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► To cite this version:

Pius W. Akumbu, Patience Teneng, Sylvanus Ngu. Technological development and distance learning during disease outbreak in Cameroon: The COVID 19 experience. Justine Germo Nzweundji.; Pius W. Akumbu. Responding to disease outbreak in Cameroon: Lessons from COVID-19, 55, Rüdiger Köppe Verlag, pp.97-107, 2020, Topics in Interdisciplinary African Studies, 978-3-89645-855-1. hal-03691698

HAL Id: hal-03691698

<https://hal.science/hal-03691698>

Submitted on 1 Sep 2022

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Teachers' technological development and distance learning during disease outbreak in Cameroon: The COVID-19 experience

Pius W. Akumbu, Patience P. Teneng & Sylvanus W. Ngu

Abstract

COVID-19 set in at a time when governments and educational institutions were working towards providing quality, inclusive and continuous education in order to meet Sustainable Development Goal 4 (SDG 4). The outbreak of the pandemic ushered in lockdowns and the use of distance learning as a response mechanism. Although key actors, the level of technological development of a majority of teachers in sub-Saharan Africa is largely insufficient, preventing a successful implementation of distance learning during COVID-19 in this part of the world. An important question addressed in this study is whether the Cameroonian government and educational authorities have invested in training and equipping teachers to facilitate distance learning. This study used the descriptive approach, based on information collected through documentary research and interviews of educational authorities and teachers at all levels of education in the Far North Region of Cameroon. Content analysis was done and findings revealed existing but significantly insufficient technology measures taken by educational authorities to prepare teachers to successfully facilitate distance learning during COVID-19 and in the event of any other disease outbreak. Recommendations have been made to these authorities to ensure teachers' technological development in Cameroon.

1. Introduction

Efforts by the Cameroon government to achieve SDG 4 by 2030, and most particularly the 2035 vision of an emergent nation through education have suddenly received a setback from the COVID-19 pandemic. As a matter of fact, the outbreak of the pandemic in Cameroon led to the disruption of schools at all levels, in a similar way it did in over 190 countries in all continents. UNESCO estimates as of April 2020 counted about 1.6 billion children and youths who were out of school, whereas approximately 91% of those enrolled in formal education programs were affected (UNESCO 2020).¹ In Cameroon, a Prime Ministerial order of March 18, 2020 ordered the closure of 31,851 schools with over 7 million children and youths of school age affected. Some 4,200 community learning centers have also been closed across the national territory in an attempt to contain the spread of COVID-19 (WHO 2020).²

As elsewhere in the world, the Cameroonian government and educational authorities have opted for distance learning to continue providing quality, inclusive and continuous education in

¹ <https://en.unesco.org/courier/2020-3/education-unprecedented-crisis>. Accessed on November 6, 2020.

² <https://www.who.int/home>. Accessed on November 6, 2020.

order to meet SDG 4. For this to happen effectively, the input of teachers, who remain the crucial driving force of education at all times, is required. However, the current context differs significantly from what obtained before the COVID-19 era. The COVID-19 context has imposed a new normal where by traditional learning has almost completely shifted to online learning Dhawan (2020). A shift which requires teachers to follow suite. Unfortunately, the low level of appropriation of digitalization by Cameroon teachers pointed out by Josué (2007), Mbangwana (2008), Fonkoua (2009), Ndongfack (2015), Ndjebakal & Teneng (2017), Béch  (2013, 2017), and Karsenti (2009) poses the challenge of their preparedness to facilitate distance learning. The question this study seeks to address is to what extent are Cameroon teachers at all levels of education prepared to cope with COVID-19 classrooms? The study considers the current state of teachers' skills in online education resulting from basic training, continuous training and experience at the work place, and how these are useful during the COVID-19 era. It further examines individual efforts by teachers themselves to develop online education skills to cope with COVID-19 classrooms. It also surveys the measures put in place by the Cameroon government and educational authorities to develop teachers' skills to allow them cope with distance learning not just during COVID-19 but at all times especially in the event of other disease outbreaks.

