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Developing "Vision-for-Learning" Competencies among Teachers in Tanzania —An Innovative Higher Education Initiative

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Abstract

In Tanzania, many children do not master basic reading skills even after a number of years of school. One of the causes of failure in children's learning to read is impaired vision. Intact visual capacity is an important prerequisite for print reading as well as learning in general. However, countries that do not have mandatory vision screening for children place children at risk of their visual needs not being met. There is evidence to show that teachers can be effective vision screeners. And teachers are ideally placed to intervene with vision-guided educational practices to improve children's reading and learning. As part of the project *Securing education for children in Tanzania*, we conducted a blended learning course for 30 teachers and college faculty over the course of two consecutive years, (15 each year). The course participants attended a unique 30-credit post bachelor's degree Continuing Professional Development (CPD) course called *Vision for reading and learning*. This course was arranged by the Western Norway University of Applied Sciences with the Patandi Teachers' College of Special Needs Education, Tanzania, and the University of Applied Sciences, Koblenz, Germany. Through an innovative combination of content and teaching strategies, the goals of the course were to improve knowledge and skills in the area of visual development, to learn skills of vision screening and vision intervention as well as to raise awareness about the relationship between vision and learning. The course success was evaluated on the basis of academic results at the end of the course and on a questionnaire answered by course participants about the usefulness of knowledge and skills learnt and their applicability in real life. The results showed that teachers can, with training, become successful vision screeners and interveners and that a higher education blended learning course is a potential tool for future training in this area.

1. Introduction

As a rule, teachers are educated in vision competencies with a view to providing special needs teaching to children who are blind or have low vision. However, recent insights into the central role of vision in learning have shown there is a need for a broader focus on children's vision in classroom teaching (Hallahan et al., 2019, 2020; Wilhelmsen, 2012; Zebehazy & Lawson, 2017). In 2016, the Western Norway University of Applied Sciences (HVL), Bergen, was awarded project funds for *Securing education for children in Tanzania* (2017-2021) by the Research Council of Norway (NFR in cooperation with Innovation Norway and the Norwegian Agency for Development Cooperation (NORAD)). The Patandi Teachers' College for Special Needs Education, Arusha, Tanzania, and the University of Applied Sciences in Koblenz, Germany, were project partners.

In this paper we focus on selected elements from the core of the project, the Continuous Professional Development (CPD) Course *Vision for reading and learning*. The purpose of the CPD course was to give teachers new skills and develop their critical thinking, professional planning and practice (Grieve & McGinley, 2010). It was organized as a blended-learning course which consists of internet based learning and face-to-face elements at Patandi College.

Instructors from Patandi together with teachers and principals from primary schools (n = 30) were educated in the 30-credit post-B.A. blended-learning course *Vision for reading and learning* based on knowledge of how vision influences children's development, learning and reading skills (Sterner et al., 2004; Cyvin & Wilhelmsen, 2008; Wilhelmsen, 2012; Wilhelmsen et al., 2015). There were 7 teachers from primary schools: 1 teacher for intellectual disabilities, 1 for visual impairments and 7 teachers for regular education. There were 2 headmasters of primary schools and 21 instructors from Patandi College: 7 instructors with a specialty in vision impairment, 4 with specialty hearing impairment, 4 intellectual impairment and 6 were instructors in education subjects. Because the prerequisites were very high for the course (B.A. degree and teaching certificate), applicants who applied to the program were accepted.

This course has been taught to teachers in Norway at HVL since 2008 (HiB/Bergen University College, 2014). The curriculum was designed to provide vision assessment and intervention skills to equip teachers in Norway to improve children's reading and learning.

In Tanzania, poor reading skills are a significant problem at the individual level and the society at large (Lyytinen & Richardson, 2014). A multitude of factors determine student literacy in Tanzania (Sumra et al., 2015). In order to address the fact that 70% of all classroom activities involve vision (Narayanasamy,

Vincent, Sampson, & Wood, 2016), this project was intended to focus on the area of vision. Tanzania has limited eye health infrastructure (Mwakyusa et al., 2017) and vision screening in schools is not mandatory (Chan et al., 2017). There are few prevalence studies on children's visual problems in Tanzania. However, a recent study conducted in Mwanza revealed that almost 19% of children in the study group had visual problems (Naaseh et al., 2019). A two-year school eye health project in the Singida region in Tanzania found that 30% of the children screened had a previously undiagnosed vision problem (Lujuo, 2018). Many children in Tanzania never have their vision screened because their parents are unable to take their child for an eye examination with an optometrist or ophthalmologist due to lack of local services, the cost of travel and lack of health insurance. Only 30% of Tanzanians have health insurance (Buguzi, 2017). Children under the age of five, pregnant women and the very poor are provided free health services; however, hospitals may lack the equipment, personnel and medicines to treat them (Grainger, 2016).

