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Perceptions of Educators on the Learners' Youngest Age for the Introduction of ICTs in Schools: A Personality Theory Approach

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***Abstract*—**Age ratings are very helpful in providing parents with relevant information for the purchase and use of digital technologies by the children; this is why the non-definition of age ratings for the use of ICTs by children in schools is a major concern; and this problem serves as a motivation for this study whose aim is to examine the factors affecting the perceptions of educators on the learners' youngest age for the introduction of ICTs in schools. This aim is achieved through two types of research objectives: the identification and design of theories and models on age ratings, and the empirical testing of such theories and models in a survey of educators from the Camperdown district of the South African KwaZulu-Natal province. A questionnaire is used for the collection of the data of this survey whose validity and reliability is checked in SPSS prior to its descriptive and correlative quantitative analysis. The main hypothesis supporting this research is the association between the demographics of educators, their personality, and their perceptions on the learners' youngest age for the introduction of ICTs in schools; as claimed by existing research; except that the present study looks at personality from three dimensions: self-actualized personalities, fully functioning personalities, and healthy personalities. This hypothesis was fully confirmed by the empirical study conducted by this research except for the demographic factor where only the educators' grade or class was found to be associated with the personality of educators.

***Keywords*—**Age ratings, Educators, E-learning, Personality Theories.

I. Introduction

THE dawn of the new millennium has seen a number of technological developments that allow children to express themselves and learn through personal digital technologies such as computers, cell phones, high definition television, video games, Internet, cable TV, radio, etc. [7]. Such digital technologies come with different age ratings which provide guidance to consumers (particularly parents) in their purchase decisions, and allow them to monitor children's experiences with the use of technologies [5]. For example, in Europe, and in the United State of America (USA), the Pan European Game Information (PEGI), and the Entertainment Software Rating Boards (ESRB) respectively set age ratings for games and video content. Games and video content age ratings levels in Europe are: 3, 7, 12, 16, and 18 [15]; and age and content ratings for video games and mobile apps in USA are: EC (Early Childhood) for ages 3+, E (Everyone) for ages 6+, T (Teen) for ages 13+, and AO (Adults Only) for persons from 18 years and above [3]. Furthermore, in the USA, the motion picture association of America (MPAA) provides the following age ratings about the age appropriateness of films: G for General Audiences, PG for Parental Guidance, R for Restricted (for content with adult material) [12].

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A. Problem Statement

The previous paragraph shows that age ratings have been quite well defined for digital content in relation to games, movies, and television. This raises the issue of the non-definition or non-regulation of age ratings for the use of ICTs by children in schools. For example, in Iceland, it is reported that young children begin using computers for learning as early as age 2 [14], [16]. In the USA, it is reported that children begin using computers in schools between the age of 2 and 4, and they start using the Internet at the age of 13 [10], [11]. In Belgium, children have their first Internet experience at school between the age of 3 and 4 [20]. In Australia, young children start using computers in schools between the age of 4 and 5, and they start using Internet between the age of 5 and 8 [21]. This problem of the non-regulation of age ratings for ICT use by children in schools raises the following main research question followed by its sub questions, and its subsequent research aim and objectives.

B. Main Research Question

What are the factors that affect the perceptions of educators on the learners' youngest age for the introduction of ICTs in schools? And which recommendations can be made on the most suitable age for the introduction of these ICTs in schools for teaching and learning?

Research question 1: What are the theories that can explain educators' perceptions on the learners' youngest age for the introduction of ICTs in schools for teaching and learning?

Research question 2: How can the contributing factors to the perceptions of educators on the learners' youngest age for the introduction of ICTs in schools be shaped into a hypothetical model?

Research question 3: How can the hypothetical model of research question 2 be empirically validated?

Research question 4: Which recommendations can be suggested from the understanding of the factors affecting educators' perceptions on the learners' youngest age for the

introduction of ICTs in schools for teaching and learning?

C. Aim and Objectives

The aim of this research is to determine the factors affecting the educators' perceptions on the learners' youngest age for the introduction of ICTs in schools, in an attempt to contribute towards solving the identified problem of the non-regulation of age ratings for the use of ICTs in schools.