This study adopted a qualitative approach, with data collected from two main sources. The first was documents on the COVID-19 situation and measures taken by the state and the second source was interviews. The purposive sampling technique was used to select teachers from randomly picked practicing primary schools, Vice Principals of secondary schools, a Principal of a teacher training college, and Heads of Departments at the University of Maroua all in the Far North Region of Cameroon. Due to the prevailing COVID-19 context, we interviewed only 15 participants, i.e. 03 primary school teachers, 07 secondary school teachers and 05 University lecturers. The interview had three key components which were the state of online education skills by teachers, the degree of state intervention, and individual efforts by teachers. All was aimed at uncovering measures by the state to prepare teachers for emergency situations such as COVID-19, specifically verify the distance learning skill levels as well as measures for self-preparedness. Data were analyzed with the help of simple content analysis.

This chapter is organized as follows: In the next section we examine the current state of distance learning in Cameroon, then consider the role of ICTs in education in section 3, the presence of android devices in schools in section 4. In section 5, we present and discuss the results of our survey, make recommendations in section 6 and provide a conclusion in section 7.

2. The evolution of ICT in education in Cameroon

In the age of unparalleled digital evolution in education, it was only in 2001 that ICT was officially launched into the school curriculum in Cameroon by the president of the republic. This saw the arrival of the cyber education project which targeted the secondary and higher education sectors (Josué 2007). Since then, multimedia resource centers have gradually opened in almost all state universities, while secondary schools and teacher training colleges are progressively receiving funding to open these centers. Despite this, few computer technicians have been trained, while insufficient online learning platforms have been created in schools at all levels. In this light (Karsenti 2009) asserts that the level at which secondary schools in Cameroon integrate ICT in

the learning process is worryingly insufficient. These writers explain that not only do schools own insufficient and obsolete computers, but that school managers and teachers lack satisfactory practical knowledge on how to manipulate a computer, yet you find them teaching the parts of a computer and how to manipulate a computer in the classrooms simply based on textbook knowledge.

However, this lukewarm culture toward the pedagogic integration of ICTs is long old Karsenti et al. (2011). Reasons for this include the absence of a vibrant educational technology policy (Djemeni 2010), non-appropriation of educational technologies, Béch  (2013, 2017, 2020), lack of up-to-date computer equipment or adequate multimedia rooms, and a significantly weak telecommunication environment (absence of strong and high speed internet connection). How can Distance learning succeed under such conditions? in this light, the former UN Secretary General, Kofi Annan, at the world summit on information societies in Tunis in 2005 and at the University of Nairobi in 2006, pointed out with dissatisfaction, the low pace at which African countries were embracing technology. He re-emphasized the unprecedented benefits of technology in developing African economies. In like terms, the former US President, Barack Obama, pointed out that Kenya and south Korea were on the same economic development index 40 years back, but that the Korean economy became 40 times better off than Kenya as of 2006, thanks to their full engagement in technology. This is true for Cameroon as Fonkoua (2009) corroborates this line of argument when he notes that a study carried out by *L'Union Internationale des Telecommunication* in 2008 revealed that 93% of countries with a significant technology culture comes from Asian-pacific and the Americas, whereas Oceanic and African countries, in which Cameroon falls, still register very low adherence to Technology.

However, it has been over a decade of technological advancement, most particularly in the domain of education. The recommendations made by Fonkoua (2006) all focused on the relevant training of secondary and tertiary education teachers in Educational Technologies, and most particularly in blended learning. Although implemented only partially and slowly, his findings have significantly planted the d cor for policy-reforms, curriculum, and research in online education in Cameroon. He insisted on the urgent need for the education system to engage in the training, firstly of teachers, then, allow for the rest to follow in the required order. Fonkoua (2006) anticipated days like today as he predicted an inevitable future of video-pedagogy, interactive white board, and total online pedagogy where teachers will have limited face-to-face contact with learners, and that learners will be very fortunate to follow classes effectively, no matter where and when they find themselves. Thus, the question of human resources in Educational Technology is becoming more acute, like that of digital hardware, software, and internet infrastructures in online education. The present study investigates distance education preparedness by teachers and argues that there is urgent need to prepare teachers with online education skills that will allow them to facilitate learning during COVID-19 in particular and in situations of disease outbreak in general.

