



INFLUENCE OF TEACHER CHARACTERISTICS ON LEARNING READINESS AMONG 5-6 YEARS OLD IN PUBLIC PRE-SCHOOLS IN KIMILILI-BUNGOMA SUB-COUNTY, KENYA

Waswa O. Matsa¹ⁱ,
Musera G. Ababu²,
Opiyo Rose¹

¹Department of Educational Psychology,
Masinde Muliro University of Science and Technology,
Kenya

²Department of Educational Planning and Management,
Masinde Muliro University of Science and Technology,
Kenya

Abstract:

Learner readiness enhances academic achievement and predicts children's performance in the near future. Children who are ready are less likely to experience behavioural and emotional problems and score higher in reading, mathematics and fine motor skills than those who are not ready. However, teachers are still struggling with learners from preschool who are not well prepared for grade one. This paper provides empirical evidence of the influence of teacher characteristics on learning readiness among 5-6 years old using data obtained from 356 pre-schoolers and 55 preschool teachers in public pre-schools in Kimilili-Bungoma Sub County, Kenya. The multiple regression analysis results indicate that selected teacher characteristics variables (age, years of schooling and number of workshops attended) are statistically significant in explaining variations in learning readiness among pre-schoolers. It is recommended that the Ministry of Education, County and Sub-County Education office and public preschools should ensure that preschool teachers managing learners are qualified and attend more in service training.

Keywords: learning readiness, preschool, teacher characteristics

1. Introduction

Readiness to learn involves acquisition of specific skills required for learning such as cognitive, linguistic, social and motor skills, which are linked to later school completion (World Bank, 2016). Preschool learner readiness refers to the ability of the learner to

ⁱ Correspondence: email oduorimatsa@gmail.com

smoothly and successfully transit, integrate into the preschool environment and be able to meet its expectations without facing learning difficulties (Maxwell & Clifford, 2004). Preschools all over the world have a special role of preparing learners for later stage learning by imparting in them the skills they need to deal with learning tasks and processes. This preparation occurs in various domains.

The first domain on learner readiness is the physical well-being and motor development of preschool learners (Alotaibi, 2016). The physical wellbeing encompasses all the aspects that constitute good health such as nutrition, regular checkups, and enough sleep. Motor development means acquiring small skills such as building with Legos, holding a crayon, or turning pages and large movement skills such as walking upright and playing with others in the field (Williams et al., 2009)

The second domain in learner readiness entails the social and emotional development of preschool children whereby children should be able to take turns with others in carrying out different tasks, create and maintain meaningful relationships, control their emotions, and develop a positive self-image. The learning environment should thus provide opportunities for learners to participate in activities that enable them achieve social-emotional development.

The third domain is where the learners' develop approaches to learning such as language development, curiosity, the ability to reflect on learnt ideas, confidence, and the learners' interests and attitudes (Bustamante, White, & Greenfield, 2017; Ramey & Ramey, 2004).

The final domain in learner readiness is the cognition and general knowledge where the learner acquires basic knowledge of concepts and working of the environment in which they take part (Welsh, Nix, Blair, Bierman, & Nelson, 2010; Davis, 1992)

In order for preschool learners to have an improved level of readiness along the five domains, the school environment should have certain features. Singh (2014) posits that preschool characteristics can influence the level of learner readiness. Singh argues teacher behaviour is an important factor within the preschool environment that determines the level of learner readiness. Du Plessis (2016) observes that teacher behaviour makes learners to think, compare, judge, anticipate, and believe in specific behavioural patterns that make them to want to read. Du Plessis further argues that for learning to be meaningful, a teacher should appear to enjoy reading so that children identify with reading as an intriguing activity; hence, ready to engage in it without straining. A World Bank study (2015) on school readiness among pre-schoolers in Mozambique indicates that school readiness has immense benefits in as far as learning cognitive development is concerned.

The actions include using Developmentally Appropriate Teaching Practices (DAPT), motivating behavioural culture among teachers through such efforts as creating a print-rich environment, and implementing a robust nutrition support program that places emphasis on quality nutrition for pre-schoolers and learners exposed to these programs have a longer attention span leading to better performance in key learning areas (Tomlinson, 2007).

