations and facilitated personalised adaptations, more readily added considerable fluidity and flexibility to learning (Traxler, 2016:197). It also allowed for physical as well as cyber-space contact, something that continues to be valued by young people, even those glued to their devices.

Technology developed rapidly and digital hardware became more sophisticated and smaller, heralding the advent of Mobile Assisted Language Learning (MALL), the "use of personal, portable devices that enable new ways of learning, emphasising continuity or spontaneity of access across different contexts of use" (Kukulska-Hulme & Shields, 2008:273). Mobile devices are considered to be compact forms of PC technology, shifting their capacity from the desk to the lap and then to the hand, facilitating any time learning and teaching for students and their instructors (Kukulska-Hulme, 2009). Consideration has not specifically been given by the Vision 2030 initiative to mobile learning. This research aims to play a part in filling that gap. It is appropriate therefore to consider the writings and reports on that particular subject. The academic evidence noted above provides a solid basis for understanding its introduction.

Introduction to Mobile Learning

The proliferation of technology commands attention from policy makers, government stakeholders, teachers and academic institutions around the world. There is however a gap between rapidly developing digital capacity and resources and the uptake of the opportunities they present to educational institutions at all levels in terms of adopting these new products, applications, and mobile devices. Attwell (2007) warns that unless universities respond to this change, the student experience will not develop the significance and benefits it can bring to everyday social interaction as a continuous language learning activity.

At university level, a report by the UK National Union of Students conducted for the Higher Education Funding Council entitled 'Student perspectives on technology – demand, perceptions and training needs' (2010) indicated that nearly a quarter of the students thought their lecturers needed additional training in IT skills. Over three-quarters of the students surveyed were self-taught in ICT skills and nearly 90% considered themselves effective online researchers.

Young adults already have a remarkably high degree of digital competency, having been surrounded by such technology at arguably their most important left development phase from childhood. Prensky (2011) calls them 'digital natives', and their older teachers 'digital immigrants', a rather pejorative distinction and description that serves as his introduction to a rhapsodic portrayal of a new teaching order, somewhat unsupported by empirical evidence. Beetham *et al.* (2009:24) more unpretentiously assert that students "are creating their own learning spaces, blending virtual with face-to-face, and formal with social. Informal collaboration is widespread, often facilitated by technology that is under learners' ownership and control." It is hoped that the design of the empirical data gathering process of this research explained and discussed in the methodology chapter will be indicative of a similar finding for Saudi students of EFL.

Franklin and van Harmelen (2007:21) suggested that the technological revolution ushered in by the arrival of the second generation of the world-wide-web enabled a significant increase in the capacity to interact and share information. This will be examined later in the chapter. It brought enhanced opportunities for constructivist learning that did, however, take time to be embraced by the traditional teacher-led orthodoxies of many nations including, as has been noted, Saudi Arabia. Theories of learning and teaching methods develop with technological change and the new opportunities they bring. Students are looking for fun and convenience as adjuncts to knowledge gathering to increase motivation in their language learning (Asmali, 2017). Siemens' connectivism envisages learners gathering information through a network of trusted people, content and tools.

A note of caution is raised against over-exuberant advocacy of the benefits of independent mobile learning; "neither mobile technology nor learning theory is the answer to our education" but both of these can help enhance the process of learning with the guidance of accomplished teachers (Craig and Van Lom, 2010:21). This warning has been taken into account and indeed the design-based model explained in the next chapter aims to integrate teacher and student involvement in the learning process to mutually enhance outcomes. Having reviewed the introduction of mobile learning into the pantheon of teaching resources, it is now possible to examine its evolution as a learning instrument.

Evolution of mobile learning

The perceived social and business need for mobile digital devices has resulted in around two billion mobile devices being shipped globally in 2013 (Hepburn, 2013). Technological innovations have created multi-functional tools and in the education context, students can share information, select collaborators in their education quest, make notes and audio-video record their learning experiences (Godwin-Jones, 2018).