3. Current state of distance learning in Cameroon: Where do teachers stand?

The framework for measuring teachers' skills and engagement in the pedagogic integration of ICT have received considerable research, e.g. Rogers (1995), Traor  (2008), Tchombe (2009), B ch  (2020). In this light, Rogers identifies five categories of teachers with various levels of

techno-pedagogic skills: innovators, premature users, advanced majority, late majority and late comers. On its part, UNESCO groups teachers into three categories of skills, namely (1) technology literacy, (2) technology deepening (3) technology creation. Teachers are required to acquire advanced skills so as to be able to use ICT tools for lesson preparation and presentation either online or on site with the help of a video projector (Anderson, 2010). Tchombe (2009) corroborates this view as she posits that pedagogic integration means choosing and using the right applications, and tools for the preparation, presentation and evaluation of learning.

Adding to the above, several studies worldwide provide a skill profile on digital education by teachers. According to Danvoye (2002, 2001, 2000), Garnier & Gauvin (2000), Larose, Grenon & Palm (2004), Karsenti (2004), Gervais (2000), Bibeau (2005), teachers have different levels of ICT integration depending on training and learning needs. These levels include:

- **Pioneers:** This category has reached the highest level of digital literacy (4-5), they go beyond teaching learners basics to effective usage of these tools, to learn, carry out research, create applications and other innovations. They even help their colleagues in appropriation of digital pedagogy.
- **Sceptics:** They easily get discouraged by pedagogical integration challenges, and may even refuse taking initiatives if the conditions are not favorable. They are subdivided into two groups: (1) The *unsecured* who constitute the late comers as described by Rogers (1995). Their level of digital literacy falls between 3-4. They use ICT tools to prepare lessons at home, but are afraid to use them in classes for lesson presentations, as strongly recommended for Cameroon teachers by Tchombe (2009), Béché & Fonkoua (2016). Not much efforts are required to get this group techno-pedagogically ready in emergency situations like the COVID-19 classroom. (2) The *fearful* whose level of techno-literacy is 2. To them, a computer is a mysterious box, which is very difficult to understand. They shy away from using it both at home and in school. They even lack knowledge on how to connect to the internet. This groups requires much attention and effort to prepare for distance learning during emergencies.
- **The hesitant:** Their level of technology literacy is between 0-1. They are not even convinced that ICT can facilitate teaching-learning, and improve performance. The training need by this group is the highest and most urgent.

A careful reading of this framework presented by these studies can help a system identify the level of technology literacy of their teachers, then know the level or dose of training required. To understand the level of teachers' digital literacy in Cameroon, it is necessary to review the advent and evolution of technology in the classroom, as seen in the following section.

4. The inevitable presence of android devices in the classroom

Tchombe (2009) appeals to teachers to be conscious of the knowledge economy or diversity of the 21st century learning environment which is characterized by continuous scientific and technological innovation, and the effective presence of technological gadgets in the classroom. In this vein, it has been observed, for example, that learners even go to the extent of destroying their books just to smuggle their mobile devices into the school campus. What is against the

school's internal rules and regulations, as hinted by the Disciplinary office in one of the secondary Schools sampled in 2019, and exemplified in figure 1.



Figure 1: Android phone inserted in an exercise book and smuggled into school

Source: By one of the authors in a secondary school in the Far North Region in 2019

This figure shows that learners can go as far as destroying their exercise books just to smuggle their mobile phones into the classroom since they are attached to their android devices. It is based on the above unsatisfactory events which are related to the non-use of ICT in teaching in general that this paper sets the pace for a paradigm shift from the status quo, to an integrative innovative teaching culture.

