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Secondary school students' perceptions of the 21st-century 4Cs in Zimbabwe

Abstract

The volatile, uncertain, complex and ambiguous future world has highlighted the importance of critical thinking, collaboration, communication, creativity and innovation (4Cs) in today's classrooms. Framed by the Partnership for 21st-Century Learning (P21) Learning and Innovation theme, the study investigates the perceptions of the 4Cs by secondary school students from four schools in Zimbabwe. Two hundred and thirty-six (236) students participated in this quantitative study. Data were collected using online and paper questionnaires. Exploratory and first-order confirmatory analysis revealed a four-factor model with excellent fit indices. The second-order confirmatory factor analysis confirmed that the individual 4Cs were sub-constructs of a higher latent factor, Learning and Innovation (4Cs), where the students strongly endorsed collaboration, followed by communication, critical thinking, creativity, and innovation in decreasing magnitude. Age has a significant influence on critical thinking. The findings highlight the need for teachers to embed critical thinking and creativity activities within collaborative and communication learning activities.

Keywords: *4Cs, collaboration, communication, creativity and innovation, critical thinking, curriculum change, learning and innovation*

1. Introduction

The recent fast technological changes have caused turbulence in the 21st century (Gravett, 2019; Trilling & Fadel, 2009). Consequently, today's students should be equipped mainly with the 4Cs, among other skills, such as 21st-century interdisciplinary issues, life and career skills, and information and media and technology skills to thrive in the 21st century (P21, 2011; 2009). These 21st-century competencies must be incorporated into the students' core subjects, such as the Arts, Geography, History, Mathematics and Science (P21, 2011; 2009).

Several authors (Pardede, 2020; Sipayung, Sani & Bunawan, 2018; Trilling & Fadel, 2009; Makonye, 2019) posit that equipping students with the 4Cs will prepare them to function adequately in this fast, technologically changing world, driven by the fourth industrial revolution (4IR), and hence mastery of these 4Cs has become a global drive for

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student success (Gravett, 2019; Dede, 2010). In addition, mastering the 4Cs empowers the students to have a competitive edge in the future (Selman, 2020; Pardede, 2020; P21, 2011). Furthermore, future jobs that are yet to be created and are unknown will need a workforce that is skilled in the 4Cs to deal with "non-routine tasks and complex problem-solving" in artificial intelligence (AI)-induced environments (Care *et al*., 2017). Hence, well-equipped students with these 4Cs will become versatile innovators (Sohaya, 2020).

Student-centred pedagogies such as enquiry and project-based methodologies foster the growth of the 4Cs (Sultoni, 2021; Geisinger, 2016). For instance, Harshbarger (2016) reports that teachers who use student-centred pedagogies integrate 4Cs more successfully than those who use teacher-centred ones. However, Baghoussi (2021) posits that teacher-centred approaches are prevalent in Algeria. In addition, numerous authors (Chimbi & Jita, 2021; Madondo, 2020) report that teaching is mainly teacher centred rather than student centred in Zimbabwe. Besides, Zimbabwean teachers teach for examinations, using lectures and traditional methods (Nyamayedenga & De Jager, 2021; Mpaso, 2018). Nevertheless, implementing student-centred learning is time consuming, especially for inexperienced teachers and may delay the completion of the syllabus (Alias *et al*., 2018). The study investigated secondary school students' perceptions of the 4Cs in Zimbabwe, and sought to answer the question:

What are the secondary school students' perceptions of 4Cs in Zimbabwe?

The aims of the study were to:

- validate the P21 instrument for measuring the 4Cs for secondary school students in Zimbabwe; and
- investigate how secondary school students in Zimbabwe perceive the importance and relevance of the 4Cs in their education.

The objectives of the study were to:

- validate the P21 instrument for measuring the 4Cs using exploratory factor analysis; and
- establish the contribution of the individual elements of the 4Cs (creativity, critical thinking, communication and collaboration) to the latent 4C construct (Learning and Innovation) using second-order confirmatory factor analysis.

This study is unique in several ways. Firstly, there is a dearth of quantitative studies about the perceptions of 4Cs by secondary school students in African countries, particularly Zimbabwe. Secondly, the study measures the applicability of the learning and innovation theme (4Cs) as purported by the Western P21 framework in a non-western country (Zimbabwe).