This aim is carried out by the following research objectives:

a) Selecting relevant theories that can conceptualize the educators' perceptions on the learners' youngest age for the introduction of ICTs in schools.
b) Designing a conceptual model of the factors affecting educators' perceptions on the learners' youngest age for the introduction of ICTs in schools for teaching and learning.
c) Empirically assessing the planned conceptual model of the educators' perceptions on the learners' youngest age for the introduction of ICTs in schools for teaching and learning.
d) Making recommendations on the most appropriate age for the introduction of ICTs in schools for teaching and learning.

II. Literature Review

The results of the Internet search conducted by this study with different keywords related to each of the research objectives of the study are hereby presented.

A. Theories

The determination of the learners' youngest age for the introduction of ICTs in schools is a teaching decision, but it also seems natural to consider children age matters from a child development perspective. Therefore, theories on the educators perceptions on the learners' youngest age for the introduction of ICTs in schools were found from existing literature using the Internet search keywords "literature review" + "child development"+ "teaching", with the hope that such a literature review will also include suitable theories. This Internet search led to the identification of a paper [1] confirming a general assumption that understanding child development contributes to teaching". This paper classifies child development theories in the teaching context according to two groups: Learning theories focusing on the child's mind, and ecological theories focusing on the social child. Learning theories such as behaviorism, constructivism, and social constructivism are quite popular and as a result, they are out of the scope of this study. On the other hand, ecological theories stress the need for teachers to "understand that each student is an individual who is developing a sense of self and relationships in a variety of contexts, notably the family, school, and community" [1]. In other words, educators must adhere to the principle according to which each student is a unique individual with his or her personality. However, adherence to that principle also depends on the personality of the educator himself, because "both [...] personality factors and […] situational factors influence behavior" [6]. This study is therefore built from the premises of the personality theories. A new Internet search conducted with the keyword "personality theories" listed psychodynamic theories, humanistic/existential theories, and dispositional theories as three of the most important types of personality theories [4].

1. Psychodynamic Theories

These theories assume that our behavior is determined by unconscious forces which we are unaware of, and believes that our experiences during childhood shape our personality. These theories are related to psychoanalysis, that attempts to reveal unconscious thoughts and desires [4], [18].

2. Humanistic/Existential Theories

These theories stress the importance of aspirations, human strengths, conscious free will, and fulfillment of human potentials in understanding our personalities. These theories describe people as creative and an active being pressing towards growth and self-actualization [4].

3. Dispositional Theories

These theories assume that each individual is unique and has a finite number of personality traits that can be measured, evaluated, and observed in predicting one's personality in different situations [18].

B. Conceptual Models and Frameworks

This study is based on two of the three types of personality theories identified in section IIA: humanistic theories and dispositional theories. Further examination of [4] allows for the identification of the following personality models: Maslow's self-actualization model, Carl Rogers Model, and Allport's traits model. This study considers these three theories as models mainly because they are usually presented in the form of a set interconnected constructs, and this interconnection of constructs deserves to be given the name of a model.

1. Maslow's Self Actualization Model

Maslow's model is well known for describing the process by which individuals try to meet their needs. First, an individual must satisfy his or her physiological needs such as hunger, thirst, and sex. Then, he or she has to satisfy his or her safety needs in order to feel secure and safe from danger (See Fig. 1). Afterwards, he or she must satisfy his or her needs for belongingness and love by affiliating with others. He or she must then satisfy his or her self-esteem needs by achieving and winning the approval and acceptance of others. The self-actualization need, which is the need to fulfil one's own potential, is only relevant once a person has satisfied all the above identified needs [4], [18].

2. Carl Rogers Model

This model argues there is a natural tendency for humans to develop their abilities and potentials in all aspects of life, and such development leads to fully functioning persons satisfying the following list of criteria: "being aware of all experiences, being open to positive and negative feelings, having a freshness of appreciation for all experiences, having trust in

one's own behavior and feelings, having a freedom of choice, living without inhibitions, being creative and spontaneous, and growing continually by striving to maximize one's potential" [4], [18].

Fig. 1 Maslow model

3. Allport's Model

This model describes a healthy adult personality as a person who constantly develops from a biologically dominated infant into a matured psychological adult through seven sequential stages. Each stage includes aspects of our personality that are unique and distinctive to each of us that unite our perceptions, attitudes, and intentions. To Allport [4], our personality is either unhealthy or healthy. The unhealthy personality is one whose growth has been inhibited by a lack of security throughout childhood. On the other hand, a healthy personality is one that satisfies the following criteria: Having an extended sense of self, relating warmly to others, accepting oneself for who we are, having a realistic perception of the world, having a sense of humor and self-objectification, and subscribing to a unifying philosophy of life [18].