The influence of mobile devices can be found in both formal and informal learning contexts (Traxler, 2007). For instance, in the teaching and learning of a language such as English, there has been growing interest in using these mobile devices in the EFL/ESL classrooms. The literature contains a large number of studies investigating the integration of mobile learning. Nah, White and Sussex (2008) highlight in their study in South Korea the benefits of mobile

access to the internet in promoting learning and pronunciation, with the listening activity aiding communication in English. This will be considered in feedback sessions with the student participants in this study in the continuing development of activities.

Further, Tabatabaei and Goojani (2012) studied the use of texting in language learning in Iran. This will be discussed further, but the conclusion reached by this researcher is that it will not play an integral role in this study, save to notify participants of uploaded activities. Nevertheless, students may wish to use the facility in communicating with each other, and this will be addressed in feedback sessions should it occur.

It should be noted that different issues, other devices and a diverse range of particular faculties have resulted in a search of the term 'Mobile Assisted Language Learning MALL' on the online ERIC database producing around 300 articles. It is impossible within the limitations of time, cost and logistics of this work to examine them all. A cursory review was nevertheless conducted of approximately 20 of these articles to seek Saudi-based HE studies using mobile phones in support of a classroom learning process adopting a design-based model of data gathering. There were none identified, and indeed there was no indication that those so briefly considered made any reference to connectivist learning. This is not conclusive, of course, of a finding of the uniqueness of this research programme.

Karlsson *et al.* (2017, p.3) assert that 'global adoption of smartphones has grown at an extraordinary pace: today's circa 4 billion smartphone connections are nearly double the figure of three years ago' in emerging markets 'an internet-enabled handset can signify the only form of internet access.' Arrigo *et al.* (2016:39), in their review of Italian studies, comment that commercial market-driven imperatives have resulted in a dramatic improvement in the quality and burgeoning availability of devices that accompanies increased internet coverage.

It is only relatively recently however that mobile devices have been considered for significant use in schools and universities. Wilson and Piraino (2015) note that 'students are markedly accepting of mobile learning possibilities, and will thus willingly partake in activities offering potential improvements in student retention and satisfaction'. There is however 'a significant amount of scepticism towards Mobile Assisted Language Learning' emerging in academic studies (Calabrich, 2016, p.120).

Content and directed guidance are key to language learning, with cultural, commercial and national curriculum achievements in mind: "technology can only be as good as the pedagogy behind it" (Burston, 2011:14). Mobile learning may take the 'classroom' out of the confines of the institution but 'schools generally consider outside activities difficult to manage' (Arrigo *et al*., 2016:27). This requires detailed design and planning of lessons and activities, and indeed Arrigo *et al.* suggest alternating the pedagogical process across activity sites and the classroom, using mobile and desktop faculties. This suggestion is broadly adopted in the design of this study through outside conducted activities discussed and subject to feedback in class sessions to embed learning. The mix of contexts of learning has thus integrated design controls that are so important in the traditional Saudi framework.

The most obvious concern of teachers in the introduction of mobile phones into a classroom is, according to Campbell (2006), their capacity to cause student distraction by virtue of musical or other ringtones, or tempting students into social media use (Campbell, 2006). It may be suggested that all university teachers will have experienced this, no matter what rules are set or steps taken. Cheong *et al.* (2013:278) also suggest that classroom tasks involving websurfing must be directed and controlled, which is more difficult with mobile devices than

with desktops, whose access to social media is controlled and monitored by institutional and teacher oversight.

Kearney *et al.* (2012) nevertheless argue that it certainly has the potential to revolutionise the learning process in allowing individuals to determine their own independent paradigms and frameworks of learning. However, there needs to be a clear institutional policy on their use and content that drives guided learning in the classroom, whilst facilitating students' more spontaneous general language learning use in their own study time.

The concept of mobile learning is an evolving field that could also develop to become an extension of the e-learning process (Beetham and Sharpe, 2008). The potential of this area is amply exhibited when one considers the increasing popularity of conferences, workshops and seminars conducted on this concept, both within the United Kingdom and beyond (Burden *et al.*, 2012). Although there is no utility identified for these capacities in this study, its results may provide an impetus for further research into its value in e-learning courses. Mobile learning is also becoming a highly lucrative area of investment for major technology companies, as they develop platforms and applications to attract institutions to utilise speciality learning faculties with directed content (Selwyn, 2016).