2. Literature review

The learning and innovation theme comprises creativity, critical thinking, communication and collaboration (4Cs). These 4Cs are discussed in the following sections.

2.1 Creativity and innovation as an element of the 4Cs in secondary education

Creativity and innovation refer to students' capacity to create and innovatively solve complex problems through fusion and analysis by combining or presenting what they have learnt in a novel way (Ravitz, 2014; Pardede, 2020). According to Pardede (2020), creativity and innovation result from creative thinking. Therefore, to achieve creativity, one needs creative

thinking skills, motivation and expertise (Pardede, 2020). More importantly, teachers can empower students to be creative through technology-mediated teaching (Lepe-Salazar & Cortes-Alvarez, 2023). Still, developing countries' lack of technological resources can be an obstacle (Al-Amin *et al*., 2021). Zimbabwean schools have a poorly developed digital infrastructure; hence, using technology-mediated learning, which fosters creativity and innovation, becomes a concern (Chimbi & Jita, 2021; Madondo, 2020). Further, the teacher-centred approaches many Zimbabwean teachers use aggravate the situation (Chimbi & Jita, 2021; Madondo, 2020; Nyamayedenga & De Jager, 2021; Mpaso, 2018). In addition, creativity can also be developed and improved by using failure as an opportunity to improve and tap into constructivist pedagogies (Sharp, 2004; LanSchool, 2021).

2.2 Critical thinking as an element of the 4Cs in secondary school education

Critical thinking refers to the student's ability to weigh alternatives, analyse arguments, evaluate ideas and understand complexities (P21, 2009). Critical thinking is a higher-order skill and resource that empower students to solve or formulate problems, generate answers, and self-regulate during their learning (Bećirović, Hodžić & Čeljo, 2019; Makonye, 2019) and in their personal lives, resulting in enhanced academic achievement (Anggraen *et al*., 2023). Critical thinking is best practised as a pedagogical tool when learners engage in rational peer discourse to brainstorm answers to solve problems together (Taylor,1998). However, some other teachers' preferential use of traditional teaching approaches curtails rational peer discourse. Several authors (Bećirović *et al*., 2019; Dambudzo, 2015) report the prevalence of poor critical skills in secondary school students. Makonye (2019) attributed this shortage to conservative culture, students' poor socioeconomic backgrounds, inadequate support from teachers and a lack of skills to incorporate critical thinking into teaching and learning. To mitigate this problem of low critical skills in secondary schools, numerous authors (Elisanti, Sajidan & Prayitno, 2017; Dambudzo, 2015; Chukwuyenum, 2013; Makonye, 2019; Harshbarger, 2016) suggested the integration of technology into the teaching of individual subjects. For instance, heightened scaffolding strategies in online discussions foster critical thinking skills (Cheong & Cheung, 2008). However, with the availability and pervasiveness of WhatsApp in our daily lives, teachers in developing countries have no valid reason not to use WhatsApp as a mediating teaching tool.

2.3 Collaboration as an element of the 4Cs in secondary school education

Recently, collaboration has become essential due to globalisation and technological advancement (LanSchool, 2021). Collaboration refers to students working together to solve problems effectively (Ravitz, 2014; P21, 2009). Through shared responsibility, the students work productively in teams, engaging in conflict management, goal setting, idea sharing, decision-making, power sharing, acknowledging diversity and willingness to make compromises (Sohaya, 2020; P21, 2009). Activities encouraging collaboration include gamification, safe discussion environments, storytelling and brainstorming (LanSchool, 2021). However, the downside to group work is when some members refuse to participate and remain passive, while others ignore differing opinions, interrupt others, provide shallow explanations and reject alternative perspectives without reasonable grounds (Ross, 2008). Le, Janssen and Wubbels (2018) attribute these collaboration problems to aspects such as free-riding, where some students do not contribute; competence status, where low academically competent students may

lack confidence; and friendship, where friendships prohibit constructive criticism and the implementation of collaborative learning. However, the Zimbabwean teachers' disregard for student-centred strategies (Chimbi & Jita, 2021; Madondo, 2020) and lack of awareness lead to poor discussion and student disengagement (Harshbarger,2016). For instance, Zimbabwean secondary school Mathematics' teachers rarely use groups as a teaching strategy (Mangwende & Maharaj, 2018). Le, Janssen and Wubbels (2018) suggest that having group guidelines will make collaboration effective. In addition, Ross (2008) reports that substandard explanations in collaboration groups did not foster shared knowledge construction, leading to teachers' lack of group use. On the other hand, collaboration skills inherent in groups empower students to develop diverse viewpoints, enabling them to express and defend their ideas (Kulikovskikh, Prokhorov & Suchkova, 2017) and scaffold students' knowledge construction (DeWitt, Siraj & Alias, 2014).

