Knowledge - Use of Technology and Teachers' Professional Development as Correlates of Successful Intelligence among Students with Physio - Emotional Disability

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Abstract: *This research examined teachers' professional development and knowledge of technology as correlates of perceived successful intelligence among students with physio - emotional disability. Successful intelligence is that knowledge which helps adult citizens, given their ability, to be effective and self - reliant in their given society. Animated, mobile and recreational appliances constituted the technologies in the study. Mixed methods of correlational and quasi - experimental designs were employed for the study, using teachers' and students' factors. Students with physical and emotional disabilities in the Education Zones of Nnewi and Onitsha in Anambra State, and Oji River in Enugu State were specific targeted population samples. The nature of the study prevailed on the researchers to use convenience sampling technique to select the studied population (N = 64). Categories of spinal bifida = 11%, cerebral palsy = 16%, visual impairment = 20%, hearing impairment = 23% and other 30% comprised the sample. Findings revealed a negative correlation between teachers' professional qualifications and students' perceived successful intelligence attainment (r = - .774, N = 64, p - value <.000). The researchers also found that boys with disability were more interactive than girls, and believing that their education assures successful intelligence upon graduation. More analyses revealed that 83% of the students did not see their physical or emotional disability as impediment to successful intelligence, while 17% believed that their disability would hamper them in contributing to and benefiting from the society. The researchers' major recommendation is that teachers should be trained to use students' defined technology in their professional development, in order to train students with disability in successful intelligence.*

1. Introduction

Education is seen as a tool for enhancement of life and in the development of societies. Hence, education, as done in school, is believed to be a strong instrument for social, economic and political transformation and change. The unspoken reason for educational systems and endeavours of any given society is to develop thinkers who will eventually become the society's problem solvers and thinkers. Students are trained to be able to use the knowledge they receive in school to solve their real life problems while in school and when out of school. It may sound redundant to say that education is the most essential ingredient in the development and empowerment of individuals. It may sound critical here to say at this junction that any education in this milieu devoid of technology is like setting the intellectual clock of the students backwards. Technology has become an indispensable tool in the education of citizenry. Meanwhile, teachers are aware that not everything called technology is used in the classroom. The question worth asking is what type of technology is needed in the teaching and learning exercises? Is it the technology as needed by the teacher to make teaching enhanced, or is it the technology as needed by the learner to make learning enhanced? If learning is to be learner - centered, technology use in the classroom makes more meaning in its use if it is tailored to suit the learner and enhance learning.

Teaching with students' defined technology, irrespective of differences in socio - economic status, 'abilities' and 'disabilities' could make education moresupportive ((Praisner, 2003; Ahmad, 2014). Akpan and Beard (2013) added that the purpose of education is to provide equal opportunity to all students so that they can become productive and contributing citizens in the society given their individual abilities. To improve and achieve educational goals in their respective educational settings, students with disabilities need to be provided with assistive tools to compensate for the lacked resources and facilities (Akpan & Beard 2013). This goes to suggest that assistive tools used for students with disability need to be "additive" – meaning that the *component aspect of the disability* is considered for addition when designing whatever technology that should be used in the delivery of subject matter. Otherwise, learning will become nonsensical for students with disability if usual technology for the typical students is used. Tangential to this is that the professional certification and development of teachers of students with disability need to be tailored to suit the disability of the learners instructed.

Teachers' professional development includes certification in domain field as well as continued improvement through formal in - service training that is believed to upgrade their pedagogical content knowledge. The higher the level of education, the more sophisticated should the teachers' professional development (Onukafor, 2019). This development is expected to be regular no matter the level. It is an important means of improving teaching and learning. According to Demonte (2013), professional development that is central to lifelong learning is that which supports teachers' continued training to improve students' learning. Learning implies teaching, and teaching well implies continued learning well.