According to Béché & Fonkoua (2016), the omnipresence of ICT tools in the classroom is significant, thus, making it absurd to imagine today's classroom without ICT. In this vein, Tchombe (2009: 22) contends that "teachers across the education spectrum need to acquire and internalize effective and usable skills in managing ICT in teaching and learning". She concludes that this is meant to render teachers informed, dynamic, and innovative with the ability to sail through the fourth industrial revolution imposed by technological innovation. The thrust of Tchombe's work was mainly in the use of ICT in pedagogic and evaluation processes. To her, it is a great task for teachers since they will have to carry out online research, prepare lessons using computers and the internet, use projectors to present their lessons, interact with learners in online learning platforms, and evaluate learners through online mechanisms. This is blended learning in practice since face-to-face meeting still occur, although less frequently. The crucial question is, are today's teachers equipped with such skills to sail through successfully? This nature of the classroom in the COVID-19 era and in conditions of disease outbreak in general require relevant technological development in online education for teachers at all levels.

Studies on the pedagogic integration of ICT in Africa and Cameroon in particular by Karsenti (2009), Fonkoua (2006, 2009), Tchombe (2009), Ngamo (2009), Nsolly & Charlotte (2016), Djebakal & Teneng (2017) have made suggestions on teachers' training in online education. Their call has mainly focused on the question of teachers' continuous professional in the domain of Educational Technology, since teachers with quality online education skills constitute the main actors for learning to escape any disruption as currently observed during the COVID-19 pandemic. This will permit the successful planting of the technology culture in Cameroon, ensure the attainment of SDG 4 and allow for continued teaching during disease outbreaks.

Interestingly, the teacher-distance-learning skills equation has received increased attention in recent years, e.g. Djeumeni (2007), Béché (2017, 2020), Teneng & Njebakal (2017), Ndongfack (2015). As a matter of fact, Djemeni (2007, 2010) investigates how teachers perceive their roles in the age of the omnipresence of ICT in the teaching-learning process, how they can obtain the skills needed to fully integrate ICTs in their classroom practices, and the extent to which technological policies in Cameroon can facilitate these aspects. This study concluded that ICT policy orientations in Cameroon are good, but fall short of adequate and consistent implementation. In a similar reflection, Njebakal & Teneng (2017) illustrate the crucial role technology can play in preparing graduates to cope in the 21st century environment. Their work challenges policy makers, managers, teachers and students to urgently embrace technology learning and professional practices so as not to be left behind. They recommend increased commitment by policy makers towards the development of teachers' ICT skills so as to permit the country to survive the fourth industrial revolution characterized by a dramatically changing knowledge-based economy.

In this light, Béché (2017) explains that Article 11 of the 2001 Higher Education law recognizes online distant learning (ODL) as a means of continuous professional development, and an alternative mode of training. This has inspired most state universities to build projects on ODL, which has resulted to more than 20 Cameroonian universities offering distant education (Béché & Fonkoua 2016). It is as a consequence of the latter that an online distance learning project has been initialized at the Higher Teachers' Training college of the University of Maroua. Despite significant insufficiency of ODL ingredients, efforts by authorities and sensitization from researchers continue to illuminate the need for this shift into technology-oriented culture in education. The coordinator of the University of Maroua project pointed out, for example, that funding constitutes a major challenge as Cameroon universities to thrive in distant education. He concluded that an already made ODL system cannot be achieved instantly, as it is a gradual process.

The arguments advanced by the above authors align with the orientation of this study since the central thesis is to equip teachers with ICT skills to better manage the 21st century classroom. However, this study goes further to consider level of pedagogical and technological training offered by Cameroon's educational system to teachers to facilitate distance learning not only during the COVID-19 era, but beyond.

5. Results and discussions

The results of interviews and discussions with participants are presented in this section. First, we sort to find out participants' views on the current state of skills in online education resulting from

