Abstract
The purpose of this paper is to demonstrate that documentary linguistics (DL), through its objectives (safeguard endogenous knowledge), tools (digital technologies), methods (collaborative research), and results (digital archiving of data for posterity), constitutes a stable base on which African education systems must reform. Admitting that a young Africa rich in natural and human resources but living in abject poverty is a paradox that can only be broken through education (Nana Akufo-Ado, pc), then, there is need to invent new ways to “do education” on the continent, in other to achieve sustainable development. Remote working and online education imposed on the world by the Covid-19 pandemic has come to exacerbate Africa’s digital divide (DD). Despite the reality that close to 90% of students in Sub-Saharan Africa do not have access to learning tools like computers at home, and 82% lack access to the internet (Sikiti Da Silva, 2020), I argue that DL, as an academic discipline of the digital humanities (DHs), is a palpable means to contribute to closing the DD. Indeed, DL permits to increase computer literacy, enhance digital learning, and build academic resilience in Africa.

Keywords: Documentary linguistics, digital learning, quality education for all, digital divide, educational reform

1) Introduction: DHs or requiem for the humanities
Despite the fact that devices like computers have been used in the humanities and social sciences for over forty years now (Mounier, 2010, p. 447), the terms “humanities computing” first, and presently “digital humanities” are recent, owing to Schreibman, Siemens and Unsworth (2004), in their publication *A Companion To Digital Humanities*. DHs is seen as the meeting of new information and communication technologies with the disciplines of humanities and social sciences, arts and letters (Darbellay, 2012/3, p. 269). It is the intense and multi-level integration of computing or digital technologies (DTs) in all research processes, from data collection to publication (Mounier, 2010, p. 447). In fact, the use of electronic tools like computers, laptops, tablets, smartphones, mobile phones, social media, online games, multimedia, systems, resources, etc. to produce, store or process data has invaded the daily life of humankind. Today, no human activity is performed without the optimal utilisation of DTs, a rapid and efficient way for us to connect, communicate easily, and perform difficult, painstaking tasks quasi effortlessly and cost-effectively.

With its impact on the modern society, the DH has now gradually grown into an interdisciplinary field of study and research that borrows from languages, literature, history, music, media and communications, computer science, and information studies, with the ultimate goal to merge those disciplines these into new frameworks. DH has also integrated perspectives like critical digital studies, machine learning, data science, and artificial intelligence. In other words, DH consumes and lives of technology that occupies a central position in research in the humanities (Berry 2019). The fields of research and education are two of the many areas where DTs have proven to be indispensable. For example, the digitization, analysis, presentation and easy retrieval of old texts, the construction of electronic libraries and maps for areas of cultural or historical significance, the extensive use of DTs to document endangered languages etc. are concrete applications of DT in the humanities.

In a context where the DHs have rapidly turned into an international movement owing to its presence in academic milieus to reorient the contours of the discipline in university faculties, I provide evidence that DL, thanks to its extensive use of computing, is part of the DHs. DL is a
typical example of a language discipline confirming the DHs as an area of scholarly activity at
the intersection of computing and the disciplines of the humanities, where digital resources are
systematically used and their application analysed. Therefore, against this backdrop, I hold that
DL is a strong argument to introduce the DHs in research and education for sustainable research,
learning and teaching, thanks to its approach. Indeed, the objectives of DL (safeguard endogenous
knowledge), its tools (DTs), its methods (collaborative research), its results (digital archiving
of data for posterity), and its users (researchers from many disciplines), constitutes a stable base
on which education systems in Africa must reform or reborn.

The paper is organised as follows. In the next section, I present the discipline of DL and argue
that it is a candidate for DH by showing its connection with DTs. In section 3, I examine the
interface between DH and sustainable teaching and learning. Before concluding in section 5, I
presented some of the challenges of the use of DH in education, challenges that turns to be
prospects for those branches of knowledge concerned with human beings and their cultures.

2) Brief overview of Documentary linguistics

2.1. What is DL?
DL, also called language documentation, became an epistemological discipline in the attempt
of linguists to safeguard many languages of the world under threat of extension. In fact, the rate
of world languages extinction became so alarming that linguistics had to invent, imperatively,
a way of preserving those languages through lasting records. In many cases, the documentation
initiatives aimed at supporting speakers of these languages in their desire to prevent them from
with the methods, tools, and theoretical underpinnings for compiling a representative and
lasting multipurpose record of a natural language or one of its varieties. Here, the role of
language speakers, their rights and needs are highly considered and valued. With a strict
collaboration with the members of the speech community under study, a multidisciplinary team
systematically records, transcribes, translates, and analyses the broadest possible variety of
spoken (and written) language samples (Austin, 2007). A hallmark of DL is the creation of
multipurpose records of languages through audio and video recording of native speakers with
sound annotation to ensure their preservation and the distribution of the resulting materials.
This digitally recorded multidisciplinary data collected within their appropriate social and
cultural context is supposed to be a comprehensive record of the linguistic practices
characteristic of a given speech community.

