New Trends in Qualitative Research

(cc) BY-NC-ND

VOLUME 21 | Nº 2

DOI:
https://doi.org/10.36367/ntqr.21.2.2025.e991

Charlotte Dineo Shirindi

Nokulunga Sithabile Ndlovu

Submission date: March, 2024
Review date: September, 2024
Publication date: May, 2025

CONNECTIVIST LEARNING IN THE SOUTH AFRICAN TECHNOLOGY RICH SCHOOLS

ABSTRACT

The South African education policy, the Curriculum Assessment Policy Statement (CAPS) envisions the utilisation of ICTs for teaching and learning in all subjects and yet, it is silent on the pedagogical approaches to be employed by teachers, to achieve their learning outcomes using ICTs. In this multiple case study, focus was on four Grade 8 Technology teachers teaching in technology rich (Full ICT) schools in one of the provinces, Gauteng. It sought to understand how they created opportunities for learners to acquire the desired network society skills, to solve real-life or authentic problems and thus prepare them for meaningful participation in the global world. The Guided Blended Connectivist Learning (GBCL) Framework was developed and used to analyse data from teacher interviews, lesson observations, lesson plans and social media. Coding (thematic analysis) was used to analyse data. The literature reviewed reveals constraining factors inherent in the utilisation of ICTs in the South African context, which negatively impact the development of Learner Network Society Skills (LNSS). These include lack of access to connectivity, classroom management skills in the context of ICTs, lack of ICT devices by most learners, inadequate ICT teacher training and support. However, the findings reveal that the Technology teachers in the participating schools shied away from a mechanistic application of existing models and customised teaching and learning approaches to suit their context. Accordingly, teacher professional development programmes should be guided by research findings such as this, to design and equip teachers with appropriate ICT pedagogical skills for the benefit of the achievement of curriculum goals, in the context of utilising ICTs.

Keywords
Connectivism, Network Society Skills, Blended Learning, Modelling.

1. Introduction

Connectivist learning (CL) is derived from connectivism, the learning theory of the digital age; wherein knowledge flows through connections between information sources such as individuals, groups, communities, and non-human resources (Siemens, 2005; Kizito, 2016 and Shrivastava, 2018). It propagates for the utilisation of a variety of technologies to learn in complex, information loaded environments, through self-regulation, orientation and pattern recognition (Wang et al., 2014). Thus, connectivist learning (CL) calls for building and maintaining networks which connect individuals to other humans and non-human appliances (Siemens, 2005). In other words, CL actualises learning in the network society.

Castells (2004) describes a network society as a community (of individuals and or organisations) whose structure is made of interconnected nodes, powered by the internet; to share information anytime, anywhere to serve different purposes. It expands communication and collaboration among people, to facilitate economic, social and political relationships globally. The prerequisite for participation in the network society is the utilisation of the internet, which facilitates the acquisition of internet skills (henceforth referred to as the learner network society skills (LNSS) in the context of this study). Such skills not only include the ability to operate and access information on the internet, but include engagement with programs, communication and collaboration with people, as well as making informed decisions, to achieve a specific goal (Van Deursen, 2010). As an ICT, the internet plays a role in expanding interactions, to address human needs (Castells, 2004).

Based on the above, LNSS may not be confined to using the internet to access information. Instead, utilisation should also include engagement with programs, collaboration, discussions, as well as making informed decisions, to realise a specific goal (Van Deursen, 2010). This accentuates the need for pedagogical practices that advance the development of LNSS (DBE, 2004).

Although acclaimed by some scholars, CL is not completely suitable for the South African schooling sector, as it advances independent learning with internet (Siemens, 2005; Siemens, 2011). Whereas learning in the schooling context is dependent on guidance by the teacher, as many learners, particularly at lower levels may lack the higher order thinking skills required, such that learning across all the cognitive levels and the eventual acquisition of the LNSS could be a challenge for them. Hence, Wang et al. (2014) and Kizito (2016) find it suitable for distance learning and at university level. Connectivism has been adapted in this paper, to accommodate the schooling environment.

2. Research Background

In the context of this study, the Technology-rich schools include the new schools built from 2015, schools that obtain 100% Matric pass rate, Schools of Specialisation (SoS), as well as the Twinning Schools (TS) in Gauteng, one of the nine provinces in South Africa (GDE, 2019). The data was collected in these schools, referred to as the full ICT schools in October 2021 and the research process was concluded in October 2024. All teachers and learners across all grades have been provided with ICT training and resources, which include, connectivity, digital content in the LED Boards, teacher laptops and learner tablets.