basic training, continuous training and experience at the work place, and how such skills can be of help during disease outbreaks. Responses suggest that teachers' skills in online learning are very low and require reinforcement so as to prepare them for teaching during disease outbreaks. One head of department at the university of Maroua said "here at the university, I can say teachers have some computer knowledge. For example, in my department, all of them own a laptop, and I always see them working with. You know... our training schools do not have multimedia centers, reason why most teachers graduate with little or no ICT skills. But, they do not use these tools for teaching because I have never received any of them asking for a video projector to present his/her lesson with." A similar opinion came from university lecturer who said "what I know is that we teachers do not have online education skills; we are already used to face-to-face learning. This migration to online teaching seems to be very difficult. We have just received instructions to be versed with online education, but no training as of now. From the look of things, the COVID-19 era is going to be blended learning, or shifting learning. We really need these skills." This was also echoed by a Vice Principal who stated that "beginning from the Higher Teachers' Training Colleges in Cameroon, teachers learn ICT only in theory, and just as basic knowledge for their own use. Secondly, very few secondary schools can boast of a multimedia center, and teachers do not use it for practice quite often. We hardly see teachers even with laptops here in school, not to talk of online learning. They do not even care about it, even our superiors have not insisted on things like that. It was only during COVID-19 that we were asked to instruct teachers to type lessons and send to parents' mobile phones via emails or WhatsApp. And very few teachers could do this. My teachers are very weak in online education." The twelve remaining respondents had similar responses. These opinions suggest that teachers have not been (sufficiently) exposed to online education, and hence are not prepared to undertake effective teaching in online mode in the context of disease outbreaks such as COVID-19. This confirms Béch e's (2020) view that COVID-19 has uncovered the hidden weaknesses of the Cameroon educational system. Among these weaknesses is the high degree of digital divide in terms of online education skills or what he terms the appropriation of educational technologies. As suggested by Njebakal & Teneng (2017) it is imperative for university lecturers (and teachers at all levels) to embrace the new order imposed by the 21st century world of technology. Worth noting from some of the responses is the readiness of teachers to familiarize themselves with distance learning facilities since they all agree that online education is inevitable not only in times of disease outbreaks but in the 21st Century in general.

Secondly, we sort to find out if any measures by the State through educational authorities for teachers to develop online education skills and adapt during disease outbreaks. All responses point to the fact that not much has been done by the education authorities in Cameroon to prepare teachers for online learning in emergency situations. A Vice Principal said "some teachers were trained by the ministry in online education, we do not know if it is going to extend to all the schools. As of now, we still expect the go ahead to be given by the ministry", while a head of department said "at the University level, online education is going to be reinforced in the days ahead. As of now, no concrete measures have been taken by the authorities to prepare us for the COVID-19 era. We do not even know how it is going to look like". Eleven of the respondents were categorical that nothing had been done while two said they were unable to comment at all on the issue. Responses revealed that only the shifting school attendance strategy (some learners attend classes in the morning till midday, while others attend from noon to 5:00 p.m.) and one

the one learner per bench measures have been taken so far. This was mainly to enable the writing of exams at the primary and secondary levels.

The third issue we focused on was whether teachers themselves were making individual efforts to develop skills in online education which could be exploited during disease outbreaks. Responses were mixed with some affirming that teachers were making individual efforts while others disapproved. A primary school teacher said “I and some of my colleagues have taken to start a computer course in a secretariat, we just hope we will be prepared for the COVID-19 context as soon as possible”, while a head of department said “some teachers, I think have really put efforts to adapt to this new normal, the way some were engaged in preparing and sending notes online really impressed me, given that they have not received any particular training.” The second head of department reluctantly said “I cannot really tell, but we always have conscious teachers who work hard to cope with new environments”. On the other hand, some respondents stated that not much is done at individual level by teachers. A Vice Principal said “I’m not really convinced they are doing anything to help themselves. The normal here is that everyone waits for the government to do something”, while a university lecturer said “personal training is relevant, but we really need intensive training by the authorities in online education. It is difficult to tell if some colleagues are undertaking individual training.” The remaining ten respondents said individual teachers were doing their best to cope with the situation but did not point out any specific activities that were being undertaken. Most university lecturers have engaged in online education skills development specifically because they were obliged to use platforms like Google classroom and WhatsApp to exchange with learners at the peak of the first COVID-19 wave. Teachers at lower levels of education in Cameroon lack motivation towards technological development in general, and online education in particular. Karsenti et al. (2011) assert that lack of motivation in technological development by teachers is characteristic of Sub-Saharan Africa. This highlights the need for education authorities to lay down effective mechanisms for teachers’ technological development, without which it will be difficult to successfully implement online teaching during disease outbreak.