To fill this gap in eye health infrastructure and accessibility, the CPD course aimed at training faculty at a teachers' college and primary school teachers in the area of vision for reading and learning. In terms of sustainability, college faculty were seen as particularly important as they teach teachers who then go on to work throughout Tanzania. There is evidence that teachers can be effective vision screeners (Berezovsky et al., 2010; Carneiro et al., 2019; Liao et al., 2018). The goal of this course was to educate faculty and teachers about the importance of children's vision and the need for good viewing conditions in classrooms. Course participants learned to screen visual functions and to plan and administer visual stimulation and education programs and/or refer children to health care facilities, eye clinics or optometrists for further assessment and measurement of need for glasses. Faculty were also taught to teach such content to fellow teachers in the community and students at the college. The contents of the course were presented in a blended learning format, which has become increasingly relevant in higher education over the past years (Mozelius & Hettirarachchi, 2017). Through the combination of face-to-face and online instructional sequences (Graham et al., 2013: p. 5) two central requirements could be met: carrying out necessary face-to-face sessions for instruction and training in visual screening and intervention, and offering working participants high levels of flexibility, so that they could acquire parts of the theoretical contents without time and place constraints.

The International Classification of Functioning, Disability and Health, ICF (WHO, 2014), and the latest International Classification of Disease, ICD-11 (WHO, 2019a), were used as frameworks for the project and for the CPD course. The focus of ICF lies on participation in central school activities. The project had a Memorandum of Understanding with the Tanzanian Ministry of Education and an agreement of cooperation with Patandi Teachers' College for Special Needs Education. Local school authorities entered into an agreement with the

project, with participating schools offering to provide opportunities to program participants for practice periods with pupils on their own school grounds. Parental and institutional consents were obtained for screening and intervention.

Here, the rationale of the CPD course is described and following this the results of the course evaluation are presented.

2. Methods

Two of the authors (Marion Felder/M. F., Gunvor Birkeland Wilhelmsen /G. B. W.) were the main instructors/teachers in the CPD course. One of the authors (G. B. W.) was the head of the overall project. This paper is mainly a descriptive review of the CPD course. The course could be described as a *demonstration project* anchored at institutions of higher education. In addition to a detailed description and analysis of the course, we present here a small empirical study conducted by the authors to evaluate the course outcome for the participants. The authors were directly part of the educational process and the outcome of the CPD course. This paper's focus is the impact of the CPD course on the *participants*, the 30 adults who took the course. The impact of the training on the *children* will be the topic of other papers. The authors of this paper are first and foremost teachers in institutions of higher education. Teacher research is a form of research that is based on the perspective of teachers. Methods of teacher research such as narrative and practitioner inquiry (Craig, 2009) are used to highlight the features of the teaching process and outcome of this CPD course.

The first part of the following section is based on a literature review regarding the educational system and educational outcomes in Tanzania (section 3). The next part (section 4) discusses the importance of vision during learning. An extensive literature search on both topics was done using data bases and scientific search engines. These sections are followed by a detailed description of the CPD course *Vision for Reading and Learning* (section 5). This is based on the project goals and objectives and a critical analysis of the teaching methods employed in the course, particularly the blended learning strategies. Finally, the course evaluation (section 6) is presented based on the completion rate for the course and a semi-standardized questionnaire for the participants. The article presents a conclusion in the final section (section 7).

3. Education Challenges in Tanzania

Ever since independence in 1964, education has played an important role in Tanzania (Unicef, 2017). Children attend two years of pre-primary school, and six years of primary school, followed by four years of secondary school and two years of advanced secondary school (Sumra et al., 2015). All levels except for the advanced secondary level are free of charge.

However, the quality of education in Tanzania is a significant problem. Uwezo Tanzania (2013) states that there has been no evidence of change in learning

outcomes in East African countries, including Tanzania, since 2009/10. In Tanzania, six years' primary education is mandatory, but many children demonstrate poor reading skills even after finishing primary school. Less than half of young people pass their final exam from primary school and are thus deprived of opportunities to obtain further education or qualify for employment. The average student-per-teacher ratio in Tanzania is 48:1, but in some regions, there are 130 students per classroom/teacher. On top of this, more than one million children do not attend school or drop out of school (El-Noshokaty & Gebert, 2017). The teacher-student ratio in pre-primary classrooms is up to 169 students per teacher. In private schools the ratio is 24 students per teacher. Children are often unprepared for primary school due to a lack of access to proper stimulation, poor nutrition, and poor quality of pre-primary schools. The outcome of schooling is problematic, and many children do not graduate from secondary school.