C. A New Conceptual Model

The present study suggests a new model of the factors affecting the perceptions of educators on the youngest learners' age for the introduction of ICTs in schools. This new model is based on the Maslow's self-actualization model, Carl Rogers's model, and Allport's trait model (Fig. 2). It uses self-actualized personality characteristics, fully functioning personality characteristics, and healthy personality characteristics as factors that can affect the perceptions of educators on the youngest learners' age for the introduction of ICTs in schools. In other words, this model hypothesizes that the perceptions of educators on the learners' youngest age for the introduction of ICTs in school depend on the demographics of these educators. These perceptions also depend on how self-actualized these teachers see themselves, and on how they perceive their personality as being fully functioning. This model finally hypothesizes that the perceptions of educators on the learners' youngest age for the introduction of ICTs in schools depend on the perceived health of the personality of these educators.

This new model presented by Fig. 2 denotes the following hypotheses to be empirically tested by the third objective of the current research.

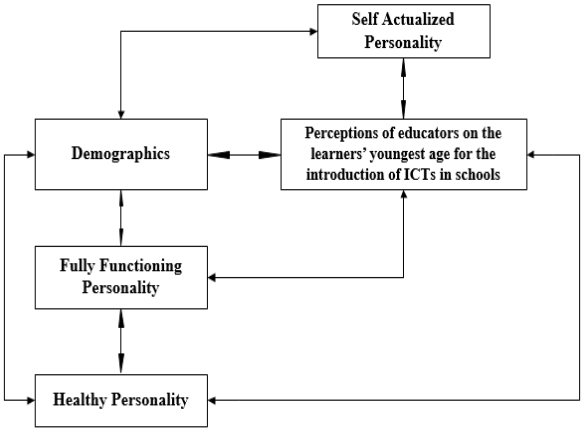

Fig. 2 A conceptual model

Ha0: There is a direct relationship between the demographics of an educator, and his or her perceptions on how self-actualized his or her personality is.

Hb0: There is a direct relationship between the demographics of an educator and his or her perceptions on how fully functional his or her personality is.

Hc0: There is a direct relationship between the demographics of an educator, and his or her perceptions on how healthy his or her personality is.

Hd0: There is a direct relationship between the demographics of an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

He0: There is a direct relationship between the perceived self-actualized personality of an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

Hf0: There is a direct relationship between the perceived fully functioning personality of an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

Hg0: There is a direct relationship between the perceived healthy personality of an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

The five constructs on the model proposed by Fig. 2 will from now on be used as a guideline for the presentation of the remaining part of this paper, starting with the presentation of empirical studies linking personality theories to the determination of the learners' youngest age for the introduction of ICTs in schools.

D. Empirical Studies

This sub-section presents existing papers that have looked at the appropriate age for kids to start using computers in schools and at home. The papers reviewed in this section were retrieved from Google using the search keyword "Early media use", "age", "learners". Only a handful of papers found are really focusing on the youngest learners' age for the introduction of ICTs in schools, including [8], [9], [19]. Existing literature on child development theories was used by

[19], and results from [8], [19] are also based on a review of literature.

According to [8], kids can only start using computers at home and in schools when they are aged 7; and that age limit is extended to 8 by [9], and to 15 by [19].

E. Research Gaps

One of the gaps that one can identify from the literature overview relates to the fact that existing literature on the youngest age for the use of ICTs by children has been mainly conducted in the developed world [9], [10], [12] and very few studies cover the developing world. Moreover, most studies are based on existing literature [8], [19] as very few studies actually base their recommended age limit on actual empirical research.

III. Research Design

Two types of research methods were used in pursuit of the objectives of this research: a qualitative approach for objective 1, 2, and 4, and a quantitative approach for objective 3.

A. Content Analysis in the Form of a Literature Review

For objectives 1, 2, and 4, content analysis of existing literature was performed using Internet search keywords as already specified in the second section of this paper.

B. Survey of Educators from the Camperdown District of the South African KwaZulu-Natal Province

The conceptual model proposed by this study was empirically tested through a survey of educators selected from public schools from the Camperdown district of the KwaZulu-Natal province of the Republic of South Africa.