Diversity of Definitions and Characteristics of M-learning

Mobile learning (m-learning) is a relatively new learning concept that provides opportunities for continued learning as an anytime activity (Lee, 2005), and Geddes (2004:1) calls it "the acquisition of any knowledge and skills through the use of mobile technology, anywhere and anytime". Much has changed over three decades in the capacity embedded in devices, and they may now be considered mini-computers, contributing much of what fixed classroom desktops contribute to learning, accessing most if not all of the same resources.

The MALL element of this learning practice includes handheld devices such as smartphones or tablet devices used for educational purposes (Traxler, 2005).

(i) M-learning has been defined in terms of the technology or mobility of the technology as well as by reference to the size of mobile devices (Traxler, 2009).
(ii) Sharples (2006) asserts that it must take into account the environment, the experiences of the user, the uses and backgrounds, whereas
(iii) Traxler emphasises mobile learning as an educational process, in which handheld devices are the dominant form of technology tool.
(iv) O'Malley and Stanton (2002) accentuate personalisation, connectivity and interaction by handheld devices.
(v) It is used in the context of collaborative learning (Pinkwart *et al.*, 2003), fieldwork and as a useful tool while counselling and guiding others (Vuorinen & Sampson, 2003).

In the multifarious emphases of mobile learning, a pathway is sought herein to gain insight into benefits to language learning and understand the theories behind its use and value. With that in mind, Table 1.1 presents an overview of various mobile learning definitions, to simplify the start of the investigation process.

Table 1.1. Definitions of Mobile learning

Author (year)	Definition
Quinn (2000)	E-learning through mobile computational devices: Palmtops, Windows CE machines, even digital cell phones.
O'Malley *et al.* (2003)	Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies.
Trifonova (2003)	Any form of learning (studying) and teaching that occurs through a mobile device, or in a mobile environment.
Georgiev *et al.* (2004**)**	A new stage of e-learning having the ability to learn anywhere at any time through the use of mobile and portable devices.
Keegan (2005)	The provision of education and training on PDAs/palmtops/handhelds, smartphones and mobile devices**.**
Traxler (2005)	Any educational provision where the sole or dominant technologies are handheld or palmtop devices.
Doneva *et al.* (2006)	A next stage or a new form of e-learning through the use of mobile and portable devices and wireless networks and communication technologies for teaching and learning**.**
Ally (2009)	The process of using a mobile device to access and study learning materials and to communicate with fellow students, instructors or institutions.
Cook, Pachler and Bachmair (2010)	The 'interrelationship of hardware, structures of the mobile complex and its internalisation within cultural practices.' (p. 5)
Kukulska-Hulme and Traxler (2019)	'is an expanding field of research and practice, increasingly shaped by rapid technological and socio-cultural change that is at odds with the more leisurely pace of evolving pedagogy, especially the formal pedagogy within colleges and universities.'

Traxler, in 2007, found definitions of mobile learning current at the time to be too constricting, viewing them as "technocentric" and too "tied to current technological instantiations", focusing on digital capacity with insufficient attention to the student experience in a cultural context (2007:4). He called for the exploration of other definitions that focus on the learner's experience and distinguish it from other forms of education, especially e-learning. Cook, Pachler and Bachmair (2010:7) indeed place mobile learning in an environment of 'meaning' through collaborative knowledge-building which is normally conducted outside of the traditional classroom, not simply the use of images and signs for memory activities. This stimulates independent learner input.