Although conditions are similar, educational attainment varies across districts (Sumra et al, 2015). This may point to the importance of the quality of teaching and perhaps teacher training. There are many societal reasons for low educational achievement (Joshi & Gaddis, 2015) but it is possible that the absence of vision screening and lack of subsequent intervention leads to significant problems in learning, reading, and academic achievement in general and, as a consequence, professional attainment (Juggernath & Knight, 2015).

4. Vision and Learning

In low-income or middle-income countries, visual impairment (VI) is most often the consequence of uncorrected refractive errors, such as near-sightedness or far-sightedness, which can be remedied with eyeglasses (WHO, 2019b). However, other visual functions including intact ocular motor functions also play important roles in reading and learning processes (Sterner et al., 2004; Christian et al., 2018), as will be described in the following paragraphs.

Intact visual functions are essential for reading and writing. Although education is not a part of a health care system, many countries use the WHO's classification of visual impairment to determine which pupils should get services and education in school. ICD-11 now classifies visual impairment as Visual Acuity (VA) below 0.5, or 20/40 in when measured in feet or 6/12 when measured in meters, with best correction. This means that a child can see a symbol clearly from a 20 feet (6 meters) distance that was expected to be seen at 40 feet (12 meters). ICD-11 (WHO 2019a) now also classifies problems in areas such as eye ocular motor dysfunction, as *Vision Impairments Unspecified* (9D9Z) and for the first time reduced near VA at a reading distance is classified as visual impairment. These are changes from previous editions of the ICD and are likely to make it easier for children to obtain interventions for visual problems affecting learning that are not primarily a problem of distance VA.

For educational purposes, VA is important for seeing details close up and at a

distance. Ocular motor control including accommodation and convergence abilities, are fundamental for reading (Lions et al., 2013; Metsing & Ferreira, 2016). When the eye lens adjusts from looking from far to near and vice versa, it *accommodates*. In the event of any disturbance in this function, children may experience blurry vision and become unable to read from the blackboard and copy information in their books. Accommodation problems may be one reason why children have good VA at distance but not close-up. To rule out accommodation problems it is therefore important to measure near VA and far VA.

Convergence is the action where both eyes focus on the same image. If they do there is binocular vision. This is necessary in all activities to prevent the child from having double vision. Binocular vision is important for focusing, scanning, tracking and for effective eye jumps (saccades) from one position to another. These activities are essential for efficient and accurate reading. Children also need to have an intact *Visual Field*, where they are aware of and have visual attention on objects and people peripherally. In reading, this includes rapidly anticipating the next letter, the next word, and the length of the text line. Even good eye-hand coordination for writing and the ability to see colors are essential for learning.

Distance VA is often the only vision measurement taken in school screenings (Sathyan, 2017), but it is necessary to evaluate more than this. Balanced and stable accommodation and convergence are required to reach a functional near VA; for effective reading, good binocularity and intact attention are necessary in the visual field in order to manage precise saccades. All visual functions are connected in a visual cycle where eye motor capacities influence sensory and perceptual functions and vice versa (Daw, 2006; 2009). Even tiny ocular motor disturbances can affect concentration, attention, endurance, social communication, reading and writing and motoric activities, and negatively influence the ability to manage assigned tasks (Garzia, 2006; Sterner et al., 2004). Improved vision thus has a positive impact on motor functions and social activities (Cyvin & Wilhelmsen, 2008; Wilhelmsen, 2010; Wilhelmsen et al., 2015).

Visual capacity develops throughout childhood and relies on stimulation (Black et al., 2008). Vision is therefore a *learned* process (Gislén et al., 2006; Huurneman et al., 2013; Cyvin & Wilhelmsen, 2008; Wilhelmsen et al., 2015), something which makes teachers responsible for providing stimulating environments and interactions. Children need an environment that provides sensory stimulation, including the visual sense, from an early age (Fundamentally children, 2015). Parents and teachers need to interact with children in developmentally appropriate ways, playing with them using toys and books, which are naturally visually stimulating. Stimulating children visually sets them on a path for creativity, curiosity and imagination (Fundamentally children, 2015).