However, there are constraining factors that negatively impact the development of LNSS in the utilisation of ICTs in South Africa. These include lack of access to connectivity, classroom management skills in the context of ICTs, lack of ICT devices by most learners, inadequate ICT teacher training and support, as well as Departmental prescripts (Minty, 2020; Msiza et al., 2020; Masango et al., 2022 and Dlamini, 2022).

This research responds to the following:

Research Question:

How does teaching Grade 8 Technology in the Gauteng Full ICT schools create opportunities for learners to utilise the available ICT resources to acquire network society skills?

Research Objective

To determine how teachers purposefully plan to utilise the available ICT resources to promote the acquisition of LNSS.

3. Theoretical Framework

This study combines the pedagogical approaches that facilitate the development of LNSS in the South African context. As a result, it has modified connectivism and developed the Guided Blended Connectivist Learning (GBCL) Framework, to understand the development of desired skills through blended learning and guidance by the teacher. Blended learning is defined as an approach to learning that combines face-to-face teaching with online learning (Senturk, 2021). Guided learning involves the teacher initially modelling the target skill, providing support, and gradually reducing that support as learners gain competence (Bandura, 1986, as cited in Schunk, 2012).

The framework incorporates Siemens' (2011) Four Levels of Interaction in Connectivist Learning (CL) with Hurley and Chater's (2005) Modelling Instructional Strategy, Puentedura's (2009) Substitution Augmentation Modification Redefinition (SAMR) Model and Laurillard' s (2012) six learning types as contributors to the aspects relevant to this study.

The four levels of interaction in CL include: operation, wayfinding, sensemaking and innovation interaction. In addition, modelling strategy enabled the identification of teaching and learning activities that guide the development of the LNSS in a traditional classroom. Puentedura's (2009) four levels of learning have been woven into CL, to accommodate blended learning in the participating schools. Importantly, the SAMR model in figure 1 below, not only enhances the understanding of concepts; but also includes the acquisition of higher order thinking skills, to apply the knowledge and skills acquired through collaborative learning, to solve real life problems (Shouman and Momdjian, 2019; and Aldosemani, 2019; Rehman and Aurangzeb, 2021).

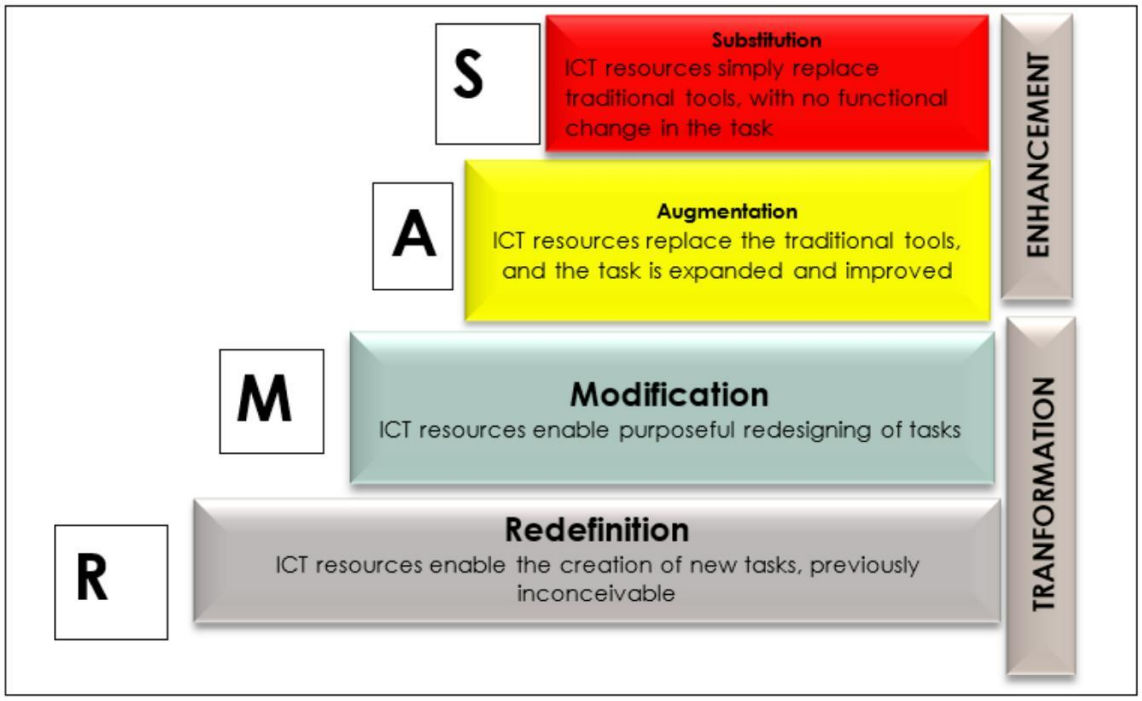


Figure 1. Adapted from Shouman and Momdjian, 2019; and Aldosemani, 2019; Rehman and Aurangzeb, 2021

It is worth highlighting at this point that the combination of the four models infuses Anderson and Krathwolh's (2001) and Churches's (2008) cognitive levels, to facilitate the understanding of concepts and the eventual acquisition of the LNSS in GBCL.