According to Himmelmann (2006:15, cited by Austin, 2007), some of the important new
features of language documentation include:

- Focus on primary data
  Language documentation concerns the collection and analysis of a wide range of
  primary language data meant for a wide variety of users;
- Explicit concern for accountability
  Access to and representations of the primary data collected make evaluation of linguistic
  analyses possible and expected;
- Concern for long-term storage and preservation of primary data
  Language documentation has a particular focus on archiving in order to make sure that
  documentary materials are at the disposal of potential users into the distant future;
- Work in interdisciplinary teams
  Documentation demands input and expertise from an array of disciplines and is not
  restricted to linguistics alone;
- Close cooperation with and direct involvement of the speech community
Language documentation requires active and collaborative work with community members both as producers of language materials and as co-researchers.

Austin (2007) also stated that the outputs of documentation are multifunctional. Indeed, they serve:

- Linguistic research - phonology, grammar, discourse, sociolinguistics, typology, historical reconstruction
- Folklore - oral literature and folklore
- Poetics - metrical and music aspect of oral literature
- Anthropology - cultural aspects, kinship, interaction styles, ritual
- Oral history, and
- Education - applications in teaching
- Language revitalisation

2.2. Language documentation tools

DL uses hardware and software tools. In fact, the most essential part of DL is an expandable, portable and transparent corpus of audio and/or video materials recorded with digital devices, captured, analysed, transcribed, translated, annotated, and completed with the notation of metadata. Then, comes the phase of archiving, another distinguishing characteristic of DL. The data being in digital form, filing is done through electronic archiving i.e. the safe preservation of that inactive information in digital format for long-term retention. This involves the storage, indexing, classification and management of electronic documents and data to ensure their conservation throughout their lifecycle. Thus, amongst the key skills a language documenter must possess, there is data and metadata management. This entails the mastery of markup languages like XML, HTML, of relational database models, and of use of software tools for language and cultural data like Transcriber, Shoebox/Toolbox, FLEX, ELAN, IMDI, etc. The language documentation tools include video and audio recorders, microphones, electrical power generation, storage and management, computer systems, and accessories. As for the software, there are many. For example, SIL International has developed and supported a wide range of software for language and cultural data, including linguistic and cultural research, literacy and mother-tongue education, dictionary development, community and computer-assisted translation, and vernacular media production (SIL International, 2022). The SIL language technology department has created a number of key software for language development, language learning and literature production:

- The FieldWorks Language Explorer (FLEx), supports language documentation and analysis.
- SayMore manages recordings of language data.
- WeSay builds a dictionary easily.
- ScriptSource for document scripts and writing systems.
- PrimerPro and Bloom is to produce books for early readers.
- Webonary helps to publish dictionaries.
- Graphite supports complex writing systems with award-winning fonts and keyboards and ground-breaking technologies (SIL International, 2022)

On the other side, The Language Archive (TLA) in Nijmegen, in order to host digital language materials (audio, video and texts) from all origins, has developed linguistic tools for working with these language materials and for organising and archiving them. The goal of the archive is to make the collection of materials available for research and other purposes, now and in the future. Two of DT tools developed by TLA are ELAN and CLARIN. ELAN (EUDICO Linguistic Annotator) is a multimedia annotation tool widely used for creating time-aligned
transcriptions and annotations for audio and/or video recordings. CLARIN is a digital infrastructure that enables research based on digital language resources by offering advanced services to discover, explore, exploit, annotate, analyse, combine or archive language data. All those tools are open source and free of charge (Drude, 2012).

Anastasopoulos (2019) has proposed software that cover every layer of linguistic annotation (spoken corpora of endangered and low-resource languages with limited translation annotations) in his PhD dissertation. These include:

- **Speech-to-translation alignment**: it is an unsupervised method for discovering word or phrase boundaries in the audio signal and aligning the discovered segments with translation words.
- **Speech transcription**: two new neural methods for creating a phoneme or grapheme level transcription of the audio, also utilizing any available translations.
- **Speech translation**: a novel multitask neural model that jointly produces a transcription and a (free) translation of an audio segment.
- **Morphological analysis**: the production of a layer of annotation that provides word-level or morpheme-level information, with focus on grammatical (part-of-speech) tagging on an endangered language (p. i-ii)

What precedes is enough evidence that linguistics research cannot do without DTs today. The main change brought to the documentation of languages that departed radically from the traditional method, (before Himmelmann, 2006), is the extensive use of digital resources. I have just provided evidence that DL is a discipline of the DH thanks to the array of easy-to-use language resources the discipline utilises.