All teachers, even if they are not trained to screen children's vision, can become good observers of any problem children may have in their visual development. They may note changes in the appearance of the eyes, the pupils' behavior

or learning problems that may be indicative of a vision problem (Prevent Blindness North Carolina, 2015).

This indicates that all teachers need to be aware of the fact that vision is a learned process, that proper stimulation can support and influence this process and that teachers can learn to identify signs which may indicate that a child has visual problems.

Of particular importance for the rationale of the CPD course is research that shows how visual capacities can be improved through teaching (Wilhelmsen, 2000; Zihl, 2000; Opsal, 2012) and that reading improves by means of teaching visual skills (Powers et al., 2016). There is also evidence from the field of behavioral optometry that training improves ocular motor disorders (Ciuffreda, 2002; Kaplan, 2005; Lane, 2005; Rouse, 1987).

5. The CPD Course Vision for Reading and Learning

State schoolteachers and principals together with instructors from the Patandi Teachers' College (n = 30) participated in the CPD course. All participants held a bachelor's or master's degree from an accredited institution in Tanzania. None of the participants had had any thorough training in visual development or screenings of visual functions such as near and distance VA or any other visual function. Vision screening in most cases only means testing for distance VA. Given the fact that other disturbances cause such problems in learning, it is important to screen for all the visual functions mentioned above (Sathyan, 2017). So, the participants of the course learnt to screen also for other visual functions (see below for more details).

Of particular importance for the rationale of the course is research that shows how visual capacities can be improved through teaching (Wilhelmsen, 2000; Zihl, 2000; Opsal, 2012) and that reading improves by means of teaching visual skills (Powers et al., 2016). There is also evidence from the field of behavioral optometry that training improves eye motor disorders (Ciuffreda, 2002; Kaplan, 2005; Lane, 2005; Rouse, 1987).

During the 30-credit course, which was divided in two phases, Figure 1, the students were going to be qualified for educational work with children, with vision disturbances and afterwards have knowledge of:

15 credits
•The anatomy of vision, vision development and educational assessments of vision disturbances for reading and learning
•Two written assignments & one exam

15 credits
•Introduction to vision teaching working methods and principles in education of children and youth with vision disturbances
•Two written assigments & one exam

Figure 1. The CPD-course Vision for reading and learning was divided in two 15 credit phases each ending with an one week home exam.

- the anatomy, physiology and neurology of vision;
- the motor functioning of the eyes;
- the sensory qualities of vision and visual perception;
- frequent vision disturbances due to different conditions, illnesses and injuries;
- the importance of intact visual functions for reading and learning;
- how to recognize signs and behaviors in children which may indicate visual problems;
- how to screen for visual function problems;
- how to optimize visual functioning with optical aids, light, colors and contrasts and educational interventions.

In summary, the goal of the 30-credit course was to qualify students to screen and stimulate basic visual qualities important to reading and learning. Topics such as child development and how to design developmentally appropriate activities for children, children's rights, inclusion in education, motivating children and the importance of listening to children were embedded into the classes throughout the entire course.

The course consisted of theoretical content and practical training at a partner school.

The course lectures and classes (theoretical content) were held at the college in Arusha and were taught by professors from HVL, Norway (G. B. W.), and the Koblenz University of Applied Sciences, Germany (M. F.). The professors were experienced teachers and researchers in the field of VI and the visual sciences. Four colleagues from the participating Tanzanian college who had successfully completed the first-year course assisted in the second course, giving lectures and hands on supervision during the practical training with pupils. This also gave them experience in teaching the contents of the course. In addition, close 1:1 supervision was provided throughout the course by vision professionals who had previously completed the course in Norway. The CPD course was partly internet-based but included three weeks of face-to-face teaching each semester (this method is also called blended learning). The program required students to have access to the internet and be able to use computers and go online. Internet access was sometimes problematic, thus the instructors and professors worked individually with students on their internet problems. Internet access was provided by the project to the college, so participants of the project also had better internet connections when they were physically at the college. Many students used their phones to have internet access at home. The language of instruction was English.

The practical training sites (one school for each 30-credit cycle) were selected on the basis of their location and prior collaboration with HVL over several years, specifically teacher training and teaching practice development for teacher students from HVL. The schools selected were state primary schools located in Arusha and had about 1000 pupils.

In the following paragraphs we will describe the course in detail.