Professional development includes when teachers investigate their practice to construct and reconstruct their

own theories of teaching. Pitsoe and Maila, (2012), Udoye, Odikpo and Onyeocha (2017), and Onukafor (2019) are of the opinion that professional development provides teachers with opportunities to acquire and explore new skills, develop new instructional strategies, refine their class room practices, and broaden themselves as educators. Ahmad, (2014, 2015) and Udoye, Odikpo and Onyeocha (2017), believe that teacher professional development demands a shift in attitude, availability and accessibility of infrastructure, pedagogy, need - based methods and materials for instructional delivery, assessment and evaluation.

Successful intelligence, at any level and for any group, involves a totality of development in the human intellect, skills and character for efficient adaptation. In this 21st century, technology has become an indispensable aspect of this totality of development. Technology has huge potential to enhance professional development in line with its analysis and its focus on *practicality, specificity and continuity* (Udoye, 2007). Learning can be given a *practical* quality, for example, when videos are used to show students with disabilities what other students of their like could do. Mobile technology, another example, makes a range of school - based learning easy and possible for students with physical disabilities.

Purposeful reflection about *specific* subject - related pedagogy can be enhanced by giving teachers access to comprehensive digital materials related to the school curriculum. For students with disability, technology can provide cost - effective ways of supporting and coaching relationships. Professional learning communities could be tailored to suit being in a place within a framework of *continuous* and sustained reflection (World Bank, 2018).

Technological knowledge (TK) is constantly shifting in its intensity of challenge. It is challenging due to the speed in its advancement and operative change. This challenge due to advancement should, instead, become an advantage to students with disability if technology is tailored to suit their individual disability need. A recent explanation of TK suggests that teachers with TK understand information technology enough to apply the use of it to their professional lives. TK is not a *g - knowledge*. It is specific, particularly when applied to an individual's professional development. Professionals know when technology should be used to achieve a goal, and adapt to constant changes that take place with regards to knowledge in their given profession (Koehler, Mishra & Cain 2013).

Teachers who acquire TK use technology skills to accomplish teaching - learning tasks in different ways. For students with disability, TK makes more meaning when their teachers use technology in helping them achieve successful intelligence. Knowledge of technology is another way of being aware of the assistive tools that can help students with physical and emotional disabilities to participate successfully in and outside the classroom. In the classroom, life outside the classroom is modelled for the students with disability. Ability to successfully teach this model and effectively impart the knowledge of the subject - matter accorded to the model makes a teacher an expert or not. If

one claims to be an expert with knowledge - use of technology, yet the one cannot help the class he/she instructs with technology, then that knowledge is un - productive and ineffective as far as these students are concerned.

There is a great need for teachers of students with disability, more than anyone, to upgrade themselves from time to time through conferences, seminars, and the like. The pedagogical content and knowledge (PCK) surrounding the needs of students with disabilities should be evident in the planning and implementation of lessons. The PCK for students with disabilities Teachers should acquire knowledge of new skills, and the use of assistive and rehabilitative technologies to aid students with physio - emotional disabilities in the classroom and at home. These do help such students to compensate for certain impairments. For this research, the following disabilities were studied among students in their special education schools: *spina bifida, cerebral palsy, visual impairment, hearing impairment,* and *other impairment* not classified. For greater understanding of general readers the researchers decided to describe spina bifida and cerebral palsy. Visual and hearing impairments are commonly understood by definition of their names.

Spina Bifida (SB) is a birth defect that affects the development of the spine and the brain (the central nervous system). It is complex as it is a disability that affects systems. The degree of damage to the brain, spine and nervous system is different from person to person. Like other disabilities studied in this research, spina bifida influences academic life of students such that the individualized education plan is needed (Krieger Institute, 2009). Students with spina bifida have definable degree of paralysis and often need to use wheelchairs. Bladder and bowel function are sometimes affected.