According to Senol (2005) preschool teachers should possess qualities such as being responsive, assertive, competent, relevant, and caring enough to allow learners understand and absorb the most important skills and competencies for learning. Roorda, Koomen, Spilt, and Oort (2011) meta-analytic study results indicate that teachers with the skills to forge a positive teacher-learner relationship produce better results in terms of learner readiness. Therefore, Berhaman et al., (2009) argues that for a developmentally appropriate preschool environment preschool teachers should undergo continuous learning in form of workshops and periodic evaluation to implement its components.

Similarly, Rimm Kaufman, Gerby, Grimm, Nathason and Brook (2009) underscores the need for continuous learning in order for teachers to update and keep improving their skills in enhancing the level of school readiness among pre-schoolers. This match Chaudry, Morrissey, Weiland, and Yoshikawa (2017) study findings indicating that subjecting teachers to in-service courses in public preschools improves learning in class and teacher-learner interaction, which enhances learner readiness because they acquire more literacy skills.

Other studies have also reinforced the role of the teacher in pre-schoolers learning readiness. For example, Connor, Son, Hindman, and Morrison (2005) study using structural equation modelling methodology examined teacher qualification on the decoding skills. The three markers of teacher qualification examined in the study were years of education, their credentials in elementary education, and years of experience. The study findings indicate that teachers who spent more time in academic activities and with more years of experience have a distal and proximal experience on learners and that their learners demonstrated higher decoding and reading skills. Similar results have also been recorded by Martinez, Naudeau, and Pereira (2012) in a report adopted by the World Bank and Ngware, Hungi, Kitsao, Mutsya, & Muhia (2016).

In Kenya, several studies have also demonstrated the relationship between teacher characteristics and pre-schoolers learning readiness. For instance, Weveti (2017) observes that preschool children improve their performance in class when teachers adopt a positive attitude. Weveti posits that a positive attitude has the intrinsic effect of motivating teachers to employ the most effective skills and resources during lessons. They argue that preschool learners exposed to teachers with a positive work attitude enhance their learning readiness because they acquire the most from their learning experiences.

Similarly, Ndung'u (2014) and Ngware et al. (2016) argues that teachers are a vital source of learning motivation for preschool learners. Their findings indicate that teaching experience and academic qualifications collectively correlate with high levels of motivation among preschool children. The study stresses the need for continuous learning as a way to impart motivational skills among teachers.

However, learning readiness in Kenya is a mirage (Ngware et al., 2016). For instance, existing surveys such as the one documented by Uwezo Sixth Learning Assessment Report (2016) indicate alarming levels of inadequacy and disparities in learner readiness. Statistics indicate little progress in numeracy and literacy skills for

children aged 6-7 years suggesting that little progress is being made in this county. For example, the Uwezo report of 2016 indicate that 16 out of 100 and 18 out of 100 children aged 6-7 years cannot identify letters and numbers respectively in Western region compared to 2 out of 100 and 3 out of 100 in Nairobi. In addition, the Uwezo report indicates that Western region ranks low in literacy and numeracy skills compared to others. While Central, Coast, Eastern, Nairobi, North Eastern, Nyanza, Rift valley recorded 3.8, 7.5, 7.5, 1.7, 15.8, 10.9, 11.7 literacy skills respectively among 5-6 olds, Western region trails with 15.8. The region also trails with 18.3 in numeracy skills compared to 7.8, 9.9, 11.1, 3.3, 17.0, 11.9, 11.8 for Central, Coast, Eastern, Nairobi, North Eastern, Nyanza, Rift valley respectively. Within the Western region, Bungoma County has 17.2% and 20.4% for those unable to identify letters and numbers respectively compared to Busia's 9.1 and 12.1, Kakamega's 17.6 and 18.5 and Vihiga's 14.2 and 19.3 respectively.

In order to achieve the Sustainable Development Goal 4.2 by 2030 that require access to quality Early Childhood Development Care and pre-primary education, it is necessary that preschool characteristics that are attributed to variations in pre-schooler's readiness in Bungoma County be identified. This paper therefore provides empirical data on the relationship between teacher characteristics and learning readiness in Kimilili-Bungoma Sub County with a view of providing a basis for which policy intervention for training and placement of ECD teachers in early childhood development centres in Kenya can be implemented. This may equalize opportunities for pre-schoolers' readiness in public early childhood development centres in Kenya.