6. Recommendations

Considering the findings of this study, the following recommendations have been made:

1. Teacher’ Training Colleges should take the teaching of ICT with much seriousness, and make it more practical.
2. Well-equipped multimedia centers should be put in schools, with sufficient telecommunication dispositions.
3. The state should develop an aggressive digital education-sector policy to resolve the problems of possession and appropriation by all the actors of the educational community, and teachers in particular.
4. The state of the digital environment (affordable internet, high speed internet, outreach of the internet to the rural areas, and stable energy for all).
5. Continuous training or in-service capacity building for teachers in the form of seminars should be organized with specific targets to develop online education skills at all levels of education.

6. Considering the COVID-19 context, there is an urgent need for educational authorities to organize training sessions for teachers in the acquisition of distance learning skills, and blended learning methods.
7. Given that the Cameroonian context seemingly does not allow to fully switch to exclusive online education, blended learning should be introduced with shifting mechanisms. This allows for few learners per class, thus respecting social distancing, then, a greater part of the lessons should be sent and discussed through online education platforms. However, teachers are required to embrace the novelty and collaborate effectively.

7. Conclusion

This study set out to verify the measures put in place by Cameroon's educational authorities to prepare teachers to cope with the COVID-19 era and subsequent disease outbreaks. In this light, three specific objectives were formulated to verify teachers' personal engagement, their initial and continuous training, and whether specific measures have been taken by the state to accompany them in this journey. Findings revealed that teachers received very weak ICT training with no practical at their initial training, while no continuous training opportunities have been provided. It was observed that the measures taken by educational authorities have been limited to the general "STOP THE SPREAD!" which is based on wearing facemasks, social distancing and frequent washing of hands. However, digital measures in education have proven to be practically insufficient to enhance learning in times of unprecedented crisis like the COVID-19 pandemic. This study has, therefore, recommended, among other things, that Cameroon's educational authorities should design and concretely implement teachers' technological development activities at all levels so as to be adequately prepared for distance learning in the event of other disease outbreaks.

References

- Anderson, J. (2010). *ICT transforming education: A regional guide*. Bangkok: UNESCO.
- Béché, E. (2020). Cameroonian responses to COVID-19 in the education sector: Exposing an inadequate education system. *International Review of Education*, 1–21.
- Béché, E. (2017). Conceptualizing the Implementation of Distance Learning System at the Higher Teacher's Training College of Maroua (Cameroon) *International Journal of Humanities Social Sciences and Education* 4(5): 51–62.
- Béché, E. (2020). Cameroonian responses to COVID-19 in the education sector: Exposing an inadequate education system. *International Review of Education*, 1–21.
- Béché, E. & Fonkoua, P. (2016). Introduction: Utility, usability and acceptability of open and distance learning in the Cameroonian university context. In Fonkoua, P. & Béché, E. (eds.), *Les formations ouvertes et à distance au Cameroun : Entre discours et réalités d'innovation*, 11–32. Paris: L'Harmattan.
- Béché, E. (2013). TIC et innovations dans les pratiques enseignantes au Cameroun. *Frantice.net*, 6: 5–21.
- Bibeau, R. (2005). Les TIC à l'école : Proposition de taxonomie et analyse des obstacles à leur intégration. *Revue de l'EPI*. https://edutice.archives-ouvertes.fr/edutice-00277818/file/a05_11a.html. Accessed on March 05, 2021.
- Danvoye, P. (2000). *Bilan de l'an III du plan ministériel d'intervention. Année scolaire 1998-1999*. Montréal: Gouvernement du Québec.