Cerebral palsy (CP) is a disorder that involves lack of muscular coordination. It may result in shaking and unclear speech. The most common cause of cerebral palsy is lack of oxygen at birth. Special computers are useful in helping children with this disability (Santrock, 2011). In CP, dysfunction of muscle control prevails, which can lead to spasticity or shifting muscle tone. Activity limitations affect mobility tasks such as dressing, walking, lifting of arm/hand, and in self - care activities (Diwan, Rathod, Ganatra & Vyas, 2014). The most commonly defined impairments in CP include muscle tone, muscle weakness, loss of selective movements, postural control, sensory and perceptual impairments (Margret, 2001).

To successfully deliver classroom curricular, promote learner growth, and meet the goals of all students with disabilities in their special classrooms, teachers must have basic but specialized understanding ofthe unique learning needs of all students related to use of technologies. According to Danene (2018), if a child with visual impairment is assigned to a special school with other children, the classroom teacher should ascertain the child's degree of vision loss for use of assistive technology. For instance, in a setting where students rely on audio cues such as recorder, teachers must explore other alternative to voice in order to meet the educational needs of such learners with

visual impairments. Knowing the degree of a child's vision loss assists in determining, selecting, and using specialized technology accommodations needed within his/her educational setting. Teachers who teach students with physical disabilities such as visual and hearing impairment should understand that these bring emotional imbalance and associative feeling disorders. Use of assistive technology in writing reports, in training and in assessing the students, go a long way in helping these students achieve successful intelligence (Danene, 2018).

Successful intelligence is understood as that preparedness that enables learners to adapt to, shape and reconstruct their experiences and environment to attain personal and societal goals. Successful intelligence is a concept that derives from Sternberg's triarchic theory of intelligence. Successful intelligence is the kind of intelligence used to achieve individual goals, irrespective of group differences among atypical and typical students (Onukafor, 2019). According to Sternberg, (1997a) people who succeed, whether by their own standards or by other people's, are those who manage to acquire, develop, and apply a full range of intellectual skills, rather than merely relying on the inert intelligence that schools so value. Heopines that successful students know their strengths and weaknesses; they capitalize on their strengths and compensate for or correct their weaknesses (Sternberg, 1997a). Successful intelligence is an integrated set of abilities needed to attain success in life within one's cognitive socio - cultural context and ability (Sternberg & Grigorenko, 2004).

Assistive Technology (AT) helps students with special needs to develop independent thinking skills, maintain self - reliance, increase autonomy, develop problem - solving skills, and facilitate a sense of continuity in living conditions with the general opinion to achieve success. Individuals with Disabilities Education Act (USA Department of Education, 2004) defines assistive technology as an item, piece of equipment or product system used to increase, maintain and improve an individual's functional capability. Moore, (2012) added that AT enables all students to be successful in their general and specific education classrooms. The implication here is that assistive technology is an indispensable tool in helping students with disabilities achieves successful intelligence.

Assistive technology provides substantive potentials for students with special needs to capitalize on their strengths and compensate for loss of function, making the most out of their educational experiences. It provides meaningful learning experiences in order to develop individual and unique problem solving and higher thinking skills, to function in the world beyond the classroom (Shikden, 2012).

Digital instructional materials and supports provided to professional development of teachers seem to mismatch the needs of students with physio - emotional disabilities to whom they are sent. The lack of student - directed training, knowledge and support may lead to teacher concern, anxiety, and negative perceptions of students with disabilities about such teachers (Peebles & Mendaglio, 2014). This insinuates that teachers who are sophisticatedly trained in technology may scare rather than motivate

students with disabilities if their training is not specifically tailored to their individual needs.

Classifications of Assistive Technology

Category	Product examples
Mobility	Walking stick, crutch, walking frame, manual and powered wheelchair, tricycle Artificial leg or hand, leg or hand splint, clubfoot brace Corner chair, supportive seat, standing frame Adapted cutlery and cooking utensils, dressing stick, shower seat, toilet seat, toilet frame, feeding robot
Vision	Eyeglasses, magnifier, magnifying software for computer White cane, GPS - based navigation device Braille systems for reading and writing, screen reader for computer, talking book player, audio recorder and player Braille chess, balls that emit sound
Hearing	Headphone, hearing aid Amplified telephone, hearing loop
Other (Communication & Cognition)	Communication cards with texts, communication board with letters, symbols or pictures; Electronic communication device with recorded or synthetic speech; task lists, picture schedule and calendar and other picture based instructions. Timer and automatic reminder, smartphone with adapted task lists and audio recorder as well as adapted toys and games.