2.4 Communication as an element of the 4Cs in secondary school education

Communication has become essential for social, personal, and future work success in a world that has become increasingly connected and globalised (Thornhill-Miller *et al.*, 2023). Globalisation has resulted in a social and cross-cultural understanding for effective communication. Communication refers to the students' ability to use various media for purposes such as to inform, educate, motivate and persuade when sharing their thoughts, ideas, data and any findings in writing or orally (P21, 2011).

Teachers and schools should, therefore, promote the teaching of communication skills to their learners by creating opportunities to practise interpersonal and intrapersonal communication skills. Schools should ensure that students learn to communicate digitally, solve problems, give feedback using information, communication and technology (ICT) and other communication strategies to create meaning, knowledge, values and attitudes (P21, 2011). However, the incorporation of ICT, which fosters communication in teaching and learning in Zimbabwe, is still low-slung (Guvhu, Jita & Akintunde, 2021) and has been exacerbated by teachers' lack of ICT skills. In addition, the teacher-centred pedagogies used to teach in Zimbabwe (Nyamayedenga & De Jager, 2021; Mpaso, 2018) curtail the bottom-up strategies inherent in group work and project-based learning that promote communication (Sultoni, 2021). Nevertheless, communication can still occur in teacher-centred approaches but less effectively than in student-centred pedagogies (Harshbarger, 2016; Taylor, 1998).

2.5 Secondary school students' perceptions of the 4Cs

In a study in the United States of America (USA), Landon (2019) reports that secondary school students experienced the teaching of 4Cs where collaboration (67,6%) topped the list, followed by communication (54.1%), critical thinking (40,9%) and creativity (39,2%). In another study by Bray, Girvan and Chorcora (2023), in Ireland, 3 863 secondary students reported their perception of their confidence in 21st-century learning with collaboration (3,53) the highest, followed by creativity (3,41), critical thinking (3,39) and communication (3,09). However, in a case study by Ye and Xu (2023), collaboration and communication were tied first, followed by critical thinking and creativity in the third and fourth places, respectively. It is noteworthy that in Landon's (2019) study, the students viewed communication (94,2%) as the most critical 21st-century skill for use in future in many of their classes, followed by creativity (89,3%), collaboration (84,9%) and critical thinking (79,9%).

3. Theoretical framework

The learning and innovation theme from the P21 frames the study. The learning and innovation theme comprises creativity, critical thinking, communication and collaboration (4Cs). Communication moderately correlates to collaboration, and critical thinking moderately correlates to creativity and innovation (Pardede, 2020). However, collaboration and communication co-occur when students exchange ideas in groups, thus fostering critical thinking (Pardede, 2020; LanSchool, 2021). According to Mariani *et al.* (2022), innovation emanates from collaboration (rather than individual thinking).

3.1 Conceptual framework

The learning and innovation theme was used as the conceptual framework. Figure 1 shows elements of the proposed conceptual framework.