5.1. First 15 Credits of the Course: The Anatomy of Vision, Vision Development and Educational Assessments of Vision Disturbances for Reading and Learning

The first 15 credits of the course focused on a broad spectrum of visual functions and a practice phase at the partnering school. The theoretical content included lectures on eye and brain anatomy, vision development, testing and assessment of vision disturbances and the functional consequences on children's development, learning and reading. Table 1 gives an overview of the contents taught and elements of practical screening in the program.

Participants also learned to conduct interviews with children, parents, teachers, and health care providers to gain information about a child's visual abilities and to observe a child for possible vision problems. An assessment of the classroom environment, i.e. light and seating conditions, noise level and legibility of information on the board, was included in the course.

During the theoretical in-class part, the students had to write about relevant research within a subject-specific topic. These had to be accepted before entering the practice phase.

First Practice Phase in Participating Schools

All students were required to carry out hands-on visual function assessment with standardized and non-standardized assessments. The screening phase took place for 1 week at a partner school. Altogether 60 children were screened in 1 week.

Screening in the schools was done under the supervision of experienced vision teachers and researchers from the project team over a one-week period. Prior to screening in the schools, the students had trained on each other, family members and some invited children. Some of the visual functions screened with the corresponding standardized tests are presented in Table 2.

The tests employ symbols that can be used with children regardless of their cultural background.

Table 1. Areas of lectures in the first 15 credits of the course and the elements of practical screening and testing.

Areas of lecture	Practical screening and testing
• Stages in the development of vision among children	• Standardized tests for: visual acuity, color vision, contrast vision, visual attention, the sighting eye
• Visual activities: eye motoric/movements (monocular and binocular vision), adaptation, visual acuity, field of vision, visual attention, color vision and visual cognition • Visual elements linked to different daily activities	• Eye motoric elements: accommodation, convergence, binocular vision, eye movements in searching, smooth pursuits, saccades and fixation.
• The impact of vision on motor, linguistic, cognitive and social development	• Reading skills • Signs to observe by vision problems

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Table 2. Vision functions that students had to learn during the screening period and the tests or methods used.

Vision functions	Tests
Visual acuity for near and far	LEA-test for 40 cm and 3 m (both with 5 symbol lines)
Accommodation	Conventional push-up method
Convergence	Conventional push-up method
Stereo vision	Stereo Acuity Test (Fly)
Smooth pursuits	Following an object in all directions
Binocular vision	LED Three Character Test
Color vision	Ishihara color vision test
Eye dominance/Sighting eye	Hole-in-the-card-test

The screening for these functions took place in two classrooms, at dedicated stations, where the tests were administered. Each student stayed with one test for one day to gain experience as pupils rotated through the stations. The students had to record results on prepared data sheets.

After the first practice phase, the students had to write about one of the cases they screened and describe visual challenges by using the theory presented earlier. Later they needed to pass a qualifying exam, arranged as a home-exam for one week, to move on to the second part of the course, the next 15 credits.

5.2. Second 15 Credits of the Course: Introduction to Vision Teaching Working Methods and Principles in Education of Children and Youth with Vision Disturbances

The second 15 credits thus gave an introduction into the foundations of vision teaching methods concerning education and stimulation of children with vision problems (Lane, 2005). Examples of activities include activities such as engaging children are presented in Table 3.

The theoretical foundation of vision teaching methods was critically explored. Theories and methods on designing a visual environment conducive to learning and networking with other professionals, such as vision and eye health professionals were presented.

Participants had to pass an exam at the end of the theoretical part to begin their 2nd practice phase with pupils in schools.

Second Practice Phase in Participating Schools

The intervention phase took place over a three-week period. Each participant was paired with two pupils selected based on visual problems identified during the screening process by the vision scientists. The selection of pupils was dependent on the possible improvement of visual functioning through educational efforts. Pupils who were discovered to have significant refractive errors and/or significant visual impairment were immediately referred to the eye health system for treatment.

Table 3. Activities the students had to develop and include in their vision lessons

Activities	For stimulating and trigging
Looking far to near monocularly and binocularly due to individual needs. Done on shorter distances (like 60 - 10 cm from the eyes) and longer (like 4 m - 10 cm).	Accommodation and convergence
Keep head steady and look at pop-up elements Monocularly and binocularly due to individual needs. Mostly done at near, but also combined with elements on a longer distance.	Saccades
Fixate on an object but be aware of elements in the periphery. Also, monocularly and binocularly.	Visual attention
Following moving objects or scanning material on a table or a screen.	Smooth pursuits

Participants taught their pupils for one hour each day individually. Lessons were planned after identification of vision problems in the screening and consisted of stimulating visual activities such as looking at objects from near to far and vice versa (see Table 3), focusing on an object, following objects visually, tracking, scanning, matching, sorting, identifying visual details and other activities. These activities were performed monocularly or binocularly depending on individual vision disturbances. Each child was engaged by its teacher in activities which changed in level and pace in accordance with the child's performance and development.