1. Population and Sampling

The Camperdown district has a population of 584 primary and secondary school educators [2]. The sample size of this research was calculated using the formula below proposed by [13] for finite populations where Z = 1.96, P = 0.05, d = 0.048, and N = 584. This gives a sample size of 70.

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

2. Research Variables and Data Collection

The research variables for this study can be found on Fig. 2. Data for each of these variables were collected using a Likert scale of 10 items except for the demographic variable which had 10 categorical items. Some of the demographic items include educators' teaching experience, their current class size, and their frequency of computer usage. The scale for the self-actualized variable was adapted from the list of personality characteristics of self-actualising people [18]. The scale for the fully functioning variable was adapted from the list of personality characteristics of fully functioning people [18]. The scale for the healthy variable was adapted from the personality characteristics of a healthy person [18]. The scale for the variable on the perceptions of educators on the learners's youngest age for the introduction of ICTs in schools was adapted from the child development stages and their implications for school-based professionals as proposed by [17].

IV. Results

This section presents the results of this study under the main assumption that the perceptions of educators on the learners' youngest age for the introduction of ICTs in schools depend on their personality.

A. Data Validity and Reliability

Table I shows that the data collected by this survey is reliable judging by the fact that all the Likert scale variables have a Cronbach's alpha (α) coefficient greater than 0.75.

TABLE I
RELIABILITY TABLE FOR THE RESEARCH VARIABLES

Research Variable	No of items	Cronbach's Alpha (α)
Self-Actualized Personality	10	0.934
Fully Functioning Personality	10	0.885
Healthy Personality	10	0.929
Perception on the early introduction of ICTs	10	0.752

B. Descriptive Statistics

This section will present descriptive statistics on the demographics of the surveyed educators as well as on their perceptions on the self-actualization of their own personalities, their perceived fully functional personality, how healthy do they perceive their personality, and their perceptions on how early can ICTs be introduced in schools for teaching and learning.

1. Demographics

Descriptive statistics on the demographics of the educators (see Table V) who participated in this study indicate that the majority of these educators are female whose age and teaching experience are evenly spread among the different groups. The size (between 21 and 40) of most classes is manageable, and most educators are suitably qualified either in languages or in Mathematics. It is also interesting to note that almost the entire sample of educators is made up of Africans, almost half of the educators are using computers, and two third of the educators are from primary schools.

2. Self Actualized Personality

According to Table II, the overwhelming majority of the educators who participated in this study perceive themselves as having a self-actualized personality.

3. Fully Functionong Personality

According to Table III, the overwhelming majority of the educators who participated in this study indicated that they have a fully-functional personality, but they admit they do not always share negative feelings with others; and they may have some inhibitions.

4. Healthy Personality

According to Table IV**, t**he overwhelming majority of the educators who participated in this study perceive themselves as having a healthy personality.

5. Perceptions of Educators on the Learners' Youngest age for the Introduction of ICTs in Schools

According to Table VI, the most preferred grade for the youngest age for the introduction of ICTs in schools is Grade R-3, and the second preferred one is Grade 4-6. However, on the issue of helping learners in the analysis of hypotheses using abstract thinking and deductive reasoning, the perceptions of educators are shared between choosing Grade R-3, Grade 4-6, Grade 7-9, Grade 10-12, and tertiary level. On the issue of the need for learners to develop physical fitness, including during puberty, the perceptions of educators are shared between choosing Grade R-3 or Grade 4-6. On the issue of the need for learners to receive, process, remember, and present information, the perceptions of educators are shared between choosing Grade R-3, Grade 4-6, or Grade 7-9.

TABLE II
SELF-ACTUALIZED PERSONALITY

B	S1	S2	S3	S4	S5	Mean	SD
B1	4	4	3	29	60	4.36	1.036
B2	3	1	3	23	70	4.56	.862
B3	3	0	6	30	61	4.47	.847
B4	3	3	7	26	61	4.40	.954
B5	6	4	9	37	44	4.10	1.105
B6	4	3	4	46	43	4.20	.972
B7	3	1	1	21	73	4.60	.841
B8	3	0	7	24	66	4.50	.864
B9	3	1	4	34	57	4.41	.876
B10	4	1	3	27	64	4.46	.958
	3.6	1.8	4.7	29.7	59.9		

C. Correlations

The results from Tables VII and VIII are summarized in Fig 3 whose interpretation combined with the initial hypotheses leads to the following results.

