Computer integrated education evaluation: a case study

Corlia Smuts[1], Hanlie Smuts[2] [0000-0001-7120-7787]

[1]Department of Humanities Education, [2]Department of Informatics
University of Pretoria, Pretoria, South Africa
corlia.smuts@up.ac.za,hanlie.smuts@up.ac.za

Abstract.

The combination of digital technologies and the focus on student-centred learning, enable the integration of pedagogical methods with the effective use of technology. This integration required educators to meaningfully engage with educational technologies as it is deployed across all aspects of teaching and learning such as teaching techniques, delivery methods and learning solutions. Furthermore, mechanisms are required to establish priority for professional development for educators in order to increase efficacy of teaching and learning design. Therefore, the purpose of this interpretive case study was to identify the key considerations that educators think through in order to achieve computer integrated education design. In addition, to create a development priority and roadmap, the key considerations were mapped to the taxonomy of blended learning design. Data was collected via 13 semi-structured interviews from the case study institution, a private school operating in South Africa. Through an automated analysis process, 30 concepts and 12 themes were identified. The primary areas identified for the case study institution to attend to relate to two taxonomy areas, namely attitudes and beliefs (educator judgement relating to the use of technology by students / learners) and contextual determinants (policy, affordability, skills determinants).

Keywords: educational technology, blended learning, e-learning, taxonomy.

1. Introduction

With the advent of new technology and access to countless information resources, the way we are being taught and the way we teach have never been so diverse [1]. From the traditional face-to-face classroom setting, technology has now made it possible to learn and teach using blended learning, distance learning and online platforms. Therefore, the use and expansion of technology has completely changed the quality of, and approach to, education [2]. These information technologies make a greater variety of educational practices possible and create more learning opportunities, while diversifying the approaches of both teachers and learners toward education [3]. The need for teachers and learners to adapt has therefore also become of utmost importance [4]. Educators now have the opportunity to use technology to enable learners to learn and practice language at all levels of language input and -output (reading, listening, writing and speaking), while educators can also use

technology to design specific learning components to enable the learning of language for set purposes and accommodating a variety of levels of fluency [4].

However, with these advances and all of the benefits and possibilities it brings, some challenges also occur and scholars have reported that these issues require more attention and further investigation [5]. These barriers include, but are not limited to; slow change, cultural/societal resistance, lack of support/resources for enablement/ the inability of educators and education systems to integrate technology and adjust to its demands, a lack of strategy and/or planning [6].

Therefore, this study aimed to establish the key considerations impacting computer integrated education. The primary research question that this study aimed to address was: "*What are the key considerations that educators think through for achieving computer integrated education design and how may it be measured?*". This was achieved by applying a single case study research strategy and collecting data through 13 semi-structured interviews. Particular themes were identified from the interviews and mapped to the taxonomy of blended learning design [7]. By evaluating the findings against the taxonomy of blended learning design, educators will be able to increase efficacy of teaching- and learning design, as well as understand where they need to focus their own skills improvement.

Section 2 of this paper provides the background to the study and presents an overview of blended learning, technology tools impact and challenges, as well as the influence on teaching practice. The approach to this study is discussed in Section 3, while Section 4 provides an overview of the data analysis of the study and report the findings derived from the semi-structured interviews. Section 5 illustrates measurement of the computer integrated design aspects and Section 6 concludes the paper.

2. Background

Based on the benefits of the use of technology as well as the barriers/challenges described, it is now apparent that there is a disparity between what technology could do for teachers and learners versus what it is currently doing/how it is used [8].

In the following sections, we consider this shift in teaching practice and blended learning, as well as the impact of computer integrated education.

2.1 E-learning and the blended classroom

Industry, the corporate sphere, the economy and the 'world of work' is constantly changing and through the increase in technology, innovation and automation the needs and pressure placed on the work force are also at an increase [9]. In order to adjust to these ever-changing demands, education systems are also constantly changing and adapting to produce an appropriately qualified work force [9]. Some of the most prominent innovations in education systems included electronic learning, games-based learning, technical skills development and subject-integration [10].