Participants talked with children about what they see, to stimulate their visual perception, visual discrimination and visual memory through games and structured exercises with a variety of age appropriate materials. Puzzles, mazes, building with blocks with and without models were some of the activities that teachers did during the practice phase. Children also participated in structured activities to stimulate their near and distance vision. They were involved in coloring, writing, counting at a reading distance but also copied text and attended to materials from further away. The participants became creative in designing exercises from everyday materials to stimulate visual capacities. Regular school materials and content were used in activities. In order to monitor progress, teachers took notes and recorded data on each lesson. On the last day of the intervention period, another screening of the pupils took place to give the participants more hands-on screening practice and to compare results pre- and post-intervention.

The evaluation of the students' second part included a case report of the two pupils they had followed using both the training results and theory. In the end of the semester the students had to pass a qualifying exam, arranged as a home-exam for one week.

5.3. Teaching Methods in the CPD Course

On campus at the participating college, there were lectures, student activities, discussions, and practical work in groups. The part of the education which took

place at the college developed the foundation for working with theoretical and practical exercises to be done when not on campus. The students were encouraged to create networking groups and communicate online between the meetings amongst themselves and with the instructors. Students were required to give oral presentations of their work and to complete three individual, written assignments. Guidelines were provided for the written assignments.

It's learning is the online platform used at HVL. It was obligatory that the students use this platform actively. This is a well-established platform and it was thus possible to avoid many of the problems that often adversely influence blended learning settings (Mozelius & Hettirachchi, 2017: p. 43).

The students were expected to familiarize themselves with *It's learning* following an in-depth introduction; they were required to have access to a computer with an internet connection. Assignments were supervised via the platform; however, many participants had difficulties accessing the platform due to internet connectivity problems and other forms of online communication, particularly WhatsApp and email, were therefore also used.

It was expected that the students present academic material for their fellow students, participate in discussions and contribute with reflections of actual problems discussed. They had to take responsibility for and be active in their own learning.

Based on research about critical elements of blended learning (Mozelius & Hettirachchi, 2017), a limited amount of materials was provided on the platform to avoid cognitive overload. In addition, the participants received continuous feedback on their performance and progress.

Participants were required to contribute to a positive learning environment. When presenting individual or group work, orally or in writing, it was important to show how and from what sources the information was collected. Parts of the curriculum were presented in lectures, while other parts were designed as self-study. The division into the various settings followed educational and didactical considerations and factored in knowledge from CPD courses previously taught in Tanzania (Mtebe & Raphael, 2013). It was highly recommended that participants study the literature recommended by the instructors in addition to doing their own literature searches using search engines via HVL's digital platform. The students had to read one academic textbook in English, which was provided by the project and used throughout the course.

Instructors used methods such as lectures, demonstrations, hands-on learning, quizzes, presentation and joint analysis of case studies, role-taking, student feedback and discussions for instruction throughout the course. Theory-practice transfer exercises were imbedded in all activities, so that the participants were best prepared for the actual practical work with children in schools. Participants had to do vision screenings with fellow participants of the class and also with members of their family or friends and present those outcomes to the class. They also had to practice intervention skills amongst each other in class (i.e. teaching

someone to focus, track, scan etc.).

Student feedback and critical thinking about all aspects of the content and format of the classes was always encouraged. An approach of teachers as researchers was fostered throughout the course by encouraging critical questions, discussions and collecting data.

Instructors were also flexible concerning lecture times, allowing due consideration for the participants' workload and family responsibilities. All participants were full-time working parents of young children. Course instructors were available for students via WhatsApp and consulted with them on solving individual problems such as lack of internet at home or time constraints. Relevant literature, especially recent research, was shared with the students regularly on the platform and through email. As part of the three-week sessions on campus, two to three events were held at which students presented their practice cases and case analyses.

6. Evaluation of the Course

The success of the course was measured by how many participants successfully completed it, and whether it met its objectives specifically, that participants improved their knowledge about vision, vision screening and intervention and whether they applied new knowledge in real life, in their school or college, following the end of the course.