Ra: There is a direct relationship between the grade taught by an educator, and his or her perceptions on how self-actualized his or her personality is.

Rb: There is a direct relationship between the grade taught by an educator, and his or her perceptions on how fully functional his or her personality is.

Rc: There is a direct relationship between the grade taught by an educator, and his or her perceptions on how healthy his or her personality is.

Rd: There is no direct relationship between the grade taught by an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

Re: There is a direct relationship between the perceived self-actualized personality of an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

Rf: There is a direct relationship between the perceived fully functioning personality of an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

Rg: There is a direct relationship between the perceived healthy personality of an educator, and his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

TABLE III
FULLY FUNCTIONING PERSONALITY

C	S1	S2	S3	S4	S5	Mean	SD
C1	4	0	4	37	54	4.37	.920
C2	1	1	3	20	74	4.64	.743
C3	17	19	17	24	23	3.17	1.424
C4	4	7	19	34	36	3.90	1.105
C5	4	3	6	44	43	4.19	.982
C6	4	0	10	27	59	4.36	.979
C7	4	0	4	41	50	4.33	.912
C8	3	3	10	26	59	4.33	.912
C9	6	1	6	39	49	4.23	1.038
C10	3	1	1	20	74	4.61	.839
	5	3.5	8	31.2	52.1		

TABLE IV
HEALTHY PERSONALITY

D	S1	S2	S3	S4	S5	Mean	SD
D1	3	6	1	40	50	4.29	.965
D2	3	0	3	26	69	4.57	.809
D3	3	0	3	26	69	4.57	.809
D4	1	0	6	36	57	4.47	.737
D5	3	3	3	27	64	4.47	.912
D6	3	1	1	19	76	4.63	.837
D7	3	1	1	23	71	4.59	.843
D8	4	0	4	41	50	4.33	.912
D9	3	1	4	41	50	4.34	.866
D10	6	3	7	34	50	4.20	1.085
	3.2	1.5	3.3	31.3	60.6		

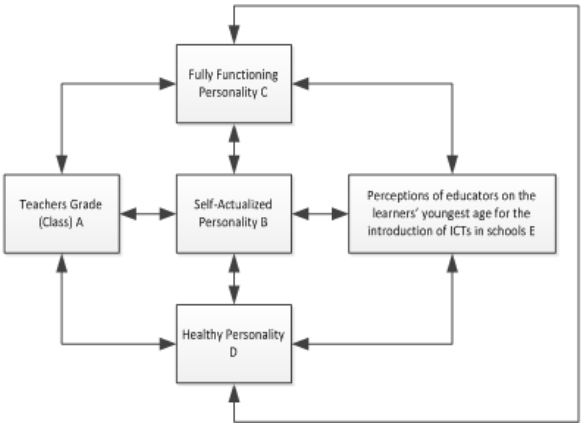

Fig. 3 The validated model

TABLE V
DEMOGRAPHICS

A		Percentage
A1	Male	20
	Female	80
A2	Urban	61.4
	Rural	38.6
A3	Less 30	22.9
	30-40	27.1
	41-50	34.3
	Above 50	15.7
A4	Grade R-3	35.7
	Grade 4-6	31.4
	Grade 7-9	17.1
	Grade 10-12	7.1
	Grade 4-6, Grade 7-9	4.3
	Grade 7-9, Grade 10-12	4.3
A5	1-20	7.1
	21-40	57.1
	41-60	27.1
	Above 61	7.1
	21-40, 41-60	1.4
A6	Diploma	47.1
	Bachelors	25.7
	Honours	24.3
	Masters	2.9
A7	L	25.7
	M	4.3
	ST	4.3
	SS	7.1
	LM	24.3
	LST	5.7
	LSS	8.6
	MST	5.7
	MSS	1.4
	STSS	4.3
	LMST	1.4
	LSTSS	4.3
	LMSTSS	2.9
A8	None	45.7
	Daily	17.1
	Weekly	24.3
	Monthly	12.9
A9	African	94.3
	Indian	4.3
	White	1.4
A10	0-5Years	25.7
	6-10Years	18.6
	11-15Years	21.4
	16-20Years	18.6
	Above 20Years	15.7

