

# A Conceptual Framework for Designing Hologram-Based Education Systems

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## ABSTRACT

The use of computer and associated network to provide learning through virtual learning systems have become a means of supplementing the existing traditional teaching method. This innovation, when enhanced through inclusion of hardware objects with capability of interactivity, will further improve learning outcomes and generally improve the quality of education. A Conceptual Framework for the development of Holograms as teaching aid is proposed. A study of various researches and frameworks that target the quality of education was carried out. This work adopted the Tikly Quality Education Framework and based its framework on the ICT sub system of (Tikly, 2011). The Conceptual Framework will provide a blueprint for the processes of a Hologram-Based teaching system which starts with requirement gathering, design, development, with subsystems for tools, techniques and technologies as well as stake holders and human resources.

**Keywords:** SDG 4, Quality Education, IDP, Holography, Virtual Reality, augmented reality, Internal Displacement, Optics waves.

### CISDI Journal Reference Format

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## 1. INTRODUCTION

Quality education has been defined as on that allows the learners to realize their capabilities, be economically productive, and be able to give back to the society (Tikly, 2011). It is the foundation upon which other drivers of national economy lies. United nation's Sustainable Development Goal number 4 (Quality education) has ten targets that can be summarized into the following five targets:

- Ensuring lifelong learning opportunities for all
- Ensuring inclusion, equity and gender equality;
- Ensuring effective and the acquisition of relevant skill, knowledge and competencies;
- Ensuring relevance of learning, in terms of vocational and technical skills for decent work as well as for global citizenship in a rural and interconnected world.
- Increase the supply of qualified teachers

Having qualified teachers facilitate learning is pivotal to the success of most goal4 targets, but this target may not be attainable as teachers posted to schools in rural areas quickly find a way to change the postings or quit their jobs out rightly due to alarming rate of kidnapping and related terrorist activities making it almost impossible to achieve

quality education targets of UN SDG in Nigeria. Students from these rural areas end up in the universities in town not achieving basic literacy and numeracy hence great government policies are not implemented or monitored. Universities and other higher institutions are obligated to absorb as many students as possible within her community. The schools' carrying capacity is over-stretched. With a poor academic foundation such as described, poor educational infrastructure, and a poor learning environment, most of the students rarely attend classes, but show up during the exams. The result is that most students graduate with little or no acquisition of the skill in their discipline of study.

## 2. LITERATURE REVIEW

In this section, a review of various methods of refugee education is carried out. The study will be extended to methods that have been adopted by educators in a bid to improve the comprehension level of the students in a learning program. This is considered vital to the success of the education of children in IDP camps as the researcher considers the provisioning of quality education a scarce resource, which when available must be fully utilized considering the many IDP camps where this service is required and the unavailability of enough professionals to achieve the desired result. With over 143,000 IDP camps in Nigeria, the task of achieving the Global Compact on Refugee and Refugee education 2030 target is an onerous one. The framework that aims to help partners achieve inclusive and equitable quality education has been developed (UNHCR, 2019).

### Framework for Refugee Education

Quality education can be measured using various variables. (Tikly & Barrett, 2011) proposed using 3 intersecting contexts:

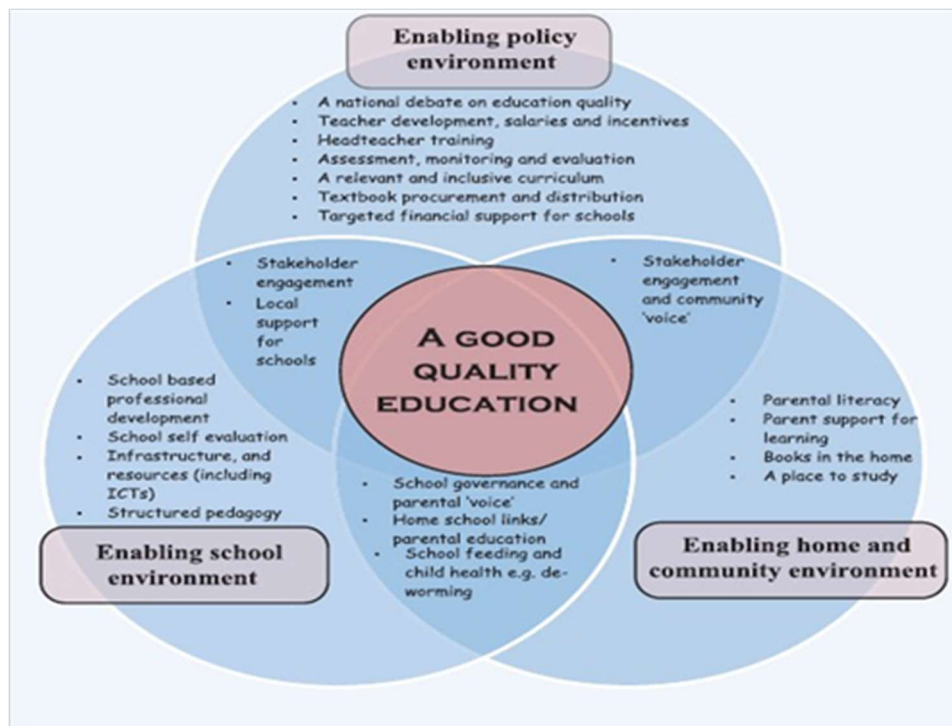
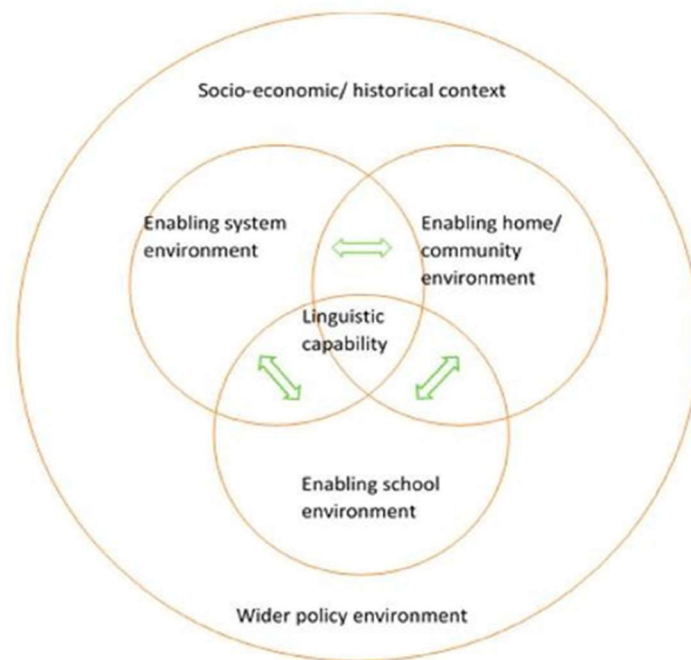


Figure 1: A Framework for understanding Quality Education in Africa (Tikly,2011)

The policy context, the home/community context and the school context. (Tikly, 2011) further broadened the framework to include language concept. (Madziva & Thondhlana, 2017) adapted the framework and built in the refugee presence as previous frameworks only accommodated a general societal measurement. Other proponents of providing systematic measurement of the value of education include UNESCO (2005) quality framework, which underscores contribution of education to Gross Domestic Product (GDP) as a means of measuring the quality of education (UNESCO, 2017) cited in (Tikly, 2011).

The framework by (Tikly, 2011) showcases the interaction between enabling policy environment with sub systems such as national discussions on quality education, teacher development, and salaries and incentives as well as headmaster training and assessment, monitoring and evaluation of relevant curriculum, procurement and distribution of textbooks, and targeted financial support for schools. The second contributing environment is the enabling school environment which has professional development, school self-evaluation, infrastructure and resources, including ICTs, while the third contributing environment is an enabling home and community environment. This agrees with (Olebara C.C and Michael Nwanyibuaku, 2018) with respect to the need for involving parents in the learning process. The subsystems here are: Parental literacy, parental support, books at home, and a place to study at home. Figure 1 below shows the Tikly's framework.