As technology has developed and now proliferates all areas of society, it is important to understand the definition of technology as it is used in education and e-learning [11]. Seeing as technology is developing continuously, the concept of e-learning is also ever changing and dynamic. E-learning consists of four different

domains which must be considered when e-learning is conceptualised and implemented; type of technology, the system of delivery, educational- and communication paradigms [12]. Blended learning can therefore be defined as innovative and adaptable methods of education, teaching and learning which allows learning to be learner-centred and can improve a learners' interaction with the material [13]. Research has shown that a blended-learning approach can greatly benefit students seeing as it combines online teaching and learning with in-class teaching and classroom time [14]. This approach allows students to interact with the material comfortably at home while homework and more conventional schoolwork can be focused in the classroom [15].

In accordance with these global trends and the emergence of blended learning environs, and the consequential change of direction and shift in priority, teachers and educators have also been encouraged to assimilate learner-centeredness into their teaching style and classroom [11]. Additionally, educators also need to develop and acquire the skills necessary to introduce e-learning and other Information, Communication and Technology (ICT) tools into their classrooms keeping learner-centred learning in mind. In order for teachers to fully utilize the technology available to them, they would require the appropriate support in terms of new skills development, professional development and practical help as to the usage of ICT in the classroom and for the preparation of lessons [8].

In order to meet the challenge, it is important to investigate and understand the current level of educator ICT skills, where there is a gap in their knowledge and establish their current ICT needs and related teaching priorities in order to encourage teachers to adopt better ICT practices and methods in teaching which will in turn impact students and foster learning enrichment [8, 16].

2.2 Technology tools and teaching practice

Taking the concepts of type of technology, the system of delivery, educational- and communication paradigms as previously discussed into account, the static use of an electronic device in a classroom does not automatically constitute e-learning [11, 12]. Therefore, in order for the device to be effectively used for e-learning as an ICT tool, it needs to play a core role in the learning process and provide support and stimulus for learners which cannot be substituted with traditional methods and materials [17]. Further studies have found that studies the usage of e-learning tools in classrooms had a positive impact on the improvement of the language ability and achievement of students in the English language classroom [8]. It can therefore be deduced that in order to bridge the gaps between ICT tool- and resource availability, e-learning and educator competence in a real-time classroom, teachers are required to develop new technical skill sets and be able to innovate new ways to use the available ICT resources in an integrated, blended manner [18]. According to Schneider and Stern [19], teachers are unable to use ICT tools effectively to create a blended teaching and learning environment without a clear understanding of the relationship between pedagogical knowledge and the role e-learning tools play as a medium for teaching and learning [19]. Therefore, if educators are expected to prepare learners for a technological saturated working environment after school, they too need to be well versed and able to use the appropriate ICT tools [11]. However, educators may

find it difficult to use ICT tools if they are unable to see said tools as being part of their pedagogical frame of reference [19].

In order for the educator to properly instruct learners and convey the appropriate knowledge, they must themselves be in possession of the appropriate pedagogical knowledge related to what they are teaching [11]. Pedagogical knowledge does not simply refer to content knowledge but also a deep understanding of teaching, learning, the educational process and the values, purposes and aims thereof [20]. Additionally, pedagogical knowledge can also include an understanding of effective lesson conveyance, assessment, student- and classroom management and lesson planning [8].

2.3 Challenges of integrating technology tools teaching

In order for ICT tools to be used effectively and appropriately in the classroom to offer invaluable support to learner, both content knowledge and appropriate instructional methods need to be integrated appropriately into the blended environment [21]. It can also be concluded that educators need to know how to create an ICT enriched classroom by implementing blended learning in a flexible and creative manner and be guided by the curriculum, learning outcomes, experience and content knowledge [22]. Additionally, the students in our schools today are also exposed to a variety of technologies from a young age which created an ever-expanding cycle where educators and schools are forced to also embrace the changes brought to the education sector though the introduction of new technologies and the needs of learners to also adopt and acquire new technology-based skills [23].