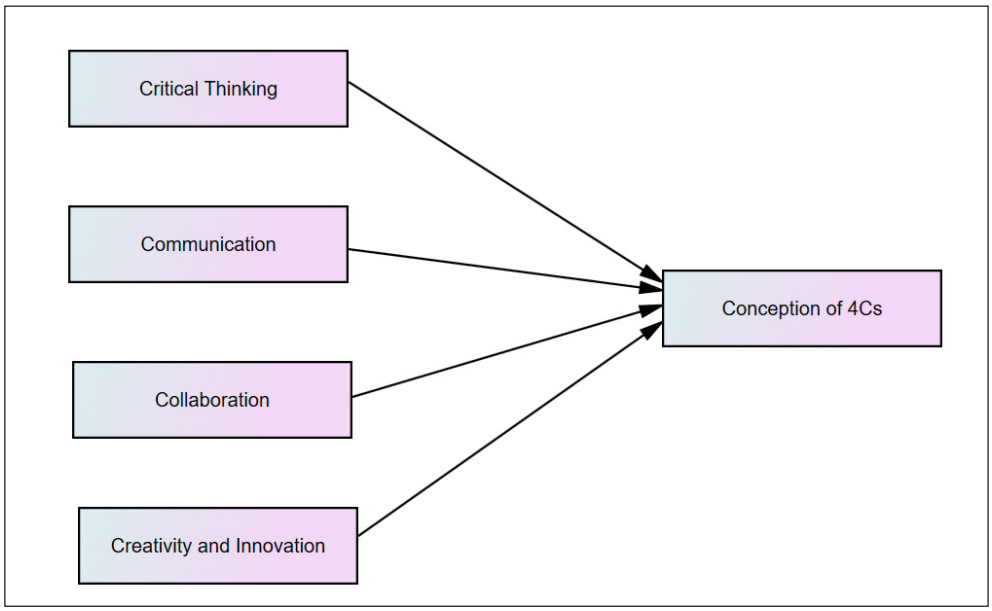

Figure 1: The elements of the conceptual framework

4. Research design

The study used a cross-sectional correlational quantitative design, which provides a 'snapshot' of the phenomenon under study (Kesmodel, 2018). The cross-sectional correlational design was chosen because the results can be generalised to a larger population, and it is inexpensive and easy to run, unlike a longitudinal study (Spector, 2019).

4.1 The instrument

The questionnaire was derived from the learning and innovation theme in P21 (Ravitz, 2014). The researchers modified some questionnaire items' wording to fit the Zimbabwean context. The instrument used a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5).

4.1.1 Instrument validity

The content and construct validity were considered, where content validity was established by asking two experienced researchers to check the wording of the questionnaire items. In addition, the researchers did a thorough literature review. Construct validity, which comprises convergent and discriminant validity, was determined by calculating the composite reliability (CR) and average variance (AVE). These two concepts (CR and AVE) are discussed in the following sections.

4.1.2 Sampling and participants

Convenience sampling was used to collect data, because the four urban schools from where the study took place were accessible to the researchers within a 10 km radius. Data were collected from four secondary schools in the Makonde District in Chinhoyi in Zimbabwe. Two hundred and thirty-six (236) students from these four secondary schools in Zimbabwe participated in the study. Of the 236 students, 119 were males, and 117 were females. Two hundred and twenty-three students (223) were black, and 13 were white or coloured. Two hundred and twenty-five (225) students were less than 17 years old, and eleven were 18 and over.

4.2 Data collection

Data were collected from 236 Form 4 students about to sit for their final Ordinary Level examination. The students at one resourced school responded to an online questionnaire and those from other schools responded to a paper questionnaire.

4.3 Data analysis

The tools used to validate the questionnaire were the Statistical Package for the Social Sciences (SPSS) and Analysis of a Moment Structures (AMOS) version 26. Exploratory factor analysis (EFA) was used to find the factor structure of the data, and confirmatory factor analysis (CFA) was used to confirm the measurement model.

4.3.1 Validation of the measuring instrument

EFA using the principal factor axis (PFA) was employed to check for uni-dimensionality (the relatedness of items in the same construct). The sampling adequacy of the data was measured using the Kaiser-Meyer-Olkin (KMO). KMO values were equal to or greater than 0.6, indicating the plausibility of factor analysis (Field, 2018; Kaiser, 1974). The determinant values were greater than 0,00001, indicating a lack of multicollinearity issues in the data (Field, 2000). Table 1 shows the factor loadings, determinants and KMO values for critical thinking (CT), collaboration (COL), communication (COM) and creativity and innovation (CI) constructs.

Table 1: Factor loadings, determinants and KMO values for CT, COL, COM and CI

	ITEM	CT	COL	COM	CI
	1	0,356	0,592	0,325	0,551
	2	0,466	0,671	0,569	0,572
	3	0,672	0,542	0,404	0,640
	4		0,629	0,584	0,582
	5		0,578		0,664
	6				0,652
	7				0,545
KMO		0,581	0,798	0,646	0,847
Determinant		0,842	0,392	0,764	0,184
Overall KMO	0,867				

Note: CT denotes critical thinking; COL denotes collaboration; COM denotes communication; CI denotes creativity and innovation

4.3.2 Reliability

Reliability measures the internal consistency of the items (Hair *et al*., 2010). Cronbach's alpha measures internal consistency. The overall reliability of the instrument is equal to 0,8; hence adequate (see Hair *et al*., 2006; Devisakti & Ramayah, 2019). For CT and COM, Cronbach's alpha equals 0,5, which is acceptable (Bujang, Omar & Baharum, 2018), but Sekaran and Bougie (2013) consider these values poor. Table 2 shows the reliability values.