(Source: World Health Organization: disability, 2015)

The researchers asked the following questions as guides for the study.
1) What aspects of professional development of teachers target at knowledge - use of technology for students with physio - emotional disability?
2) How did boys and girls with physio - emotional disability compare in their responses to teachers' professional development and knowledge - use of technology?
3) To what extent do teachers' professional development and knowledge - use of technology relate to successful intelligence of students with physio - emotional disability?

Null hypothesis below ($p < .05$) was posed to test how teachers' professional development and knowledge - use of technology together correlate with participants' successful intelligence.

H_0 Teachers' professional development and knowledge - use of technology do not correlate with successful intelligence of students with physio - emotional disability.

2. Method

The design of this research was mixed method employing quasi - experimental and correlational models of analyses. It was employed to study the relationship among variables of knowledge - use of technology, professional development and successful intelligence. A quasi - experimental model was imputed whereby with technology and without technology were observed to understand participating

students' responses. Three special education schools in Nnewi, Onitsha (Anambra State) and Oji River (Enugu State) were sampled by convenience. All the students with adequate to moderate functionality were observed and interviewed (N = 64).

3. Procedure

Teachers in these schools were employed to assist the researchers for the purposes of ascertaining objective and appropriate data collection. The researchers visited the schools twice in a week throughout the three Terms of the academic calendar. At the beginning of the study, a calendar of days *with - technology* and *without - technology* was provided. During researchers' visits on days of *with - technology*, students were exposed to watching recorded animations with no sounds for those with hearing impairment. Those with visual impairment had audio recordsof lessons in songs, music and with emboldened picture animations for those who could see and read bold prints. These pictures and animations included skits, clips from existing videos, drawings and photos related to the topic of delivery. English (Present Tense) and Mathematics (Counting and using Nigerian Currency) were subjects used in the demonstrations. Technology appliances observed in the study included those for mobility (speed of movement to class *when technology vs. when no - technology*) and recreation (attendance to optional class *when technology vs. when no - technology*), animated visual and audio assistive technologies and *other* unclassified technologies not commonly used among the studied group such as those with cerebral palsy using video games. Students were observed when these technologies were or were not used.

4. Result

In answer to research question one, it was discovered that professional development in technology - use for Mobility (27%) ranked highest, followed by that for hearing impairment (23%).
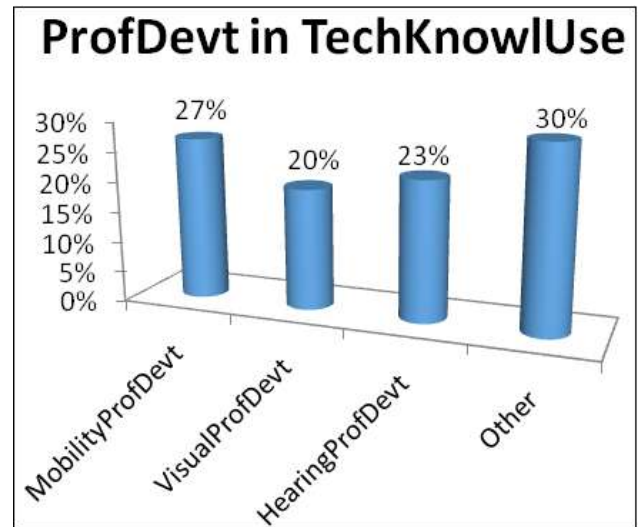

Figure 1: Aspects of Tcher Prof Devt & Knowluse of Tech Identified in the Group

Other Impairment = 30% was crafted to include those technology - use which are not common in the studied sites, and where a few experts have professional knowledge in their use (*see Figure I*).