2. Methodology

The paper utilizes stratified and simple random sampling techniques to draw a sample of 356 from 3211 pre-schoolers aged between 5-6 years and 18 head teachers in the 55 pre-schools in Kimilili Sub-county.

Data for the study was generated using a pre-school questionnaire (PSQ) which was a modification of the Kenya Schools Readiness Assessment Tool (KSRAT) 2015 developed by the Ministry of Education to assess pre-schoolers' readiness in preschools. KSRAT is a standardized tool used by the Ministry of Education to collect information on pre-schoolers learning readiness based of five major components namely: Pre-schooler's competencies in language and literacy, mathematics, creative arts, physical Science and life skills. Therefore, this study modified the KSRAT to measure pre-schooler's competencies in language and literacy, mathematics, creative arts and science using a score of 1-5 marks with 5=Excellent; 4=Very Good; 3=Good; 2=Satisfactory; 1=Fair with a maximum score of 50 for each of the 10 items for a given competency. This data was the outcome variable measured at interval scale.

The explanatory data was solicited using a pre-school head teacher (PSHQ) questionnaire which was designed and self-administered to the head teachers. Therefore, the PSHQ solicit data on pre-school teacher's characteristics relating to their gender, age, teaching experience, years of deployment in the current school, years of

schooling, employment status, number of workshops attended on pre-schooling and gross salary. This information was triangulated with that filled in the green forms as a requirement for each pre-school by the Teachers Service Commission. Face and content analysis was used to validate the PSQ and PSHQ while split-half test technique was used to test the reliability of the PSQ and PSHQ using data obtained from the pilot study. The PSQ and PSHQ were coded separately. The PSQ and PSHQ were separately randomly divided into two halves using an even-odd number approach. The Cronbach's Alpha reliability was established for the PSQ and PSHQ respectively and compared to the set threshold of 0.7. A reliability score of 0.85 and 0.83 for PSQ and PSHQ respectively were considered high to make the instruments reliable for generating data for this study (Kathuri & Pals, 1993; Mugenda & Mugenda, 2003).

This paper utilises data on pre-school teacher characteristics and pre-schooler's learning readiness to determine the influence of teacher characteristics on learning readiness among pre-school children in public preschools in Kimilili- Bungoma Sub-County, Kenya.

The hypothesis tested is that pre-school teacher characteristics have no statistically significant influence on learning readiness among 5-6 years old in public pre-schools in Kimilili- Bungoma Sub- County, Kenya using a multiple linear regression analysis. Linear regression modelling is appropriate for modelling outcome variables that are measured on the interval or ratio scale such as pre-school learning readiness. The descriptive statistics and multiple regression analysis results are presented in Table 1 and 2 respectively.

3. Results and Discussion

It is expected that a variety of variables account for variations in the learning readiness among 5-6 years old in public pre-schools. This paper models pre-schoolers learning readiness as a function of pre-school teacher characteristics (gender, age, teaching experience, experience in the current pre-school, years of schooling, employment status, number of workshops attended on pre-schooling and gross salary). In the model, the positive sign of the coefficient indicate increased effect of the explanatory variable on the 5-6-year-old learning readiness while the negative sign indicate decreased effect of the explanatory variable on the 5-6-year-old learning readiness. The value of the coefficient of the explanatory variable signifies the magnitude of its effect on the 5-6-year-old learning readiness. The significance of the relationship between a given explanatory variable and the outcome variable is tested at $p = 0.05$ on a two tailed test.

The PSHQ solicited data on pre-school teachers gender, age, teaching experience, experience in the current pre-school, years of schooling, employment status, number of workshops attended on pre-schooling and gross salary while PSQ using the KSRAT measured the pre-schooler's competencies in language and literacy, mathematics, creative arts and science using a score. The descriptive statistics for the teacher characteristics and preschool learning readiness is presented in Table 1.