Table 1 below presents the analytical framework for this study, which helped to organise the teaching and learning activities in the development of LNSS, as well as identify these during the data collection process.

Table 1. Guided Blended Connectivist Learning

Connectivist Learning	Six Learning Types	Learner Network Society Skills
4. Innovation Interaction • Redefinition • Modification	**6. Production/ Digital Authoring** Create and share learning artefacts, present new ideas, solutions, theories, products and models on the open network, where they remain persistent upon completion.	**Online Creation** Designing, constructing, producing, inventing, devising, animating, remixing, podcasting, directing, broadcasting, planning, producing, inventing, devising, making, create and edit a video, transform written tasks to visual form, material development, content creation, use multimodal media to create sophisticated products, decision making, teamwork/ collaboration, compile presentations, producing and representing knowledge, reference appropriately, insert text, pictures, audio material and videos into assignments/ presentations,
3.4. Sensemaking Interaction • Augmentation	**5. Discussion** Through synchronous and asynchronous groups/ forums, bring together ideas from the knowledgeable others, to gain clear understanding of information.	**Online Evaluation** Posting, critiquing, checking, blog commenting and reflecting, tagging, inferring, networking, judging, moderating, monitoring, reviewing, receive written and verbal comments digitally, decision making, teamwork, collaboration
3.3. Sensemaking • Augmentation	**4. Collaboration** Collaborate with others synchronously or asynchronous in online discussion groups with digital and production tools (i.e. Open Education Resources) to facilitate learning.	**Online Collaboration** Blog journaling, Twittering, commenting, annotating, subscribing, share work digitally through a blog, send and receive work through any app to and from the teacher and peers, receive written and verbal comments digitally, teamwork/ collaboration
3.2. Sensemaking • I do, We do, You do Modelling Instructional Strategy • Modification	**3. Practice** Operate different media (design tools, digital simulation, games, assessment tools, analytical tools, learning analytics) to demonstrate learning.	**Online Practice** Implementing, carrying out, using, executing, downloading, uploading and sharing, editing, playing, hacking, insert text, pictures, audio material and videos into assignments/ presentations, complete task through an appropriate app, submit completed digital work, send and receive work through any app to and from the teacher and peers, share work digitally through a blog
3.1. Sensemaking • I do, We do, You do Modelling Instructional Strategy • Modification	**2. Acquisition** Use of multimedia content (text, images, audio, video, multimedia, amination, augmented reality and virtual reality) to enhance the understanding of concepts.	**Online Acquisition** Describing, interpreting, summarising, paraphrasing, classifying, comparing, inferring, outlining, explaining, exemplifying, hypothesize
2. Wayfinding Interaction • I do, We do, You do Modelling Instructional Strategy • Substitution	**Inquiry 2: Advanced Web Searching** Navigate through complex and information loaded environments with landmarks, symbols and environmental cues, to find relevant information and people directly	**Advanced searches** Refine searches to suit needs, using features of the advanced search: domain, country, language, file type, location in page. Enters appropriate keywords or phrases **Boolean Searching** Enter multiple appropriate keywords with Boolean refinements "and" or "not". Modify keywords to refine the searches, categorising and tagging
1.Operation Interaction • I do, You do, We do Modelling Instructional Strategy • Substitution	**Inquiry 1: Web Searching** Practice and recall how to operate different media to obtain information, combine and filter content from different digital social networks.	**Remembering** Searching, googling, recognising, identifying, finding, retrieving, locating, bullet pointing, highlighting, bookmarking, social networking, social bookmarking, favouriting/ local bookmarking, save resources, access and use multimedia content, receive tasks electronically, submit completed digital work, record and replay spoken words, receive written and verbal comments digitally, receive tasks electronically, work independently

Source. Adapted from Anderson and Krathwolh, 2001; Hurley and Chater, 2005; Churches, 2008; Puentedura, 2009; Siemens, 2011; Laurillard, 2012; Wang et al., 2014; Drennan & Moll, 2018; Shouman and Momdjian, 2019; Aldosemani, 2019; Rehman and Aurangzeb, 2021.

The four levels of interaction in CL in the first column are used to group the possible teaching and learning activities in the utilisation of ICT resources during the anticipated GBCL. The language used in column 2 is adopted from Laurillard' s (2012) description of learning activities and the use of the available ICT resources to develop LNSS. The action verbs or phrases used in column 3 depict the LNSS to be developed across the different cognitive levels (Anderson and Krathwohl, 2001; Churches, 2008 and Drennan and Moll, 2018).