3) DH/DT and sustainable teaching and learning
Knowledge production infrastructure in the humanities, precisely in the field of language, has sufficiently proven it worth to think of DH as a plinth for sustainable teaching and learning.

3.1. DL and teaching/learning
In a communication at the first meeting of the *Francophonie Scientifique* (22-24 September 2021 Bucharest), I argued that DL is not only an appropriate response to the endangerment of languages, culture, biodiversity, ecosystems, etc., but also a privileged space for the promotion of African languages and cultures, which constitute the bases of an inclusive and functional education. Indeed, DL produces linguistic data from which authentic teaching materials can be extracted. In other words, thanks to the results of DL, e-learning materials like e-textbooks, e-workbooks, educational videos, e-tests, can be easily produced. The results of DL below, in the field of ethno-pharmacology (from Wovia and Isubu, two Bantu languages of Cameroon) illustrate our position:

<table>
<thead>
<tr>
<th>Isubu</th>
<th>Scientific Name: <em>Annanas comosus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>[ʤɔ̀ŋá]</td>
<td>‘pineapple’</td>
</tr>
<tr>
<td>[liʤɔ̀ŋá]</td>
<td>‘pawpaw’</td>
</tr>
</tbody>
</table>

Scientific Name: *Annanas comosus*

Medicinal uses:
- The fruit is used as one of the ingredients for viral fever home remedy.
Scientific Name: *Carica papaya L*

Medicinal uses:
- The dry brown leafs of the plant is used for the treatment of fever/malaria.
- Pawpaw fruits are used as medicine for intestinal worms.

Source: Sirih-Nagang (2018)

My contention is that DL constitutes and authentic source for the didactic materials that will carry the education of the young girls and boys in an easily usable format, digital. Furthermore, the documentation of the ecosystem, biodiversity, ideas, customs and culture, makes it possible to create authentic teaching programs/contents for education. Languages convey local knowledge and expertise, and become an irreplaceable tool for developmental sustainability. Since the publication of UNESCO in 1953 on the use of vernacular languages in education, it has been established that linguistic and cultural integration from the first hours of school has positive consequences on the educational level. In the Sustainable Development Goals (SDGs), the role of culture is undeniable for quality education, economic growth, and effective preservation of the environment. For example, the documentation of specialized vocabulary and cultural knowledge through the production of field guides in local languages on national biodiversity (zoonymy, phytonymy and myconymy) makes it possible to fix the knowledge related to the ecological systems of a place, and constitutes a pretext to (re)establish the link between humans and nature. From a DL perspective, the nature-culture-human triptych intertwines to become the source of a genuine identity, innovation, creativity and guarantee of sustainable economic growth (Atindogbe, 2021).

Owing to this era of new technology, that has deduced the youngsters, the chances to achieve better results in short time by using DTs to teaching/learning are high. Producing digital materials will enhance effective multitasking in young children. Indeed, students can learn how to listen and type to take notes, or other multitasking activities that can help them succeed in their future (WGU, 2019). With the advantages of DT in education such as easy access to and retention of information, possibility of more storage of information and better presentation of information, digital learning is the path to embrace DTs amplify interactivity in teaching, easy knowledge sharing and capture more learners’ interest. Communication is fast and time maximized. Furthermore, the optimal use of digital learning tools in classrooms increases students’ commitment, helps teachers improve their pedagogy, encourages personalized learning and contributes to students building the kind of skills they need in this 21st century.

The university landscape of training and research is going through a time of criticisms following the injunction to produce "useful" and immediately transferable knowledge, to the detriment of fundamental research that takes long time. In this new deal, the DHs represent an opportunity for repositioning and renewal of the humanities and social sciences (Darbellay, 2012/3, p. 269).

Digital archives contain various types of materials:
- audio and video language corpus data from languages around the world;
- photographs, notes, experimental data, and other relevant information required to document and describe languages and how people use them;
- records of speech in everyday interactions in families and communities;
- naturalistic data from adult conversations from endangered and under-studied languages, and linguistic phenomena (TLA, 2022).
These valuable electronic materials are to be used to design pedagogic materials.

In higher educational institutions today, DTs are at the centre of many tasks and interactions. Supervisors, with their busy schedules communicate abundantly through emails and WhatsApp fora, to share papers and projects. Therefore, this daily experience is evidence that DT is one of the modern catalyst of changes and transformations within the teaching-learning processes from the primary to the tertiary level.