Table 1: Descriptive Statistics for the Teacher Characteristics and Preschool Learning Readiness

Variable label	N	Range	Min	Max	Mean	Scale
Pre-School Teacher characteristics						
Gender	55		Male=15, Female=40			Nominal
Age	55	19	32	51	40.21	Interval
Teaching experience	55	10	1	11	5.4	Interval
Years of schooling	55				37.796	Interval
Employer	55	BOM= 4; County Government= 14				Nominal
Number of workshops attended	55	55	0	55	7.15	Interval
Monthly earning	55	20000	12000	32000	27,323	Interval
Pre-schoolers' Learning Readiness						
Language & literacy competencies	344	39	11	50	31.41	Interval
Mathematics competencies	344	40	10	50	32.06	Interval
Creative & arts competencies	344	37	13	50	29.66	Interval
Scientific competencies	344	36	14	50	33.52	Interval
Overall competency mean score	344	34	16	50	31.636	Interval

Source: Field Data, 2019.

From Table 1 the variables used in the data analysis were interval, ratio or nominal. The outcome variable for the study was the pre-schoolers learning readiness and was measured at interval scale with a mean of 31.636. The explanatory (teacher characteristics) variable constructs were measured at interval, ratio or nominal. The descriptive statistics in Table 1 indicate that a large proportion of preschool teachers were females (72.73%) compared to their male counterparts suggesting that gender disparities in teacher trainee at preschool level persist despite the various measures put in place to address this. Besides, the data in Table 1 does indicate that the mean age of preschool teachers is 40.21 years. This statistics imply that most of the preschool teachers are youthful and energetic to impact positively on pre-schoolers learning readiness. In addition, the descriptive statistics in Table 1 indicate that on average teachers had five years and above of teaching experience. The results suggest that preschool teachers in the sub-county have adequate teaching experience. This can have a positive effect on pre-schoolers learning readiness. The statistics in Table 1 also indicate that most of the preschool teachers' have a mean of 37.796 years of schooling suggesting that they have at least a diploma in early childhood.

The descriptive statistics in Table 1 further show that a larger percentage (95.36%) of preschool teachers was permanently employed by the county government hence had a stable job and salary. This has a net effect on pre-schoolers leaning readiness. In addition, the descriptive statistics in Table 1 indicate that on average the preschool teachers attended a minimum of seven workshops during the study period. This is a good indicator of constant pre training and service which may have a positive effect on their teaching skills and attitudes at preschool level. The descriptive statistics in Table 1 also indicate that preschool teachers average monthly earning was 27,000 shillings. The teacher characteristics variables (gender, age, experience, professional training, employer, workshops attended and monthly salary) are modelled using the multiple linear regressions to establish their influence on preschool learning readiness. The results of the multiple regression analysis are presented in Table 2.

Table 2: Multiple Regression Analysis Results on the Influence of Teacher Characteristics on Pre-schoolers' Learning Readiness

Model	Unstandardized Coefficients		Standardized Coefficients	T	p value
	B	Std. Error	Beta		
(Constant)	54.705	3.317		16.491	0.000
Age of preschool teacher	-0.162	0.065	-0.129	-2.48	0.014
Teachers' teaching experience	0.166	0.156	0.055	1.065	0.288
Teachers' years of schooling	1.500	0.564	0.128	2.659	0.008
Number of workshops attended	0.381	0.101	0.204	3.759	0.000
Teacher total monthly earning	0.000	0.000	-0.523	-9.356	0.100
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	0.566	0.321	0.311	6.12577	

a. Dependent Variable: Pre-schoolers Overall Competency Score

Source: SPSS Output, 2019

The results of the multiple regression analysis in Table 2 indicate that the constant of regression is statistically significant indicating that the variables fit in the model were able to predict the outcome variable. The teacher characteristics construct variables in the model (age, experience, years of schooling, number of workshops attended and monthly earning) were able to predict 0.311 (31.1%) of the variation in pre-schoolers learning readiness. The rest was accounted by other variables not in the study.

The results of the regression analysis in Table 2 indicate that the variables; age of preschool teacher, preschool teachers' years of schooling and the total number of workshops attended by the preschool teacher were statistically significant in explaining the variation in pre-schoolers learning readiness. However, the variables; preschool teachers' teaching experience and preschool total monthly earning were not. This study therefore rejected the null hypothesis that pre-school teacher characteristics have no statistically significant influence on learning readiness among 5-6 years old in public pre-schools in Kimilili- Bungoma Sub- County, Kenya. The results indicate that a number of pre-school teacher characteristics were statistically predicted to influence pre-schoolers learning readiness.