- Danvoye, P. (2001). *Bilan de l'an IV du plan ministériel d'intervention. Année scolaire 1999-2000*. Montréal: Gouvernement du Québec.
- Danvoye, P. (2002). *Bilan de l'an V du plan ministériel d'intervention. Année scolaire 2000-2001*. Montréal: Gouvernement du Québec. <http://www.meq.gouv.qc.ca/drd/tic/pim.html#suivi>. Accessed on 11/11/2020.
- Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems* 49(1): 5–22.
- Djeumeni-Tchamabe, M. (2007). Les écoles normales et les établissements scolaires face aux TICE : Le cas du Cameroun. <http://www.adjectif.net/spip/spip.php?article29>. Accessed on August 21, 2020.
- Tchamabe, M. D. (2010). *Les pratiques pédagogiques des enseignants avec les TIC au Cameroun entre politiques publiques et dispositifs techno-pédagogiques; compétences des enseignants et compétences des apprenants; pratiques publiques et pratiques privées*, Doctoral dissertation, Université René Descartes-Paris V.
- Fonkoua, P. (2006). Approche conceptuelle de la «ticologie» ou science d'intégration des TIC dans la formation des formateurs. In Fonkoua, P. (ed.), *Intégration des TIC dans le processus enseignement-apprentissage au Cameroun*, 223–234. Yaoundé: Éditions terroirs, collections ROCARE.
- Fonkoua, P. (2009). Les TIC pour les enseignants d'aujourd'hui et de demain. In T. Karsenti (ed.), *Intégration pédagogique des TICs en Afrique: Stratégies d'action et pistes de réflexion*, 151–181. Ottawa: CRDI.
- Garnier, I. & Gauvin, S. (2000). *Des contenus numériques pour l'éducation. Étude sur le programme de licence mixte 1998-1999 et les besoins en contenus numériques*. Québec: Université Laval.
- Gervais, M. (2000). *Recherche sur les besoins du personnel enseignant en regard de l'intégration des TIC dans des écoles ou des classes innovatrices du primaire*. Montréal: Direction des ressources didactiques.
- Josué, T. T. (2007). ICT in Education in Cameroon. *Cameroon country report produced by Survey of ICT and Education in Africa*. www.infodev.org/infodev-files/resource/InfodevDocuments_390.pdf.
- Karsenti, T. (2004). Pourquoi une revue scientifique internationale portant sur l'intégration des TIC en pédagogie universitaire? *Revue Internationale des Technologies en Pédagogie Universitaire*, 1(1"), 7–8.
- Karsenti, T. (2009). *Intégration pédagogique des TIC: Stratégies d'action et pistes de réflexion*. Ottawa: CRDI.
- Karsenti, T., Collin, S., & Harper-Merrett, T. (2011). *Pedagogical integration of ICT: Successes and challenges from 100+ African Schools* Ottawa, ON: IDRC. <https://depot.erudit.org/id/003775dd?mode=full&locale=fr>. Accessed on March 03, 2021.
- Larose, F., Grenon, V. & Palm S. B. (2004). *Enquête sur l'état des pratiques d'appropriation et de mise en oeuvre des ressources informatiques par les enseignantes et les enseignants du Québec*. Sherbrooke: CRIE-CRIFPE.
- Mbangwana Atezah, M. (2008). Introduction of ICT in schools and classrooms in Cameroon. *ICT and Changing Mindsets in Education*. Ottawa: CRDI, 124–135.
- Ndongfack, M. (2015) Mastery of Active and Shared Learning Processes for Techno-Pedagogy (MASLEPT): A model for teacher professional development on technology integration. *Creative Education* 6: 32–45.
- Njebakal, S. E., & Teneng, P. (2017). Technological inputs in Higher Education and graduate destinations in Cameroon. The case of the University of Yaoundé I. *International Journal of New Technology and Research* 3(3): 25–29.
- Nsolly, N. B., & Charlotte, N. M. (2016). Integration of ICTs into the curriculum of Cameroon primary and secondary schools: A review of current status, barriers and proposed strategies for effective integration. *International Journal of Education and Development Using ICT* 12(1): 89–106.

- Rogers, E. (1995). *Diffusion of innovations*. New York: Free Press.
- Tchameni Ngamo, S. (2007). Stratégies organisationnelles d'intégration des TCI dans l'enseignement secondaire au Cameroun : Étude d'écoles pionnières. PhD Dissertation, University of Montreal.
- Tchombe, T. M. S. (2009). Perceptions of learning: Principles and practices in ICT integrated classroom.
- Traoré, D. (2008). Quel avenir pour l'usage pédagogique des TIC en Afrique subsaharienne ? Cas de cinq pays membres du ROCARE. In Touré, K., Tchombe, T. M. S. & Karsenti, T. (eds.), *ICT and changing mindsets in education* Bamenda: Langaa, 168–178.