According to Amin [24], the acquisition of ICT related skills have posed some difficulties for bother student- and veteran teachers [25]. In another study, Flanagan [26] investigated and contrasted the method used by beginner- and veteran teachers when it came to solving ICT related problems as they occur in the classroom. Additionally, Hedgcock and Ferris [27] also found that the greatest challenge faced by teachers is the lack of ICT-based skills and training and an inability to properly prepare for the use of technology in the classroom in order to foster a blended-learning environment [27]. This hesitance and doubt that teachers experience has been coined by Al-Alak and Ibrahim [28] as “computer anxiety” and has been shown to negatively affect the teachers’ intentions and ability to use technology in the classroom [11, 28]. More recent research has suggested that the gap between what is expected of educators in terms of blended learning and that which they know they are actually able to achieve, has gone as far as causing “technophobia” among many teachers [29]. It was found that this “computer anxiety” and “technophobia” were primary a result of teachers not possessing the skills, knowledge, confidence or experience when it comes to using technology in the classroom [29].

In addition to the challenges teachers face as discussed above, educators must also focus on fulfilling their roles as teacher, meeting the standard of the curriculum and ensure that all of the learners’ needs are met while keeping their individual ability and learning capacity in mind [11]. Therefore, it comes as no surprise that research shows that many educators are feeling overwhelmed and ill-equipped as they attempt to follow new educational trends and meet the standards [11].

3. Reseach approach

The objective of this paper was to establish the key considerations that educators think through for realising computer integrated education design. In order to achieve the aim of the study, an interpretive, single case study research strategy was applied. The case study institution is a South African private school, primarily catering to foreign learners from diplomatic families. This school consists of 257 learners from Grade 0 to Grade 12 and employs 25 educators, as well as a support- and administrative team of 12 people. We designed a semi-structured interview guide that consisted of demographic questions, as well as questions pertaining to computer integrated education design and evaluation. Data was collected through 13 semi-structured interviews. The profile of the educators that were interviewed is shown in Table 1.

Table 1. Respondent profile

Educators interviewed			**Tenure as educator**			**Tenure at case study institution**		
Elementary School	3	23%	<5 yrs	5	38%	<4 yrs	9	69%
Middle School	4	31%	5-7 yrs	5	38%	4-7 yrs	3	23%
High School	6	46%	>7 yrs	3	24%	>7 yrs	1	8%
Total	**13**	**100 %**		**13**	**100%**		**13**	**100%**

The transcriptions of the interviews were analyzed using Leximancer [30] in order to identify and report patterns and themes within the data [31], emphasizing both organization and rich description of the data set and theoretically inform interpretation of meaning [32, 33]. Leximancer software (V5.0) is advanced natural language processing software utilizing Bayesian theory. Leximancer applies an unsupervised iterative process to determine the frequency of concepts and their relationships, and as such, has no preconception to extract the data. The final analysis is gleaned from the data itself [34]. Leximancer identified the main concepts in text reliably based on the interdependence of words in the text. Leximancer automatically infer concepts and themes from the data and provide clear, concise and accurate interpretations [35]. In the next section, we discuss the data analysis and findings of the study.

4. Data analysis and findings

The purpose of this study is to present the educator key considerations for computer integrated education design. The qualitative data collected through the 13 semi-structured interviews were analysed in order to identify the key considerations. The interview data was visualised through a concept map depicted in Fig. 1. Leximancer generated a total of 30 concepts and 12 themes from the interview data and shown in Table 2. Theme refers to a cluster of concepts that have commonalities reflected by their proximity in the concept map. The theme name is derived from the most prominent concept that appears in the group of interconnected concepts. The calculation of the number of hits informed the themes that were formed based on the interview text and fit each concept based on the Leximancer's machine learning capabilities [36].

In terms of the "tools" theme, when technology integration in the classroom is seamless and thoughtful, students not only become more engaged, they begin to take

more control over their own learning. The choice of technology integration highlights the ability and capability of finding and evaluating the best tools and devices suited to the classroom situation and that may be applied across various contexts, The "students" theme highlighted the aspect that learners adapted well to the on-line environment and that they may be taught where ever they are and that the educator may share resources with them wherever he / she is. Special needs of learners may also be addressed in this manner. The "technology" theme impacts educator pedagogical knowledge as their own training often included very little technology training apart from using an overhead projector.