4) Challenges of the use of DH in education

DTs entails the use of computer and technology-assisted strategies to support teaching and learning within schools. However, DD is a big challenge to the DT approach in education. OECD (2021) refers to the term “digital divide” as the gap between individuals, households, businesses, and geographic areas at different socio-economic levels as far as their opportunities to have access to information and communication technologies (ICTs), and their use of the Internet for a wide variety of activities are concerned (p. 4). I contend that the DD in education in Africa appears to depend primarily on three variables: change of mentality, leadership, and infrastructure, the last two highly depending on the first. Other variables, such as motivation of the main users in the education milieu (learners and teachers), age, gender, linguistic backgrounds, and location also play an important role. Other crucial indicators concern differences in the profiles of higher learning institutions, establishments of the university, the purpose and individuals that use, and make the most use of the many possibilities offered by the new information technologies and the Internet. As rightly put by Sikiti Da Silva (2020), “covid-19 reveals digital divide as Africa struggles with distance learning”, since learning institutions were compelled to close, obliging almost 1.4 billion students worldwide to stay out of the classrooms (UNESCO, 2022).

Pupils in many countries in Sub-Saharan African countries became idle, anxious and frustrated when they were asked to switch to online education since no one, parents, teachers were prepared for such a sudden need. The dismay of parents and educators became obvious as they were worried about the future of children. In terms of infrastructural needs, UNESCO (2020) deplores that close to 90 percent of students in Sub-Saharan Africa do not have access to household computers and 82 percent lack access to the internet. Consequently, they could not ensure educational continuity during the COVID-19 era. The UNICEF Chief of Education, Robert Jenkins, regretted that access to the technology and materials needed to continue learning while schools are closed is desperately unequal. Some children have almost no means to support their education.

The situation depicted above is evidence of the DD in Africa. Despite the radical transformation of the educational sector thanks to the ITCs in developed countries, despite the glaring benefits of the use of digital means, Africa is still lagging behind, struggling with traditional methods of teaching and learning. The gap in PC and Internet access by learners are very large and increasing. As education is expensive, because of the low income of many people in Africa, the higher the level of education, the more likely learners have access to ICTs. Consequently, equipping learning institutions with a range of learning tools and accelerating access to the internet for all of them and every students is imperative.

Thus, despite the bleak picture of DD, as recommended in the SDG17 (the SDGs can only be realized with strong global partnerships and cooperation), there exists tremendous efforts by partners to remedy the situation. Adam Holt proposed “Internet-in-a-Box” that provides access to a wealth of educational resources, even to students without internet access in the most remote areas of the world. It is also useful for home school parent or a teacher with a limited budget.
Recently, UNESCO put in place the initiative “Computers for African Schools”, in other to transform education in Africa with ICTs, through concrete actions like equipping schools with computers, training teachers on the use of ICTs, and aligning African countries’ educational systems with worldwide digital advancement and perspectives. This will allow students and teachers to acquaint themselves with computers, and understand IT. There is no doubt that a situation like DD would properly address partnerships between governments, the private sector and civil society, partnerships that render human empowerment at a local level possible.

5) Conclusion
In this paper, I argued that a DHs’ solution to research, teaching and learning is the way forward to sustainable education in Africa. DL, thanks to its methods, tools and objectives, is a sound illustration of the benefits that DHs can bring to research and education for sustainable research that will lead to authentic learning and teaching. DTs have gained prominence all over the globe, with the youngsters swimming in it, and there is no way they can be avoid. Thus, the necessity to use them in the implementation of a number of tasks and functions in education has fuelled my interest in this paper. However, digital information can only thrive and be useful to learners if it exists within a conducive environment. Digital transformation in Africa requires serious infrastructural investments. Unfortunately the will and means seem not to be available in poor countries, whose populations/students are still only struggling to survive with traditional methods of education. Yet, the little that exists and which is being used by some well-exposed researchers can be the starting point of a revolution that will expose the usefulness of digital technology in order to trigger good practices in education. The COVID-19 period has demonstrated that if Africa does not sit up to break the DD, their population will continue to lag behind while the other nations are moving fast and with no hope of waiting to drag those who are left behind. Even if we have to exploit to the maximum what we have at hand in order to make things change, many children in Cameroon and Africa come from disadvantaged backgrounds, a situation that remains most frustrating and discouraging. Many also come from areas with no basic infrastructure, like water, sanitation, electricity, let alone computers and internet access, data, or even modern cell phones, which are a luxury for them. Thus, talking about digital humanities in the context of extreme and growing poverty, as well as poor and precarious education systems, may sound not helpful because the task remains huge. However, it a giant or quality step to start somewhere with what we can afford while waiting for a better scenario. By building on shortcomings like the DD, and with the will of decision makers who will engage in well thought collaboration schemes with the partners of Africa like the UNESCO and many other NGO’S interested in the reform of education in Africa, I contend that digital resources, methods and skills reposition the humanities.

References