Table 2: Reliability values for CT, COL, COM and CI

Construct	Cronbach's Alpha
CT	0,50
COL	0,70
COM	0,50
CI	0,80
Overall Cronbach's alpha	0,86

Note: CT denotes critical thinking; COL denotes collaboration; COM denotes communication; CI denotes creativity and innovation

4.3.3 Construct validity

Construct validity encompasses convergent and discriminant validity and is measured by composite reliability (CR), which measures the reliability of a latent construct, and average variance extracted (AVE), which measures the proportion of variance captured by a construct relative to the total variance (see Hair *et al*., 2006). In this study, convergent validity is adequate since CR values are approximately equal to and greater than 0,6, and the (AVE) values are less than 0,5 (see Fornell & Larcker, 1981). The inter-construct correlations are less than the square roots of the AVEs (bolded diagonal in Table 3), indicating good discriminant validity (Fornell & Larcker, 1981). Table 3 shows the convergent and discriminant values for CT, COL, COM and CI.

Table 3: Convergent and discriminant validity

	CR	AVE	CT	COL	COM	CI
CT	0,503	0,265	**0,515**			
COL	0,741	0,365	0,409	**0,604**		
COM	0,536	0,234	0,405	0,452	**0,484**	
CI	0,799	0,363	0,546	0,466	0,492	**0,602**

Note: CT denotes critical thinking; COL denotes collaboration; COM denotes communication; CI denotes creativity and innovation

4.4 Exploratory factor analysis for CT, COL, COM, and CI

Data were subjected to factor analysis using principal axis factoring with Promax rotation, and four factors were extracted based on eigenvalues greater than one. Table 4 shows the factor structure for CT, COL, COM, and CI.

Table 4: Exploratory factor analysis for CT, COL, COM, and CI

Item	Factor			
	1	2	3	4
CI5	0,794			
CI6	0,725			
CI3	0,628			
CI2	0,541			
CI7*	0,407		0,329	
CI4	0,383			
COM3				
CT1				
COL2		0,823		
COL1		0,511		
COL3		0,489		
COL4		0,473		
COM4			0,747	
COL5			0,611	
COM2			0,323	
COM1				0,591
CT3*	0,344			0,447
CT2				0,361
CI1				
Note: * denotes cross-loaded items				

Note: CT denotes critical thinking; COL denotes collaboration; COM denotes communication; CI denotes creativity and innovation

Items COM3, CT1 and CI1 loaded with loadings less than 0,3 and were discarded (see Costello & Osborne, 2005). Items CT3 and CI7 loaded on more than two factors (cross-loaded) and discarded. After removing CT3, Factor 4 had two items, COM1 and CT2, remaining, but with item CT2 loading poorly at 0,361.

4.5 Confirmatory factor analysis

AMOS version 26 was used to verify the measurement model. Figure 2 shows the measurement model after model modifications (co-varying error e4 and e5 terms).