4. Methodology

This qualitative study is framed within the interpretivist paradigm and seeks to understand the meanings Technology teachers assign to their practices and experiences in using available ICT to support the development of Learner Network Social Skills (LNSSs). An inductive approach guided the inquiry, allowing the researcher to generate insights that are theory grounded in the data (Linneberg & Korsgaard, 2019).

Purposive sampling was used to select four South African Grade 8 Technology teachers from four Gauteng Province Full ICT Schools (technology-rich schools) to determine how they develop Learner Network Social Skills (LNSSs) through the integration of ICTs in their teaching. Given the research focus, this sample has a high likelihood of reaching data saturation and is appropriate for a descriptive case study design (Aguboshim, 2021). It is also, supported by rich data from interviews, observations, and document analysis, which together provide sufficient insight into the phenomenon under investigation (Mthuli, Ruffin and Singh, 2022). Grade 8 marks the entry point into secondary schooling, where Technology teachers play a critical role in equipping learners with the foundational knowledge, skills, and values necessary to make informed, career-oriented subject choices by the end of Grade 9. Within this context, it is important to examine how these teachers employ contemporary teaching methods that align with the demands of a knowledge-based and technology-driven society which are conditions that are central to the connectivist learning framework.

Data collection involved semi-structured interviews with teachers to explore their understanding of teaching Technology, the design of web-based activities, and whether they intentionally plan for LNSS development. In addition, the researcher conducted classroom observations and examined lesson plans to triangulate data from multiple sources.

Thematic analysis was used to identify recurring patterns and meanings related to the research question: How does teaching Grade 8 Technology in the Gauteng Full ICT schools create opportunities for learners to utilise the available ICT resources to acquire network society skills?

A combination of conceptual and data-driven codes was employed during analysis (Gibbs, 2007). Conceptual codes were derived from the literature review, while data-driven codes emerged from interview transcripts, field notes, and documents.

The analysis followed six interconnected stages: familiarisation, theme construction, indexing, data summarisation, mapping, and interpretation, culminating in a narrative that addressed the research question (Maguire & Delahunt, 2017; Hackette and Strickland, 2018).

To ensure the validity of the analytical tool, three experts in educational technology, each with at least a Master's degree and five years of experience, assessed the tool using face validity criteria (accuracy, agreeability, and relevance) (Thomas et al., 1992). The tool, which included five domains of skills acquisition and knowledge progression, underwent both face and content validity analysis, yielding a content validity index of 0.76 based on expert agreement. Regarding reliability, two of the three experts observed different Technology classes using the analytical tool. They reported consistent findings, affirming the tool's stability and reliability in measuring LNSS-related instructional practices (Taherdoost, 2016). Ethical considerations were rigorously observed throughout the study. Prior to data collection, ethical clearance was obtained from the relevant institutional review committees. Informed consent was granted by both the participating schools and individual teachers, who were assured of confidentiality, anonymity, and their right to withdraw at any time. All data were securely stored and used solely for research purposes in line with ethical research standards.

5. Results

The analysis of data collected from the four Technology teachers in the Full ICT schools in Gauteng revealed some level of consistency between their espoused and enacted practices in the development of the LNSS. This is consistent with Ertmer (2005) who posit that the teacher's pedagogical beliefs influence their enacted practices in the teaching and learning situation. For example, when asked during the interviews, "How do you utilise the Teacher ICT resources available in your classroom to guide learning and the acquisition of the desired ICT skills?" Teacher 2 responded,

I use the Laptop along with HDMI, so that learners can see what I am doing. For example, demonstrate to learners how to draw an object. I also demonstrate to learners how to get information from their Google Drive. Then learners do it on their own from their tablets. They are also shown how to navigate the platform to obtain, videos, notes, classwork/homework, and School Based Assessment Tasks.

The classroom activities of all teachers in this study evolved around what is presented in the extract above. This entailed modelling how to access multimedia content on the internet and creating opportunities for learners to operate ICT resources and recall what they have observed.

For instance, figure 2 and 3 below depict teacher 2 demonstrating to learners how to access multimedia content on YouTube and creating opportunities for learners to engage in different forms of interactions, to gather information, aggregate the information, share, discuss, reflect and make informed decisions, to solve the problem identified.