An improvement to the framework included the linguistic capability as shown in figure 2 below:



**Figure 2: Creating an enabling environment for developing a multilingual capability (Tikly, 2016) cited in (Madziva & Thondhlana, 2017)**

The need for the government to be intentional about the education system cannot be overemphasized, as the intersecting variables that are the outcomes of involving the above-mentioned contexts are the inputs. (Madziva & Thondhlana, 2017) while adopting these inputs, adapted the framework to include refugee education and emphasized the English as an Additional language (EAL) in the Tikly language subsystem. This framework is shown in figure 3 below.

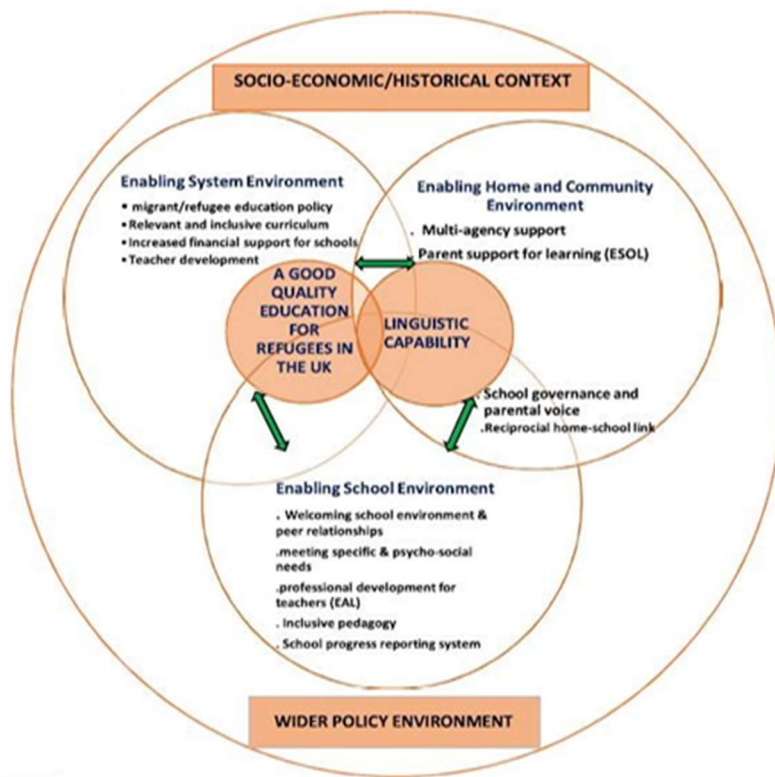


Figure 3: Model for conceptualizing the quality of education for Sudanese

refugees in UK. (Madziva & Thondhlana, 2017) adapted from (Tikly, 2011) and(Tikly, 2016).

### Holograms as Tool for Achieving Quality Education

Hologram is a Greek word for “whole picture” or “whole message”, an invention by Gabor, Denisjuk, Leith, and Upatnieks. The hologram depends on a two-step process that involves beams from a single light source to create interference (Johnston, 1966). Holograms have been applied to the education sector in order to create lasting memory of learned content. (Barkhaya & Halim, 2017) reviewed various studies and presented an analysis of various research-based works in the use of 3DH as a visualization tool for teaching various education fields.

Similarly, (Paredes & Vazquez, 2019) proposed a way to measure the impact of hologram- based teaching on engagement, learning outcomes, and social presence where the target group is first year engineering students. (Singh, 1988) described various facets of electro-optics and suggested ways of incorporating it into undergraduate curriculum of electrical engineering. In a more recent study, (Awad & Kharbat, 2018) developed a tool with a combination of holograms and Hand Gesture. Control to achieve an interactive tool that make teaching easier while enhancing the learning outcome.