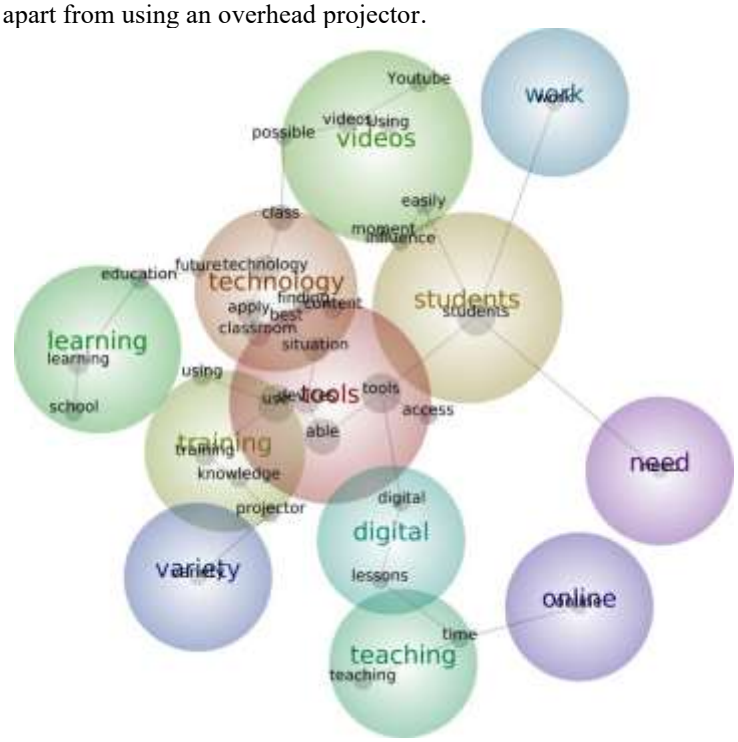

Fig. 1. Interview data concept map

Table 2. Themes and concepts from the interviews

No	Theme	Hits	Concepts
1	Tools	65	tools, use, able, devices, situation, training, content, using
2	Students	56	students, learners
3	Technology	46	technology, class, classroom, apply, finding, best, content
4	Learning	29	learning, education
5	Training	19	training, using
6	Teaching	15	teaching, time
7	Work	14	work
8	Online	11	online
9	Videos	11	videos, Youtube
10	Digital	8	digital
11	Need	7	need
12	Variety	7	variety

Tools make the content more attractive and accessible and also allow for learning to be more active and engaging such as making use of a gamified learning experience, building lesson plans using differentiated instruction and technology, build a class website, create a classroom blog and using social media as a training tool. The application of technology is not a one-size-fit-all approach and the best content, approach and application must be adopted for the particular context. The "learning", "training" and "teaching" themes consider the purpose and need of each activity or lesson in order to evaluate which tool would be best suited to the outcome. Learning is enabled through exposure to a wide variety of material, information, and it enables learners to practice and apply while they manage their own learning path. Collaborative learning is being utilised more and the material is adapted to make up for the lack of classroom contact. With regards to computer integrated education, time-management, punctuality and organisation of all concerned have become a top priority. "Work" and "online" refer to workload and was highlighted in the automated analysis as using technology as introduction for a lesson or by recording a lesson, the educator workload is impacted, and in some instances, reduced. Learners' work packs may be submitted online, changing the typical workflow experienced as opposed to when no technology is utilised. Furthermore, when learners present their work online to their peers, there is a completely new dynamic added to collaborative learning. There is a lot of simultaneous learning taking place. The "videos" and "digital" themes contributes in the classroom as learners seem to pay more attention to technology in the classroom and the teacher can be more creative in the class. YouTube has a vast collection of helpful tutorials, while online discussion boards are used to see how learners engage with the content. The "need" and "variety" themes are focused on the educators and what is required in terms of tool selection best supporting the learning outcomes. Educators reflected that their knowledge of a variety of tools are limited and that they seek the advice and guidance of colleagues.