6.1. Course Completion and Outcome: Results

All 30 participants successfully completed the course and received the 30 credits from HVL. Those credits may now be applied towards a master's degree in Norway or in Tanzania. The project also funded 5 participants to pursue their M.A. degrees at Universities in Tanzania. Those 5 participants completed their M.A. degrees with a focus on vision and visual disturbances. In addition, 2 PhDs were funded, also with a main focus on vision. One participant, a former teacher, became a principal at a school. Another former teacher now works within the department of education in Tanzania. Another participant became the director of another teacher college. One former teacher has been dispatched to work for an international agency to do vision assessments in remote areas of Tanzania. All participants continue to work in education in an array of roles.

6.2. Participant Questionnaire: Method

In 2020, the participants completed a semi-standardized questionnaire investigating the impact of the CPD course on their knowledge, skills, attitudes towards children and learning and their role as teachers. Seventeen of the 30 participants (57%) completed the questionnaire, which consisted of yes/no and open-ended questions. The questionnaires were anonymous. The questionnaires were distributed at a meeting following the completion of the entire CPD course. Not all of the 30 participants were able to attend this event because of professional and

personal responsibilities thus the low number of returns.

Open ended questions were evaluated by the authors. From the answers, the authors identified some emerging themes. Direct quotes from the questionnaires are used to highlight some of the themes. The results are described below.

Results of the Questionnaire

Question 1: Have you done any visual assessment of school children after you completed Vision for reading and learning? If yes, how many? If no, why not?

Fourteen of the 17 respondents (82%) responded that they continued to screen children after the course was finished. The number of children screened ranged from two to 47. Some participants also screened adults. Three respondents did not undertake any screenings after course completion. Reasons given were work pressure, time constraints and lack of funds. One participant mentioned that she carried out screenings in her free time and was planning an assessment center in the health center at her school.

Question 2: Are you currently doing any vision-training of children? If yes, how? If not, why?

Seven out of 17 respondents (40 %) answered that they did vision training, i.e. structured vision-related activities with children. One participant said that she engaged in vision stimulating activities with the entire class.

The 11 participants who did not do any intervention gave the following reasons: rigid timetable, lack of funds and time, job changes, competing responsibilities at school, being busy. One participant did not carry out any vision training herself but taught a parent to do it with their child.

Among the 17 participants were also college instructors. Even though they did not do any vision training, they now teach parts of the course content in the curriculum for special needs teachers and pre-service teachers. They also mentioned that at this point, because of other responsibilities at the college, they could not work directly with children.

Question 3: Do you think the knowledge from "Vision for reading and learning" is useful for your work in any way? Yes how? If not, why?

All 17 respondents answered that the course was useful for their work. Here are some excerpts from their answers:

"It is so useful for me because I apply it directly to my children in the class every day. I always announce to all children in my school if they feel changes in their vision to consult me. Some of the parents came to ask about vision screening and training."

"It is useful because it has helped me to recognise those pupils who have vision problems and I know where to place them in class."

"Very useful, in fact, the knowledge should be given to all education professionals, it is very useful because children are termed as slow learners while it is vision disturbances which hinder them from performing in school."

"Very useful in my daily teaching and preparation of student teachers, es-

pecially pre-service teachers. It is also useful for the assessment centre because I normally receive referrals from KCMC (regional eye care hospital) and Patandi Hospital to screen children's vision and hearing."

Other teachers found the knowledge useful because they began to train teachers at their school and assisted pupils. They learned to identify learners with visual problems and how to address these problems. Some also use the knowledge in their own communities with adults and they now know where to refer them to for further treatment. Teaching and educational approach in general were enhanced, as was their ability to instruct other teachers. Some special needs teachers found this course useful for their special needs' population, especially for their students with albinism.

Question 4: Had the course any influence on your attitude towards children and children's learning? Yes, how or no, why not?

All 17 respondents answered that the CPD course had a positive impact on their attitude towards children and learning. Some example statements:

"It added and provided me with more courage and positive thinking towards educating children with special educational needs."

"It influenced me a lot especially children with intellectual impairments. It is so important to understand their vision and how they use it to learn. Sometimes a teacher may think a child fails to learn something due to their brain damage but it may be vision. So, it is important to me to be aware and make follow up to children's vision."

"Much! Most of the time when children are struggling with learning we cannot know the struggle and the impact, but after this course I now know how to help my students."

Question 5: What are the three most important things you learned in Vision for reading and learning?

All 17 respondents answered this question. There were two themes that featured consistently in the answers: teachers had learnt much about vision in general and about vision screening and intervention.

Question 6: Did the course give you new perspectives or even change you as a teacher in any way? If yes, how?