In further attempts to answer research question one, the students with physio - emotional disability (SWPED) reported that they benefitted less from the more educated teachers than from the less educated (*see Table 1*). This hit the researchers with surprise.

Table 1: Distribution of Teachers' Professional Certification and Technology Use

Level of Education	Professional Certification and Knowl Use of Tech			
	Mobility	Visual	Hearing	Other
First School Leaving Certificate	7%	10%	7%	1%
Secondary Education	15%	8%	11%	5%
Nigerian Certificate of Education	4%	2%	3%	17%
Polytechnic/University Education	1%	--	2%	7%

For research question two, the researchers discovered that more boys than girls with physio - emotional disability believed that teachers were preparing them for successful intelligence.40 out of 41 = boys and 13 out of 23 = girls (83%, that is N = 53) were positive about their education preparing them for successful intelligence.
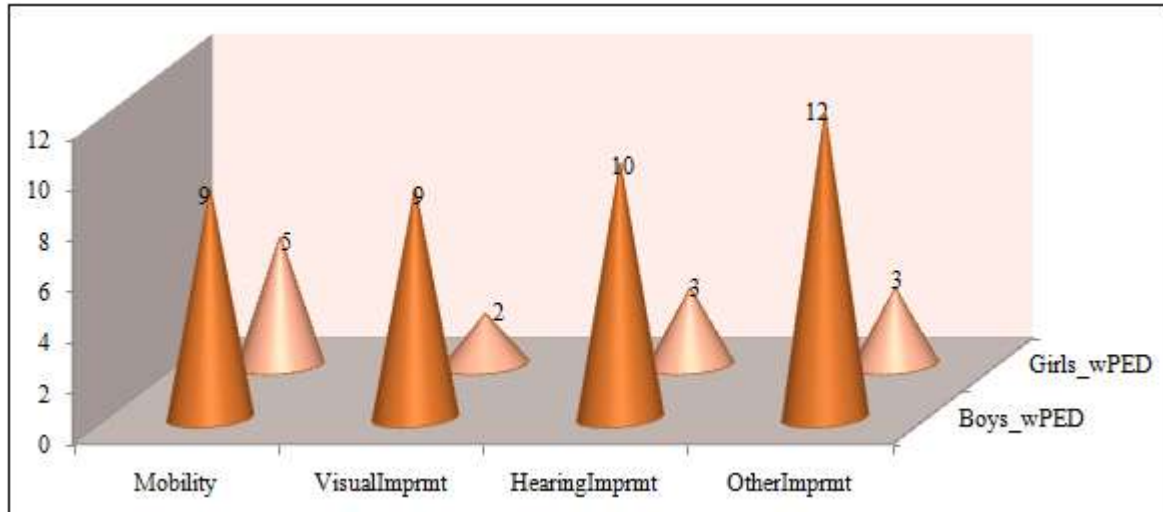
Figure II: Gender Description of Belief in Successful Intelligence for SWPED

Only 17% of the studied group believed that their disability would hamper them from achieving successful intelligence (*see Figure II*).

Table2. Teachers' ProfDevt and TechKnowl as Correlates of Successful Intel

		ProfDevTechKnow	PercSuccessIntel
ProfDevTechKnow	Pearson Correlation	1	- .774[**]
	Sig. (1 - tailed)		.000
	Sum of Squares and Cross - products	9555.438	- 2681.752
	Covariance	151.674	- 42.567
	N	64	64
PercSuccessIntel	Pearson Correlation	- .774[**]	1
	Sig. (1 - tailed)	.000	
	Sum of Squares and Cross - products	- 2681.752	1256.965
	Covariance	- 42.567	19.952
	N	64	64
**. Correlation is significant at the 0.01 level (1 - tailed).			

To answer research question three the researchers observed that teachers' professional development and knowledge - use of technology correlated with students' successful intelligence, but in negative skew. Report from the studied students, teachers who had lower degrees had higher score - points than teachers who had higher degrees.