In the next section we evaluated the findings obtained through the interviews against the taxonomy of blended learning design [37].

5. Computer integrated education design evaluation

The aim of this study was to present the key considerations that educators reflect on for computer integrated education design. The next step in this research study was to visualise a measurement of the computer integrated education application in the case study institution. For this purpose, we applied the taxonomy for effective blended learning design [37] as it is useful not only for describing key factors impacting blended learning design, but also as a professional development tool for educators to increase efficacy of teaching and learning design [37]. In order to visualise the findings and create a professional development roadmap for the case study institution, we used a basic red-amber-green status where the themes and concepts defined through the automated analysis were evaluated against the taxonomy dimensions and characteristics as depicted in Fig.2.

One taxonomy dimension, "how student learning takes place" was well presented in the educator interviews, while 5 more taxonomy dimensions only contained green and amber characteristics. For "content knowledge" attention must be given to the

content knowledge that the educator must have to adequately meet the needs of students, while making a variety of knowledge available to them. For "pedagogical knowledge", assessment and how technology means are used to achieve it, must be considered, while access and computer integrated education knowledge skill must be developed in the "technology knowledge" dimension. In terms of the "learner experience" dimension, one aspect requires development and this includes problem solving i.e. addressing the challenges students are facing when attempting to utilise computer integrated education material. Focus in the "educator skills" dimension must be on management and development. Educators must build their own capability to apply technology in computer integrated education while educator development need to develop a dynamic understanding of technology, as well as learn how to interact fluidly therewith during instruction. In the "beliefs and attitudes" dimension one characteristic i.e. educator judgement regarding the use of technology by a learner, requires urgent development attention. The same applies to policy, skills determinants and affordability in the final taxonomy dimension, "contextual determinants". Judgement regarding the thoughts and beliefs of others when it comes to using technology tools for teaching and learning, must be based on the application of technology as an information source. Affordability is driven by the technology architecture that the school subscribes to and the associated cost of ownership. Policy, especially as it relates to privacy and protection of personal information must be clearly defined and applied consistently. Finally, educators must focus on different capabilities of computer integrated education and the adjustment to a digital environment, designing revised curricula.

Dimensions	Characteristics					
Content knowledge	Cater to students needs			Availability		Variety
Pedagogical knowledge	Assessment	Enrichment	Interaction	Learning approach		Learning objectives
Technology knowledge	Access		Knowledge and skill			Usage
How student learning takes place	Meaningfulness			Efficacy		
Learner experience required	Problem solving		Student interaction		Motivation	Performance
Educator skills consideration	Communication	Creativity	Efficiency	Understanding	Management	Development
Beliefs and attitudes	Educator judgment regarding their own use of technology			Educator judgment regarding the use of technology by students		
Contextual determinants	Accessibility	Culture	Affordability	Environment	Policy	Skill determinants

Fig. 2. Computer integrated education evaluation for the case study institution

This computer integrated education evaluation may be utilised to create a professional development plan for educators in the case study institution or to create individual educator profiles for targeted individual professional development.

6. Conclusion

In 21st century teaching, educators are expected to integrate traditional pedagogical methods with the effective use of technology in computer integrated education. These increasingly sophisticated technologies, create a requirement for educators to gain new skills to meaningfully engage with these technology tools. In this study we presented a computer integrated education evaluation case study where data was collected through 13 semi-structured interviews. The taxonomy of blended learning [7] was used to map the findings from the interviews to with the aim to develop a professional development agenda for the case study institution.

Thirteen educators across elementary, middle and high school were identified with varying years of experience as well as varying tenures at the case study institution. The data from the semi-structured interviews were analysed with automated natural language processing software, Leximancer 5.0. Through the analysis process, 30 concepts related to 12 themes were identified. These concepts and themes described the educators' key considerations when applying computer integrated education design. The four most prominent themes identified included tools, students, technology and learning.