All 17 respondents agreed that this course had changed their perspectives as a teacher.

Sample answers:

"Absolutely, the course brought me to a new world of changes. I came to realize that disability is not inability through this course I learnt many things about vision."

"Yes. Because most of the children in different classroom did not perform well due to lack of early identification of children with vision problem so it helpful to convey knowledge to other student teachers."

Question 7: Other comments

All participants commented here, with two themes emerging: all teachers should have this knowledge and continuing education and offering a master's degree in this area would be good.

> "The course is very useful. It should be given to other tutors in all teachers' colleges in Tanzania. Because the students graduating in those colleges are the ones who are going to help children all over Tanzania."
>
> "All beneficiaries of this course should be advised to make sure they impart this knowledge on other teachers."
>
> "Introduce a master's degree in Vision for reading and learning or any other related class at the master's level."
>
> "It is good for parents and other member have awareness on vision disturbance so that are able to help them in one way or another rather than judging them negatively. All teachers should have knowledge on vision disturbance so that they treat them fairly"

6.3. Discussion

The CPD-course *Vision for reading and learning* conducted in Arusha, Tanzania, educated college faculty and teachers in the area of vision. The evaluation of the participants' experiences show that the course was important for their work as teachers and college instructors. Unfortunately, only 17 of 30 participants completed the questionnaire, therefore any conclusions about the outcome of the CPD course have to be regarded with caution.

However, looking at the answers of the questionnaire, in **Question 1**, most of the participants continued with the screening after the course, keeping up the new skills learned; however, some difficulties were mentioned, such as time constraints. In **Question 2**, it was shown that the Intervention, 1:1 instruction with an individual child, was more difficult for most respondents due to time and role limitations. They all found the knowledge useful and it influenced their attitude towards children's learning positively (**Questions 3 and 4**). The participants learnt many things about vision, most of them exactly what was intended with the CPD course: to learn about the importance of vision in learning, the visual system, the consequences of disturbed vision functions, vision screening and intervention (**Question 5**). In **Question 6**, respondents voiced many reasons why the course had changed their perspectives on teaching; what stands out particularly is a change in attitude towards children who exhibit learning problems. In the last question (**Question 7**) many of the participants wished to continue with continuing education courses in the area of vision, including at master's degree level.

Only 40% of the respondents were actually able to work with pupils on a 1:1 basis for intervention in real life, due to time constraints and the financial situation of their school. As mentioned in the beginning, Tanzanian classrooms are crowded and teachers' focus is on academic learning. Yet there is not a specific role or time nor space for teachers to work with individual pupils. One teacher

mentioned that she was doing more whole-group intervention and stimulation exercises with her whole class. In Tanzania whole-class teaching is central (Hardman, Kadir, & Tibuhinda, 2012) and teachers therefore have to be equipped with strategies that they can use in that setting. Currently one of the PhD students in the project is investigating such group/class methods.

The questionnaire was given to the participants upon completion of the course. It remains to be seen whether the participants will be able to use the skills and knowledge in the long term. Follow-up research would be important. Given the results of the questionnaire the attitudinal changes and the greater awareness about the importance of vision may have the most lasting impact since those aspects are not dependent on outside funding or services but may be internalized and impact their beliefs as teachers and thus their teaching practice.

7. Conclusion

The CPD course *Vision for reading and learning* was a higher education initiative conducted with multiple organizations. In our opinion, all teachers should be taught about the complexities of the visual system and how it influences reading and learning in school. We were able to demonstrate that teachers can learn to identify visual problems, screen children's vision for functional disturbances in the area of visual acuity, accommodation, convergence, ocular motor control and color vision. We showed that a CPD course arranged in a blended learning model is particularly effective in equipping professionals with knowledge, skills and experiences. Through the combination of necessary face-to-face course units and online sequences that are flexible in time and space, high quality continuing education is possible for educators in Tanzania. Through the close link between theory and practice, teacher students developed their commitment, understanding and skills (Grieve & McGinley, 2010). Although some adjustments were necessary as part of this project, the experiences were similar to those reached through the course in Norway. Because of the differently equipped classrooms, number of pupils in schools, different teaching practices, different teacher education and resources in Norway and Tanzania, participant knowledge and their situation were different. Thus, the teaching process during the CPD course required tailoring to individual participants' needs and strengths without sacrificing the high-level content.

However, in order to provide system-wide vision screening and intervention so all children benefit from it, improving teacher education alone is not sufficient. Further research has to identify country-specific and systemic challenges and solutions that work best in a given context.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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