### 3. METHODOLOGY

Conceptual Framework of Holography in Education in Developing Countries and Refugee Camps. This paper aims to develop a framework that will serve as guide for the design and development of holographic education system. The framework has five parts that form the input and processing of the overall system. The first part is the requirement gathering stage with tools such interview, survey, questionnaire and analysis of data. The second part of the framework is the design of the physical holography laboratory where use cases are presented using Object Oriented Software Engineering Methodology and Unified Modelling language (UML). The third part also interacts is the development of the Reference Architecture, while the fourth is the deployment/ implementation stage which involves the cloud services and optics tools. Figure 4 below illustrates the conceptual framework for deploying holography both in regular teaching environment and in refugee community.

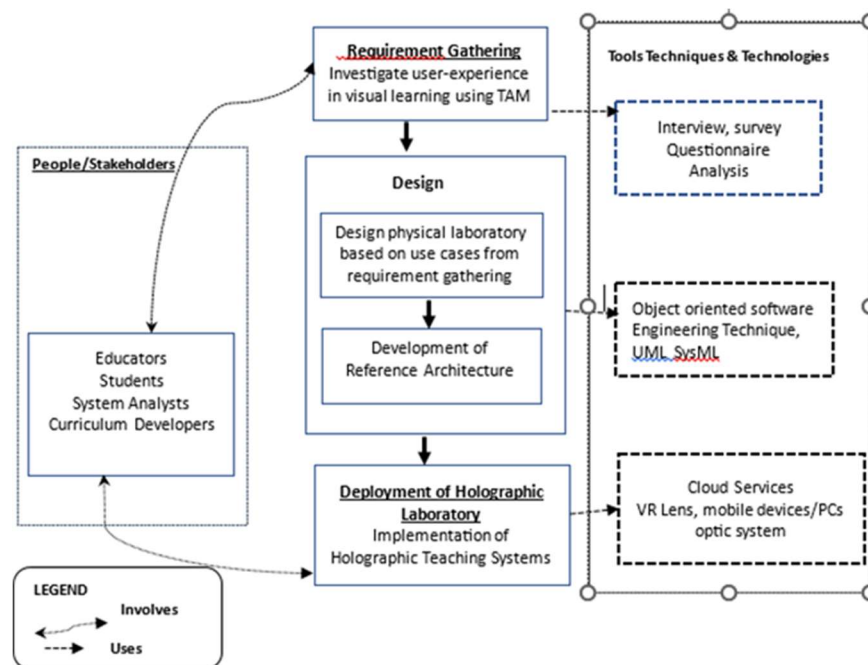


Figure 4: Conceptual Framework for Holographic Learning Visual Learning System

### 4. CONCLUSION

The use of holography has been found to be beneficial in education as it give lifeto otherwise abstract and complex topics. Huge success achieved the use of holography in education from the time it was created to recent years is remarkable. From (Walker, 2013) who applied it to board game and reflection to illustrate conventional 3D representations, to (Klett et al., 2012) where the authors used holography in Army Research Laboratory, to develop equations thattransform image processing applications, as well as in the teaching of Mathematics (Orcos et al., 2019), Physics, (Toledo et al., 2009), and multimedia(Nugroho et al., 2019). Searches for its application in developing countries yielded no valid result. The need for quality education cannot be overemphasizedas it forms the basis for actualizing many GDP promoting factors.

## 5. CONTRIBUTION OF THIS WORK

The contribution of this paper is in presenting a conceptual framework with which the holographic visual learning system can be easily deployed, while giving room for adaptations from various frameworks, some of which has been discussed in this paper. Visualized learning will go a long way to ensuring comprehension of complex topic and also use of various sensory faculties results in lasting knowledge retention and skill building.

### EndNote/Copyright Status

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