In order to create a measurement of the case study institution's computer integrated education capability, the taxonomy of blended learning, consisting of 8 dimensions and 31 characteristics, were utilised. Similar themes between the taxonomy and interview analysis were identified and visualised with a green status. Where themes overlapped somewhat and minor issues were mentioned in the interviews, an amber visualisation was applied. Where taxonomy characteristics could not be matched to a prominent theme in the interview data, a red visualisation was used. Based on this evaluation, the case study institution may design a professional development plan for its educators.

This study was based on an interpretive paradigm and a basic red-amber-green mechanism was used to inform the evaluation and consequent professional development plan. As such, for future research, the development of a quantitative measurement tool based on the taxonomy of blended learning may be designed and evaluated. Furthermore, the suggested professional development plan may be tested with the case study institution as the next research step for the application of the findings of this study.

References

1. Bergman, L., *Supporting academic literacies: university teachers in collaboration for change.* Teaching in Higher Education, 2016. **21**(5): p. 516-531.
2. Enakrire Rexwhite, T. and N. Ocholla Dennis, *Information and communication technologies for knowledge management in academic libraries in Nigeria and South Africa.* South African Journal of Information Management, 2017. **19**(1): p. 1-9.
3. Chawinga Winner, D. and S. Zinn, *Use of Web 2.0 by students in the Faculty of Information Science and Communications at Mzuzu University, Malawi : original research.* South African Journal of Information Management, 2016. **18**(1): p. 1-12.
4. Pop, C. and R. Brink, *Repositioning Work-Integrated Learning in Diverse Communities*, in *Work-Integrated Learning in the 21st Century*. 2017, Emerald Publishing Limited. p. 115-128.
5. Shulman, L.S., *Those Who Understand: Knowledge Growth in Teaching.* Educational Researcher, 1986. **15**(2): p. 4-14.

6. Salloum, S.A., et al., *Factors affecting the E-learning acceptance: A case study from UAE.* Education and Information Technologies, 2019. **24**(1): p. 509-530.
7. Smuts, H. and C. Smuts, *Effective Blended Learning – A Taxonomy of Key Factors Impacting Design Decisions*, in *Innovative Technologies and Learning*, T.-C. Huang, et al., Editors. 2020, Springer International Publishing: Cham. p. 428-441.
8. Adegbenro, B.J. and T.M. Gumbo, *Exploring the conceptual relationship between teachers' procedural functional knowledge and pedagogical content knowledge.* South African Journal of Higher Education, 2015. **29**(5): p. 29-47.
9. Maree, K. *How to Fix the Gap between School and Work in South Africa. Retrieved from The Conversation: https://theconversation.com/how-to-fix-the-gap-between-school-and-work-in-south-africa-130077*. 2020.
10. Newton, D. *Education Innovations That Could Change The World. Retrieved from Forbes: https://www.forbes.com/sites/dereknewton/2019/11/15/a-hundred-education-innovations-that-could-change-the-world/#2209e3dc634c*. 2019.
11. Gibson, R.T., *The experiences of high school English Home Language educators in preparing and delivering e- learning lessons to Further Education and Training (FET) learners: a qualitative study.* 2019, University of KwaZulu Natal: Pietermaritzburg.
12. Sangrà, A., D. Vlachopoulos, and N. Cabrera, *Building an inclusive definition of e-learning: An approach to the conceptual framework.* The International Review of Research in Open and Distributed Learning, 2012. **13**(2): p. 145-159.
13. Protsiv, M. and S. Atkins, *The experiences of lecturers in African, Asian and European universities in preparing and delivering blended health research methods courses: a qualitative study.* Global Health Action, 2016. **9**(1): p. 20-49.
14. Garrison, D.R. and H. Kanuka, *Blended learning: Uncovering its transformative potential in higher education.* The internet and higher education, 2004. **7**(2): p. 95-105.
15. Basal, A., *The implementation of a flipped classroom in foreign language teaching.* Journal of Distance Education, 2015. **16**(4): p. 28-38.
16. Conole, G., *E-Learning: The Hype and the Reality.* . Journal of Interactive Media in Education, 2004. **2**(21): p. 1-18.
17. Tavangarian, D., et al., *Is e-Learning the Solution for Individual Learning?* Electronic Journal of e-Learning. **2**(2): p. 273-280.
18. Gedik, N., E. Kiraz, and M. Ozden, *The Optimum Blend: Affordances and Challenges of Blended Learning For Students.* Turkish Online Journal of Qualitative Inquiry, 2012. **3**: p. 102-117.
19. Schneider, M. and E. Stern, *The developmental relations between conceptual and procedural knowledge: A multimethod approach.* American Psychological Association, 2010. **46**(1): p. 178-192.
20. Mishra, P. and M.J. Koehler, *Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge.* Teachers College Record, 2006. **108**(6): p. 1017–1054.
21. Ma, X., et al., *The teaching of Chinese as a second or foreign language: a systematic review of the literature 2005–2015.* Journal of Multilingual and Multicultural Development, 2017. **38**(9): p. 815-830.
22. McGrail, E., *Laptop Technology and Pedagogy in the English Language Arts Classroom.* Journal of Technology and Teacher Education, 2007. **15**(1): p. 59-85.
23. Lambert, J. and P. Cuper, *Multimedia Technologies and Familiar Spaces: 21st Century Teaching for 21st Century Learners.* Contemporary Issues in Technology and Teacher Education, 2008. **8**(3): p. 264-276.
24. Amin, S., *An effective use of ICT for education and learning by drawing on worldwide knowledge, research and experience: ICT as a change agent for*