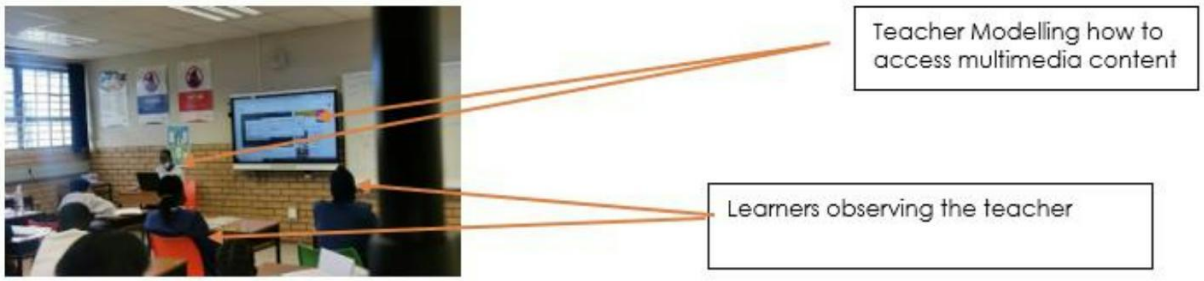


Figure 2. Modelling by the teacher

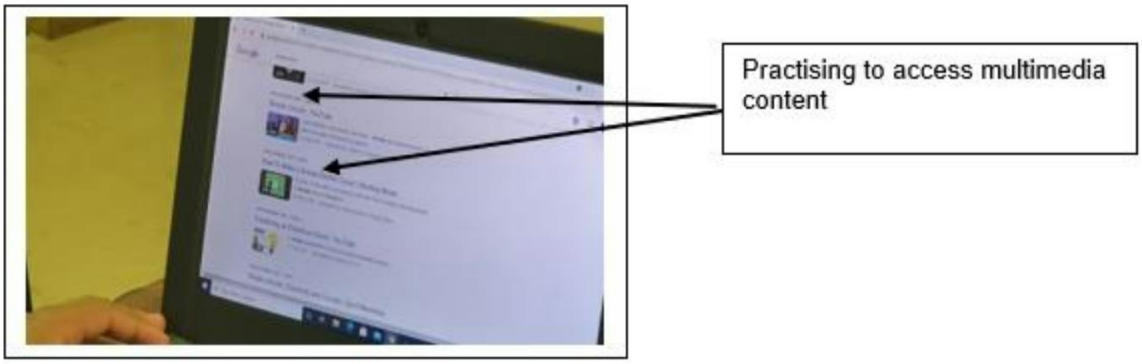


Figure 3. Practice by the learner

Notably, when teachers were asked, "What web resources do learners utilise to obtain information, communicate and collaborate with others, to solve the problem or address the need identified?" They indicated:

Teacher 1, "They use WhatsApp Groups and Google Cloud. For example, to remind each other of what the teacher said in class, share videos. Certain learners learn better from their peers. They teach each other through WhatsApp Group and share information. For collaboration, learners are given homework. Groups are formed to enable learners to share information, in responding to the task provided".

Teacher 2, "They use WhatsApp and Google Cloud to collaborate. They discuss their ideas, send pictures, videos, for the compilation of their PowerPoint Presentations".

Teacher 3, "Learners access the activities that they have to do from Google Classroom. For example, classwork activities, homework and memoranda. They also make videos and upload them on the Google Classroom. For example, they draw and make an advert on paper and then upload it on the Google Classroom".

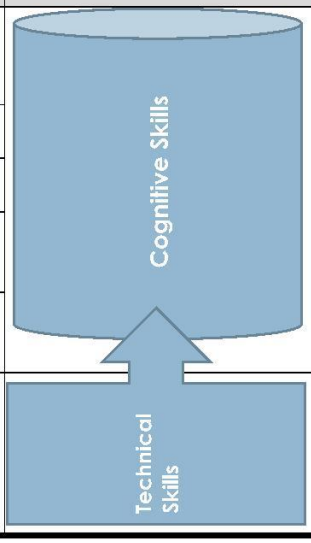
Teacher 4, "Learners use WhatsApp only when they communicate and share information with others. Learners voluntarily communicate with others".

In essence, the results reveal the development of LNSS across the four levels of CL in the Gauteng full ICT schools. However, this is not compulsory, as indicated by teacher 4. This could be taking into consideration the socio-economic contexts that these teachers encounter.

6. Discussion

This section zooms into the emerging features in the development of LNSS in the Gauteng full ICT schools, in response to the research question, How do Grade 8 Technology teachers in full ICT schools create opportunities for learners to utilise available ICT resources, to develop learner network society skills? The use of GBCL as a lens in the analysis of data gave insight into CL in the South African schooling context, as depicted in table 3 below, emanating from table 1 of the theoretical framework.