Nevertheless, in Traxler's work with Kukulska-Hulme (2019), the development of pedagogy and learning was placed more firmly in the context of technological innovation. Creating narrow definitions of m-learning will not incorporate all related features and learning opportunities such as classroom or extra-institutional environment, but the mobility and capacity of devices gives rise to a multitude of learning opportunities in diverse contexts. This serves as a basis for this study of student perceptions of value to their learning, rather than an evaluation of the technology. As a practical tool of language learning, attention is directed by researchers to mobility, improving battery life, universal wireless connectivity and application capacity (Butcher, 2014; Fisher, Lucas and Galstyan, 2013; Linder, Ameringer, Erickson, Macpherson, Stegenga and Linder, 2013; Pellerin, 2014).

SUMMARY AND CONCLUSION

In the development of a theory to encompass the smartphone as an instrument of learning, authors have suggested that mobile learning does not rely on a specific learning theory or approach due to its relative novelty (Cheung and Hew, 2009; Naismith *et al.*, 2004; O'Malley *et al.*, 2003). Theories for mobile learning are still emerging as efforts seem to focus on investigating the practical uses of mobile technology in different contexts (Comas-Quinn *et al.*, 2009).

Current practices of mobile learning are teacher-driven rather than based on students' experiences and beliefs (Kukulska-Hulme, 2009). This inhibits the introduction of the device as a tool of learning and in the design-based approach this will be addressed, treating it as integral to the education framework. There is no presumption that this will prove to be the case, but the rather piecemeal approaches of the past can at least be placed in the proposed context.

A research project by Herrington *et al.* (2009) used a design-based approach to review the pedagogical and research endeavours of a group of academics in higher education who conducted a mobile-based project over two years with teachers, IT specialists, and students. The project was theoretically inspired by design-based research and followed three stages:

(i) a problem was defined and analysed in cooperation with teachers and practitioners,
(ii) solutions, or interventions, were designed in accordance with theoretical frameworks and technology, then
(iii) design principles were created, based on the knowledge of theory and practice reflecting on the previous two stages.

Edelson (2002) had previously referred to these three stages as problem analyses, design solutions, and design processes. Herrington *et al.*'s (2009) reported findings were translated into eleven design principles and practices for mobile learning; a design-based research approach incorporated into this study as part of its planning. For the sake of completeness, these are recorded in full. Although it is not intended to specifically deal with each separately in the methodology chapter, the principles to which they relate provide a broad overview of what this research hopes to achieve.

Table 2.2. Research Objectives

i.	Real world relevance: Use mobile learning in authentic contexts
ii.	Mobile contexts: Use mobile learning in contexts where learners are mobile
iii.	Explore: Provide time for exploration of mobile technologies
iv.	Blended: Blend mobile and non-mobile technologies
v.	Whenever: Use mobile learning spontaneously
vi.	Wherever: Use mobile learning in non-traditional learning spaces
vii.	Whomsoever: Use mobile learning both individually and collaboratively
viii.	Affordances: Exploit the affordances of mobile technologies
ix.	Personalise: Employ the learners' own mobile devices
x.	Mediation: Use mobile learning to mediate knowledge construction
xi.	Produce: Use mobile learning to produce and consume knowledge

Learning 'on the move' is a considerable opportunity to develop knowledge and competence in a language (Traxler, 2007). Providing time for students to explore the technological affordances and the educational potential of their mobile devices enables students to share knowledge and engage in authentic tasks (Herrington *et al.*, 2009). Herein lies the need for teacher direction and instruction, but it also demands the availability of non-technological tools of learning, both mobile and fixed. This is particularly suited to classroom instruction. The functionality of mobile learning makes it an effective learning approach free from time and location restrictions and thus encourages social interaction as well as behaviourist individuality (Hsu *et al.*, 2006). The practice of education does not stand still, and technology itself develops exponentially. Different tasks require different methods for completion, and so teachers and students must be aware of limitations, just as they are of textbook activities and whiteboards.

This review of the current research literature on developed learning theories and MALL has highlighted challenges to new research to meet student needs, indicate pedagogical areas of improvement, avoidance of integral problems of teacher-centrism and the lack of contextual learning opportunities. There is considerable potential for learning in a shift of emphasis to student-centred, collaborative and contextual EFL learning, enhanced by computers and mobile technology, but the latter in particular requires a more rigorous theoretical basis due to its novelty.

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