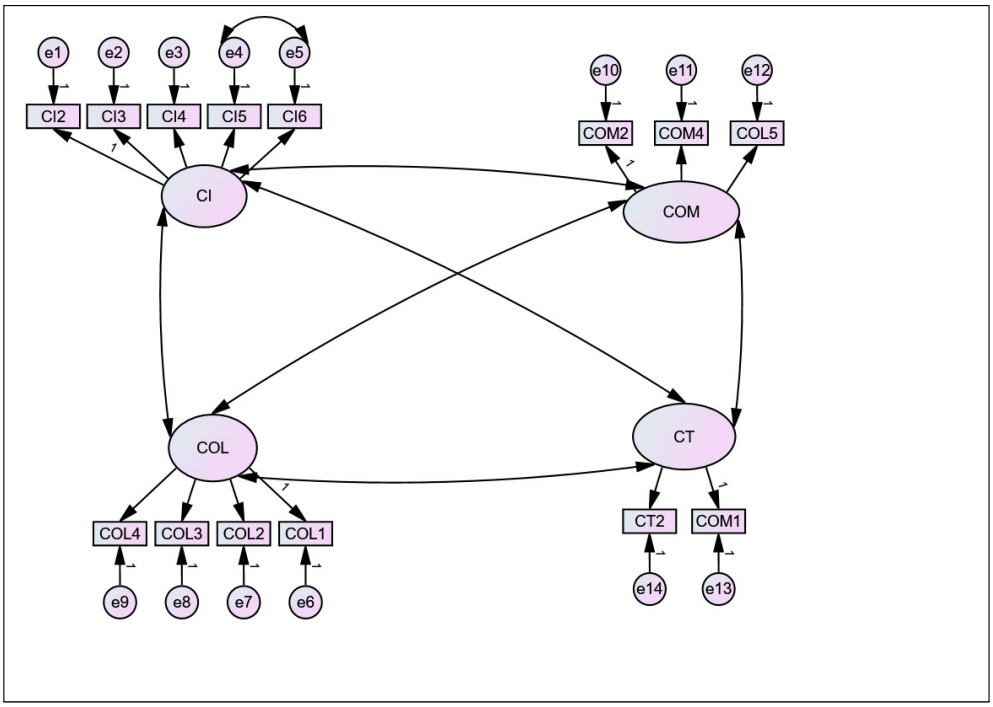

Figure 2: Shows the CFA model with the error terms e1 to e16

Note: CT denotes critical thinking; COL denotes collaboration; COM denotes communication; CI denotes creativity and innovation

4.5.1 Model fit indices

The fit indices used to measure model fitness were chi-square fit statistics/degree of freedom (x^2/df), comparative fit index (CFI), Tucker-Lewis index (TLI), incremental fit indices (IFI) and the root mean square error of approximation (RMSEA). Table 5 shows the model fit values.

Table 5: Model fit indices

Fit statistic	Threshold value	Obtained value	Interpretation
x^2/df	1<x<3	1,323	Excellent
CFI	>0,950	0,966	Excellent
TLI	>0,950	0,956	Excellent
IFI	>0,950	0,967	Excellent
RMSEA	<0,08	0,037	Excellent

The final model fit values were greater than the threshold values of 0,95 for CF1, TLI and IFI, the chi-square fit statistics/degree of freedom was between 1 and 3, and the RMSEA value was equal to 0,037, a value less than 0,08, henceforth presenting an excellent measurement model fit (see Lacobucci, 2010).

4.5.2 Second-order CFA

The second high-order factor, 4Cs (Learning and Innovation Theme), represents the combined influence of CI, COL, COM, and CT. Figure 3 shows the Learning and innovation theme and its subconstructs.