Table 2. Three Levels of Guided Blended Connectivist Learning

Levels of Connectivist Learning	Six Learning Types	Learner Network Society Skills	Technical & Cognitive Skills
3. Innovation Interaction Redefinition • Creating	6. Production/ Digital Authoring	Online Creation	
2. Sensemaking Interaction Modification Augmentation • Evaluating • Analysing • Applying • Understanding I do, You do, We do Modelling Instructional Strategy	5. Discussion	Online Evaluation	
	4. Collaboration	Online Collaboration	
	3. Practice	Online Practice	
	2. Acquisition	Online Acquisition	
1. Operation Interaction Substitution • Web Searching I do, You do, We do Modelling Instructional Strategy	1. Inquiry (Practice and recall how to operate different media)	Web Searching	

Source. (Anderson and Krathwolh, 2001; Churches, 2008; Puetendura, 2009; Siemens, 2011 and Laurillard, 2012)

At operation and wayfinding interaction level, the use of ICTs simply substitutes the traditional methods to teaching and learning (Puentedura, 2009). The teacher explains and models to learners how to operate different media, to access multimedia content (Hurley and Chater, 2005). Learners learn by observing, practising and recalling how to operate different media.

At sensemaking interaction level, the GBCL framework employs Puentedura's (2009) augmentation to promote coherent understanding with multimedia content, information sharing, aggregation, discussion, negotiation, reflection and decision making (Laurillard, 2008; Siemens, 2009 and Wang et.al., 2014). Importantly, sensemaking could be reinforced through Laurillard' s (2012) acquisition, practice, collaboration and discussions.

In essence, acquisition entails the utilisation of multimedia content such as text, pictures, videos, illustrations, diagrams, animation, augmented reality and virtual reality, to enhance learner's understanding of concepts (Laurillard, 2012). While at practice level, the teacher is required to create opportunities for learners to engage with digital tools. This could include the use of design tools, digital simulation, games, assessment tools, analytical tools and learning analytics, to promote deep learning. Collaboration on the other hand enables bringing together concepts from different domains, to further enhance the understanding of information, to make informed decisions (Siemens, 2009). Discussions could be facilitated through extending teaching and learning activities to online asynchronous or synchronous groups, promote negotiation of ideas, reflection and adaptation (Neo et al., 2013).

Lastly, the innovation level combines Puentedura's (2009) modification and redefinition levels. The former presents alternative ways for learning that would not be easily accomplished without the use of ICTs. The latter facilitates innovative application of the ideas obtained through collaboration and discussions social media to new contexts, to solve real-life problems. In that way, learners build and present new ideas and products online, where they remain persistent. These could be in the form of drawings, objects, models, written work, audio and visual learner performance, or anything created by learners during collaboration and discussions online (Laurillard, 2012; Wang et al., 2014; Laurillard and Kennedy, 2017). Learners then become selectors of the content, collaborators and creators of content to solve real-life problems (Neo et al., 2013). It is at this point where the teacher provides fading support, allows learners to work independently and showcase the LNSS acquired.

In the main, GBCL provides a broad range of resources and takes into consideration that the ICT resources provided in schools are required to support teaching and enhance learning in a wide range of socio-economic contexts that teachers encounter in South Africa.

7. Recommendation

For learners to acquire the desired ICT skills and cognitive skills, learning experiences should be extended beyond the classroom, especially where limited resources are a challenge. While schools in the research context may not allow the use of smartphones in the classroom, learning activities such as those recommended by Laurillard, 2012) can help learners develop desired LNSSS in Technology. In addition, the availability of data, connectivity and the capacity building of teachers have emerged as key levers in the development of LNSS in the Gauteng Full ICT schools (Minty, 2020; Msiza et al., 2020; Masango et al., 2022 and Dlamini, 2022). There is a need to extend this study to other subjects in the South African school curriculum. The findings can provide teachers with requisite skills to prepare learners for the changing world in their respective subjects.

8. Limitations

Although the sample of the study can be considered as small to arrive at the conclusions made and generalizable to the broader population, the criteria for the selection of the participants were informed by the study's intentions (Islam and Aldaihani, 2022). The researcher attempted to pay attention to every small detail to establish if the participants were indeed what the study required: to get the best possible teaching and learning practices in the development of LNSS.

9. Contribution to the development of qualitative research

The detailed application of the GBCL framework in this study contributes not only to the field of Technology education, but also to advancements in qualitative research. It highlights the value of developing a comprehensive analytical framework grounded in relevant theoretical perspectives. While classroom observations present challenges due to the complexity of teaching environments, they remain essential for improving practice. The methodology adopted in this study proved effective in capturing meaningful data and achieving the research objectives.