education (A Literature review). Scholarly Journal of Education Vol. 2(4), pp. 38-45, April 2013, 2013. **42**: p. 38-45.

25. Hennessy, S., D. Harrison, and L. Wamakote, *Teacher factors influencing classroom use of ICT in sub-Saharan Africa.* Itupale Online Journal of African Studies, 2010. **2**: p. 39-54.
26. Flanagan, S., *Two Teachers' Technology Use: Recommendations for English Teacher Preparation*, in *Society for Information Technology & Teacher Education International Conference 2011*, M. Koehler and P. Mishra, Editors. 2011, Association for the Advancement of Computing in Education (AACE): Nashville, Tennessee, USA. p. 3727-3735.
27. Hedgcock, J. and D. Ferris, *Teaching readers of English: Students, texts, and contexts*. 2018: Routledge.
28. Al-alak, B.A. and A.M.A. Ibrahim, *Measuring the Acceptance and Adoption of E-Learning by Academic Staff.* Knowledge Management & E-Learning, 2011. **3**(2): p. 201-221.
29. Azarfam, A.Y., & Jabbari, Y. , *Dealing with teachers' technophobia in classroom.* Advances in Asian Social Science, 2012. **2**(2): p. 452-455.
30. Leximancer. *Leximancer User Guide. 2020. Available online: https://info.leximancer.com/ (accessed on 2 July 2021).* [cited 2021 July].
31. Vaismoradi, M., H. Turunen, and T. Bondas, *Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study.* Nursing & Health Sciences, 2013. **15**(3): p. 398-405.
32. Alhojailan, M.I., *Thematic Analysis: A Critical Review of its Process and Evaluation.* West East Journal of Social Sciences, 2012. **1**(1): p. 39-47.
33. Leedy, P.D. and J.E. Ormrod, *Practical Research: Planning and Design*. 12th Edition ed. 2018: Pearson.
34. Smith, A.E. and M.S. Humphreys, *Evaluation of unsupervised semantic mapping of natural language with Leximancer concept mapping.* Behavior Research Methods, 2006. **38**(2): p. 262-279.
35. Wilk, V., G.N. Soutar, and P. Harrigan, *Tackling social media data analysis.* Qualitative Market Research: An International Journal, 2019. **22**(2): p. 94-113.
36. Kim, D. and S. Kim, *Sustainable Supply Chain Based on News Articles and Sustainability Reports: Text Mining with Leximancer and DICTION.* Sustainability, 2017. **9**(6): p. 1008.
37. Smuts, H. and C. Smuts. *Effective Blended Learning – A Taxonomy of Key Factors Impacting Design Decisions*. in *Innovative Technologies and Learning*. 2020. Cham: Springer International Publishing.