Also, the researcher observed that all the participants were present on the days of *with - technology*, except in critical ill - health. On the days of *without - technology*, students gave different excuses for absent from class. Excuses included *I am sick, My body aches, I am tired, I don't want to go.*

The hypothesis as in Table 2 also revealed a negative relationship between teachers' professional qualification, knowledge - use of technology and participants' successful intelligence ($r = - .77$, N = 64, p =.0005)

5. Discussion

Teachers with First School Leaving Certificate who trained on the job were perceived as better in the training of the students for successful intelligence. These teachers had learned on the job. They had worked long enough while receiving upgrade of their qualifications with the students. Participating students reported that they were freer in their interactions with the less educated and those with lower professional degree among their teachers. Students

appreciated their teachers who the researchers classified with the least education and whose highest degree was secondary education. Teachers with less education were trained on the job. Their professional development in the technology - use was to suit the student (s) they helped. This agreed with Onukafor (2019) in an argument that students at lower level of education benefitted from teachers with lower degrees than from those with higher degrees.

The researchers noted that the more specialized a student's need the more specialized the teacher. These included students with spina bifida and cerebral palsy. The researchers observed with surprise that most efficient teachers in the use of technology were those who received in - service training. No matter the level of teachers' qualification or knowledge - use of technology, the researchers used students' *satisfaction* as score points for knowledge - use of technology for teacher - factor. The student - participants' need for satisfaction, therefore, determined the rating. The more satisfactory to the students in the use of technology - based tools, the more the students rated the teacher as helpful in their development of successful intelligence. Their emotional well - being was an important consideration.

In general, more students in the studied group believed that their disability was not a problem to their achieving successful intelligence. In this study boys with disability

were more engaging during the experiment than with girls. In the same vein, boys more than girls, were of the opinion that their disability was not a hamper to their achieving successful intelligence. Three of the boys insinuated in their statements that their, "*disability will make them get a job faster when they graduate*".

Teachers' professional development and knowledge of technology correlated with the development of successful intelligence of students with physio - emotional disabilities. This correlation was negative, suggesting that the professional development in this case did not necessarily mean more education. Professional development and knowledge of technology, with the students in mind, targeted at connecting pedagogy to development of students' successful intelligence. This is opposed to teachers' rush to get higher degrees and certificates for promotion rather than to impact upon the lives of the learners.

6. Conclusion

Technology has become an indispensable material in the teaching and learning going on in the classrooms. Students with special needs should not just use more of technology as learning materials, but as assistants and supports to compensate their impairments and make learning satisfactory. It is not degree or higher certificate acquisitions that matter much in the lives of students with physio - emotional disabilities. Professional development in technology use of teachers serves better when the students are born in mind during the training. In this study, the researchers have been able to ascert that teachers with less education than those with more education who were trained on the jobwere reported to be more benefiting to the students with disabilities.

Boys and girls in any socio - cultural context are different in their responses to technology use. This study revealed that boys with physio - emotional disabilities are more believing in themselves than their girl - counterparts. However, the general opinion of students with physio - emotional disabilities was that their disabilities would not stop them from achieving their best related to successful intelligence after graduation if they learned how to use technologies well. In response to today's needs, more advanced and specialized assistive technologies have been developed that educators could use to revamp and redefine education of individuals with special needs, multiple learning styles, and physical challenges. Learning knowledge - use of technology seems to be the way to bridge the chasmic gap that exists between the typical and atypical students.

7. Recommendation

The researchers made the following recommendations at the end of the study.
1) Teachers' professional development in technology knowledge - use should have the disability of students in mind as the ultimate beneficiaries of their professional development.
2) The researchers suggest to the government to provide proper and functional assistive technologies for the learning - teaching activities in the special education schools.
3) Cognitive socio - cultural contextual differences of Nigerian students should be a factor to consider when providing assistive technologies to learners with physical and emotional disability in order to take care of gender disparity.

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