10. Conclusion

The developed framework (GBCL) heightens the relevance of guided blended learning as a teaching and learning strategy, to accommodate resource-constrained environments, to help learners achieve their outcomes, through the utilisation of the available ICT resources (Fawns, 2019; Fawns, 2022). Therefore, the role played by the teacher in guiding and supporting the development of the LNSS is essential and thus contributing positively to the attainment of the e-Education mandate (DBE, 2004).

In this respect, it is very important that pedagogy is designed in a way that provides rich opportunities to develop LNSS. In this regard, it is vital that teachers shy away from a mechanistic application of existing models and customise teaching and learning approaches to suit the learners' context (Aghardien, 2023). This will have a positive influence in the learners' academic achievement, to realise their personal goals. Importantly, the acquisition of the LNSS required to be full participants in the global economy (DBE, 2004).

Ethical Approval: Ethical approval was obtained from the University of Witwatersrand, South Africa, Human Research Ethics Committee (Non-Medical). Clearance Certificate Protocol Number: H21/08/32.

Informed Consent: Informed consent was obtained from all participants involved in the study, ensuring respect for confidentiality and voluntariness principles.

Declaration of Conflicts of Interest: The authors declare that there are no conflicts of interest regarding the research, authorship, and/or publication of this article. The material is part of a thesis submitted in October 2024. However, the article is not currently under consideration for publication in any other journal. All authors were personally and actively involved in the work that led to this article and take responsibility for its content. All ethical standards regarding the protection of study participants were met, in accordance with the Human Research Ethics Committee (Non-Medical) of the University of Witwatersrand.

Funding: The research reported was submitted through participation in the World Conference on Qualitative Research (WCQR) Congress. As one of the invited articles from the conference, it has been exempted from publication fees.

11. References

Agherdien, N. (2023). Enacting criticality and care. [Special Issue], Cristal Studies in Teaching & Learning, 11(1), 39-49. https://doi.org/10.14426/cristal.v11iSI.627

Aguboshim, F. C. (2021). Adequacy of sample size in a qualitative case study and the dilemma of data saturation: A narrative review. World Journal of Advanced Research and Reviews, 10(3), 180-187.

Aldosemani, T. (2019). Inservice teachers' perceptions of a professional development plan based on SAMR model: A case study. Turkish Online Journal of Educational Technology, (18)3, 46-53.

Anderson, L.W., & Krathwohl, D.R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives. Pearson Education Group, Allyn & Bacon.

Castells, M. (Ed.) (2004). The network society: A cross-cultural perspective. Edward Elgar.

Churches, A. (2008). Bloom's taxonomy blooms digitally. Tech & Learning, 1, 1-6. https://www.pdst.ie/sites/default/files/BloomDigitalTaxonomy-AndrewChurches.pdf

Dlamini, R. (2022). Factors constraining teacher integration of ICT in Gauteng schools. The Independent Journal of Teaching & Learning, 17(2), 28-43.

Drennan, G., & Moll, I. (2018). A conceptual understanding of how educational technology coaches help teachers integrate iPad affordances into their teaching. The Electronic Journal of eLearning, 16(2), 122-133.

Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology Integration? Educational Technology Research & Development, 53(4), 25-39. https://doi.org/10.1007/BF02504683

Fawns, T. (2019). Postdigital education in design and practice. Postdigital science and education, 1(1), 132-145.

Fawns, T. (2022). An entangled pedagogy: Looking beyond the pedagogy—technology dichotomy. Postdigital Science and Education, 4(3), 711-728.

Gauteng Department of Education. (2019, June 10). Education roadmap 2019 – 2024: A discussion document for consultation. https://www.gauteng.gov.za/Publications/PublicationDetails/B7DBCEF4-A0DE-4EEC-8AD6-7A9F13FECA1E

Gibbs, G.R. (2007). Thematic coding and categorising. In G.R. Gibbs (Ed.), Analysing qualitative data. SAGE Publications, Inc.

Hackette, A., & Strictland, K. (2018). Using the framework approach to analyse qualitative data: A worked example. Nurse Researcher, 26(2), 8-13. https://doi.org/10.7748/nr.2018.e1580

Hurley, S., & Chater, N. (2005). Perspectives on imitation: From neuroscience to social science. MIT Press.

Islam, M.A., & Aldaihani, F.M.F. (2022). Justification for Adopting Qualitative Research Method, Research Approaches, Sampling Strategy, Sample Size, Interview Method, Saturation, and Data Analysis. Journal of International Business and Management, 5(1), 1-11. https://www.researchgate.net/publication/357352896

Kizito, R.N. (2016). Connectivism in learning activity design: Implications for pedagogically based technology adoption in African higher education contexts. International Review of Research in Open Learning & Distributed Learning, 17(2), 19-39.