TABLE VI
PERCEPTION OF EDUCATORS ON THE LEARNERS' YOUNGEST AGE

E	S1	S2	S3	S4	S5	Mean	SD
E1	4	0	4	37	54	3.59	1.450
E2	1	1	3	20	74	3.74	1.315
E3	17	19	17	24	23	4.21	6.297
E4	4	7	19	34	36	3.67	1.224
E5	4	3	6	44	43	3.84	1.085
E6	4	0	10	27	59	3.53	1.327
E7	4	0	4	41	50	3.44	1.379
E8	3	3	10	26	59	3.14	1.311
E9	6	1	6	39	49	3.57	1.325
E10	3	1	1	20	74	3.47	1.411
	5	3.5	8	31.2	52.1		

TABLE VII
CORRELATIONS NOT INVOLVING DEMOGRAPHICS

		B	C	D	E
B	Pearson Correlation	1	.783**	.557**	.185*
	Sig. (2-tailed)		.000	.000	.126
	N	70	70	70	70
C	Pearson Correlation	.783**	1	.603**	.163
	Sig. (2-tailed)	.000		.000	.177
	N	70	70	70	70
D	Pearson Correlation	.557**	.630**	1	.263**
	Sig. (2-tailed)	.000	.000		.028
	N	70	70	70	70
E	Pearson Correlation	.185*	.163	.263**	1
	Sig. (2-tailed)	.125	.177	.028	
	N	70	70	70	70

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

TABLE VIII
CORRELATIONS INVOLVING DEMOGRAPHICS

		B	C	D	E
A1	Pearson Correlation	-.156	-.178	-.102	-.016
	Sig. (2-tailed)	.196	.140	.400	.892
	N	70	70	70	70
A2	Pearson Correlation	.058	.093	.041	.080
	Sig. (2-tailed)	.635	.445	.734	.513
	N	70	70	70	70
A3	Pearson Correlation	.008	.003	.063	.206
	Sig. (2-tailed)	.946	.977	.606	.088
	N	70	70	70	70
A4	Pearson Correlation	-.247*	-.271*	-.273*	-.113
	Sig. (2-tailed)	.039	.023	.022	.352
	N	70	70	70	70
A5	Pearson Correlation	.019	.049	-.012	-.008
	Sig. (2-tailed)	.879	.686	.922	.947
	N	70	70	70	70
A6	Pearson Correlation	.088	.111	.092	-.029
	Sig. (2-tailed)	.467	.360	.448	.813
	N	70	70	70	70
A7	Pearson Correlation	.072	.000	.022	.187
	Sig. (2-tailed)	.556	1.000	.857	.122
	N	70	70	70	70
A8	Pearson Correlation	.189	.164	-.041	-.067
	Sig. (2-tailed)	.118	.175	.739	.584
	N	70	70	70	70
A9	Pearson Correlation	.075	.157	.104	.043
	Sig. (2-tailed)	.537	.195	.390	.726
	N	70	70	70	70
A10	Pearson Correlation	.036	-.094	-.091	.101
	Sig. (2-tailed)	.770	.439	.453	.404
	N	70	70	70	70

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

V. DISCUSSION AND CONCLUSION

The following points properly encapsulate the content of this paper on the perceptions of teachers on the learners' youngest age for the introduction of ICTs in schools for teaching and learning.

a. According to the literature reviewed in this paper [4], [18], the personality theory is able to explain the perceptions of educators on the learners' youngest age for the introduction of ICTs in schools.
b. According to the literature reviewed in this paper [4], [18], one can hypothesize a model linking educators' demographics and their perceptions on the learners'

youngest age for the introduction of ICTs in schools, with the following constructs from the personality theory: self-actualized personality, fully functioning personality, and their healthy personality.

c. According to the results of the survey conducted by this study, the grade taught by an educator and the personality of that educator have a direct relationship with his or her perceptions on the learners' youngest age for the introduction of ICTs in schools.

d. There seems to be a general disagreement between the findings of this study and existing literature on the issue of the learners' youngest age for the introduction of ICTs in schools. Hence the need for more empirical research to determine learners' youngest age for the introduction of ICTs in schools, especially because the educators surveyed in this study would like learners to start using ICTs as early as when they start their school days.

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