The results of the regression analysis in Table 2 indicate that the age of the preschool teacher was predicted to reduce the pre-schoolers learning readiness by 0.162 points. Suggesting that a one year increase in a teachers age reduces the pre-schoolers learning readiness by 0.162 points. This results imply that older teachers have a negative effect on pre-schoolers learning readiness. This can be explained by the fact that young teachers are outgoing and motivated to try different learning experiences. For example, Weveti (2017) observes that preschool children improve their performance in class when teachers adopt a positive attitude. Waveti further observes that positive attitude has the intrinsic effect of motivating teachers to employ the most effective skills and resources during lessons. As a result, preschool learners exposed to teachers with a positive work attitude enhance learner readiness because they acquire the most from their learning experiences.

The results of the regression analysis in Table 2 also show that preschool teachers' years of schooling is predicted to increase the pre-schoolers learning readiness mean score by 1.500 points. The results indicate that a one year increase in a preschool teachers professional training increase the pre-schoolers learning readiness scores by 1.500 points. This results imply that as teachers progress in their academic endeavours the knowledge and skills they gain are beneficial to pre-schoolers learning readiness. This implies that teachers with diploma in ECD are predicted to produce better learning outcomes compared to ECD certificate holders. For example, Ndung'u (2014) considers teachers as a vital source of learning motivation for preschool learners. Ndung'us' study finds that teaching experience and academic qualifications collectively correlate with high levels of motivation among preschool children. The author, therefore, recommended continuous learning as a way to impart motivational skills among teachers. When preschool children are motivated to learn, they improve their level of readiness for later-stage learning activities. Besides, Rimm Kaufman, Gerby, Grimm, Nathason and Brook (2009) underscores the need for continuous learning in order for teachers to update and keep improving their skills in enhancing the level of school readiness among pre-schoolers.

The results of the regression analysis in Table 2 further show that preschool teachers' total number of workshops attended is predicted to increase the pre-schoolers learning readiness mean score by 0.381points. The results indicate that a unit increase in the number of workshops attended by the preschool teacher improves the pre-schoolers learning readiness by 0.381points. This results imply that pre-schoolers who continuously are subjected to in service training gain new knowledge and skills that are beneficial to pre-schoolers learning readiness.

The study findings are similar to a number of studies done. For example, Chaudry, Morrissey, Weiland, and Yoshikawa (2017) also established that subjecting teachers to in-service courses in public preschools improves learning in class and teacher-learner interaction, which enhances learner readiness because they acquire more literacy skills. Similarly, Connor, Son, Hindman, and Morrison (2005) study indicate that teachers who spent more time in academic activities and with more years of experience have a distal and proximal experience on learners. Maxwell and Clifford (2004) also posits that teachers with higher qualifications their learners demonstrate higher decoding and reading skills when their teachers possess such characteristics.

4. Conclusion and Policy Implication

The multiple regression analysis results showed that selected teacher characteristics were significantly associated with pre-schoolers' learning readiness at the 95% level. It is evident that the selected teacher characteristics positively or negatively predicated the pre-schoolers' learning readiness in preschools in Kimilili Bungoma sub County Kenya. It is apparent that the Ministry of Education and the County government Bungoma need to develop a policy framework that incorporate pre-schoolers teachers age, professional training and in-service training while employing pre-school teachers

in Kimilili Bungoma sub County, Kenya. Further, there is need for the Ministry of Education and the County government Bungoma to sensitise and support pre-school teachers to further their education in early childhood development so as to enhance their knowledge, skills and pedagogy. Besides, the Ministry of Education and the County government of Bungoma should organize in-service training courses for preschool teachers to continuously improve their knowledge, skills and pedagogy in early childhood development.