Laurillard, D. (2008). The teacher as an action researcher: Using technology to capture pedagogic form. Studies in Higher Education, 33(2), 139-154. https://doi.org/10.1080/03075070801915908

Laurillard, D. (2012). Teaching as a design science: Building pedagogical patterns for learning and technology. Routledge.

Laurillard, D., & Kennedy, E. (2017). The potential of MOOCs for learning at scale in the Global South. Working paper no. 31. Centre for Global Higher Education.

Linneberg, M.S., & Korsgaard, S. (2019). Coding qualitative data: A synthesis guiding the novice. Qualitative Research Journal, 19(3), 259-270. https://doi.org/10.1108/QRJ-12-2018-0012

Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical step-by-step guide for learning and teaching scholars. All Ireland Journal of Teaching and Learning in Higher Education, 7(3), 3351-33514.

Masango, M.M., Van Ryneveld, L., & Graham, M.A. (2022). A paperless classroom: Importance of training and support in the implementation of electronic textbooks in Gauteng public schools. The Electronic Journal of e-Learning, 20(3), 336-350.

Minty, R. (2020). The viability of teaching and learning mathematics using information and communication technologies (ICTs) in Gauteng paperless classrooms [PhD thesis, University of the Witwatersrand].

Msiza, G.M., Malatji, K.S., & Mphahlele, L.K. (2020). Implementation of an e-Learning project in Tshwane South District: Towards a paperless classroom in South African schools. The Electronic Journal of e-Learning, 18(4), 300-310. https://doi.org/10.34190/EJEL.20.18.4.003

Mthuli, S. A., Ruffin, F., & Singh, N. (2022). 'Define, Explain, Justify, Apply'(DEJA): An analytic tool for guiding qualitative research sample size. International Journal of Social Research Methodology, 25(6), 809-821.

Neo, M., Neo, K.T.K., & Lim, S.T.L. (2013). Designing a web-based multimedia learning environment with Laurillard's Conversational Framework: An investigation on instructional relationships. The Turkish Online Journal of Educational Technology, 12(3), 39-50.

Puentedura, R.R. (2009, February 04). As we may teach: Educational technology, from theory into practice. R. Puentedura's Weblog. Ongoing thoughts on education and technology. http://hippasus.com/blog/archives/25

Rehman, Z.U., & Aurangzeb, W. (2021). The SAMR Model and Bloom's Taxonomy as a framework for evaluating technology integration at university level. Global Educational Studies Review, VI(IV), 1-11. https://doi.org/10.31703/gesr.2021(VI-IV).01

Schunk, D.H. (2012). Learning theories: An educational perspective. 6th ed. Pearson.

Senturk, C. (2021). Effects of the blended learning model on preservice teachers' academic achievements and twenty-first century skills. Education and Information Technologies, 26, 35-48. https://doi.org/10.1007/s10639-020-10340-y

Shouman, D., & Momdjian, L. (2019). Deeper learning versus surface learning: The SAMR Model to assess e-Learning pedagogy. In R. Jallouli, M.A.B. Tobji, D. Bélisle., S. Mellouli, F. Abdallah & I. Osman (Eds.), Digital economy. Emerging technologies and business innovation. ICDEc 2019 (pp. 230-238). Springer.

Shrivastava, A. (2018). Using connectivism theory and technology for knowledge creation in cross-cultural communication. Research in Learning Technology, 26, 2061. https://doi.org/10.25304/rlt.v26.2061

Siemens, G. (2005). Connectivism: A learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2(1), 3-9.

Siemens, G. (2011). Orientation: Sensemaking and wayfinding in complex distributed online information environments [Doctoral dissertation, University of Aberdeen].

Taherdoost, H. (2016). Validity and reliability of the research instrument; How to test the validation of a questionnaire/survey in a research. International Journal of Academic Research in Management, 5(3), 28-36.

Thomas, S.D., Hathaway, D.K., & Arheart, K.L. (1992). Face validity. Western Journal of Nursing Research, 14(1), 109-112. https://doi.org/10.1177/019394599201400111

Van Deursen, A.J.A.M. (2010). Internet skills. Vital assets in an information society [Doctoral thesis, University of Twente].

Wang, Z., Chen, L., & Anderson, T. (2014). A framework for interaction and cognitive engagement in connectivist learning contexts. The International Review of Research in Open & Distributed Learning, 15(2), 121-141. https://doi.org/10.19173/irrodl.v15i2.1709

Charlotte Dineo Shirindi
Gauteng Department of Education, South Africa
https://orcid.org/0009-0001-4831-8769
✉ Charlotte.Shirindi@gauteng.gov.za

Nokulunga Sithabile Ndlovu
University of Witwatersrand, South Africa
https://orcid.org/0000-0003-3368-2880
✉ Nokulunga.Ndlovu@wits.ac.za