References

- Alotaibi, K. N. (2016). The learning environment as a mediating variable between self-directed learning readiness and academic performance of a sample of Saudi nursing and medical emergency students. *Nurse Education Today*, 36, 249-254.
- Berhaman. J. R Engle and Fernald L.C. (2013). *Pre-school programs in developing countries* Chicago University Chicago Press.
- Bustamante, A. S., White, L. J., & Greenfield, D. B. (2017). Approaches to learning and school readiness in Head Start: Applications to preschool science. *Learning and Individual Differences*, 56, 112-118.
- Chaudry, A., Morrissey, T., Weiland, C., & Yoshikawa, H. (2017). *Cradle to kindergarten: A new plan to combat inequality*. Russell Sage Foundation.
- Connor, C. M., Son, S. H., Hindman, A. H., & Morrison, F. J. (2005). Teacher qualifications, classroom practices, family characteristics, and preschool experience: Complex effects on first graders' vocabulary and early reading outcomes. *Journal of School Psychology*, 43(4), 343-375.
- Davis, G. & K. Pepper (1992): Mathematical problem solving by pre-school children. *Educational studies in Mathematics*, 397-415.
- Du Plessis, S. (2016). *Factors affecting the reading readiness of Grade R learners in selected preschools in Gauteng Province* (Doctoral dissertation).
- Martinez, S., Naudeau, S., & Pereira, V. (2012). *The promise of preschool in Africa: A randomized impact evaluation of early childhood development in rural Mozambique*.
- Maxwel, K., & Clifford R. M., (2004). Research in review. *School readiness assessment on young children*, 59, 42-46.
- Ndung'u, C. (2014). *Influence of Teacher Characteristics on Motivation of Pre - School Children in Learning the English Language in Starehe District in Nairobi County* (Master). University of Nairobi.
- Ngware M. W. Hungi N. Kitsao Wekuto P., Mutsya, M. & Muhia, N.G (2016). Tayari pre-primary programme in Kenya. *Getting child ready for primary school*. Baseline report. African Population and Health Research Center, Nairobi.
- Ramey, C. T. & Ramey, S. L. (2004). Early learning and school readiness: Can early intervention make a difference? *Merrill-Palmer Quarterly* (1982-), 471-491.
- Rim-Kaufman, S. E., Curby, T. W., Grimm, K. J., Nathanson, L., & Brock, L. L. (2009). The contribution of children's self-regulation and classroom quality to children's

- adaptive behaviors in the kindergarten classroom. *Developmental Psychology*, 45(4), 958-972.
- Roorda, D. L. Koomen, H. M., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher–student relationships on students’ school engagement and achievement: A meta-analytic approach. *Review of educational research*, 81(4), 493-529.
- Senol, S. (2005). Cocukveokul. *CocukSabl*. 13(6), 34.
- Singh (2014) *Test score gaps between private and government sector students at school entry in India*. *Oxford Review of Education* 40 (30-49).
- Tomlison, M. (2007).” *School feeding in the East and southern Africa. Improving food sovereignty or photo opportunity*.
- Uwezo (2016): *Are Our Children Learning? Uwezo Kenya Sixth Learning Assessment Report*. Nairobi: Twaweza East Africa
- Welsh, J. A., Nix, R. L., Blair, C., Bierman, K. L.& Nelson, K. E. (2010). The development of cognitive skills and gains in academic school readiness for children from low-income families. *Journal of educational psychology*, 102(1), 43.
- Weveti, M. (2017). *Influence of Teacher Characteristics on Pre School Children’s Performance in Visual Discrimination of Words in English in Kairuri Zone, Embu, Kenya*. (Master). University of Nairobi.
- Williams, Harriet G., Pfeiffer, Karin A, Dowda, Marsha Jeter, Chevy; Jones, Shavers; Pate, Russell R. (2009). *A Field-Based Testing Protocol for Assessing Gross Motor Skills in Preschool Children: The children’s Activity and Movement in Preschool Study Motor Skills Protocol*”.
- World Bank. (2016). *World Bank Education statistics (Edu Stats)*. (Data set). Retrieved from <https://dataworldbank.org/data-catalog/ed-stats>.

Creative Commons licensing terms

Author(s) will retain the copyright of their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Education Studies shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflicts of interest, copyright violations and inappropriate or inaccurate use of any kind content related or integrated into the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a [Creative Commons Attribution 4.0 International License \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).