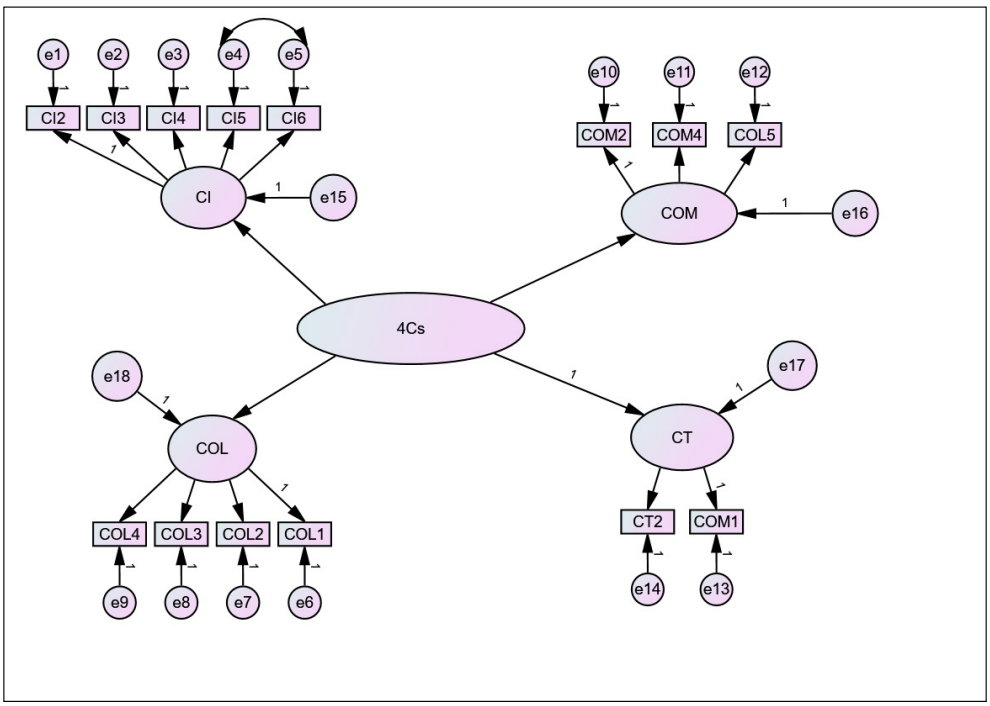

Figure 3: The second-order CFA model

Note: CT denotes critical thinking; COL denotes collaboration; COM denotes communication; CI denotes creativity and innovation

The factor loadings of the subcontracts of 4Cs (CI=0,697, COL=0,838, COM=0,829 and CT =0,760) are moderately high and significant (p <0,001), thus confirming the existence of a second or higher order factor (4Cs) that accounts for these four factors (see Brown, 2006). In addition, the CR and AVE values for 4Cs are 0,863 and 0,613, respectively, with values greater than 0,7 and 0,5, indicating convergent validity (Hair *et al*., 2006). Table 6 shows the factor loadings of the sub-constructs and their statistical significance.

Table 6: The regression path analysis for the sub-constructs CI, COL, COM and CT

			Standardised Estimate	Rank	SE.	CR.	Sig	Result	CR	AVE
4Cs									0,863	0,613
CI	<---	4Cs	0,697	4	0,463	3,699	***	significant		
COM	<---	4Cs	0,829	2	0,404	3,560	***	significant		
CT	<---	4Cs	0,760	3			Reference point			
COL	<---	4Cs	0,838	1	0,596	3,798	***	significant		

Note: CT denotes critical thinking; COL denotes collaboration; COM denotes communication; CI denotes creativity and innovation

4.6 The influence of moderators on COL, COM, CI and CT

The ANOVA test was used to determine the influence of gender, age and population group on COL, COM, CI and CT. Gender and population group did not influence COL, COM, CI and CT. Age influenced CT (p =0,021), where the mean (4,17) of the 16 to 17-year-olds was greater and statistically significant to the mean (3,54) of the students above 18 years old.

5. Discussion

The second-order factor confirmatory factor analysis verified the applicability of the elements of the Learning and Innovation theme in a non-western country, since all the elements of the 4Cs (Learning Innovation theme) loaded onto it with factor loadings between 0,697 and 0,838, and these factor loadings are significant (p<.001).

The students strongly endorsed collaboration, followed by communication, critical thinking, creativity, and innovation (see the magnitude of standardised estimates in Table 6). This result aligns with the findings from Landon (2019) on how high school students in the USA experienced the teaching of the 4Cs in most of their classes.

5.1 Perception of collaboration

Collaboration was ranked first, and this result aligns with findings from several authors (Landon, 2019; Bray, Girvan & Chorcora, 2023; Ye & Xu, 2023). The result also supports the view of several authors (Pardede, 2020; LanSchool, 2021; Kulikovskikh *et al*., 2017; DeWitt *et al*. 2014; Cheong & Cheung, 2008; Sohaya, 2020; P21, 2009) who see collaboration as the starting point before other processes namely, critical, thinking, communication and innovation can take off. Because of the high student-to-teacher ratio, Zimbabwean teachers probably use group work to collaborate.

5.2 Perception of communication

Communication was ranked second, consistent with Landon's (2019), and inconsistent with Bray *et al.*'s (2023) findings, where communication is endorsed last. The result also aligns with findings by Thornhill-Miller *et al.* (2023), who report that communication is an essential social and personal skill in an increasingly connected and globalised world. However, in this study, one would have expected a poor ranking of communication, since Zimbabwean teachers do not use student-centred strategies that foster communication (Chimbi & Jita, 2021; Madondo, 2020). In addition, the incorporation of ICT into teaching and learning that foster communication is still low-slung in Zimbabwe (Guvhu *et al*., 2021), but the fact that the students endorsed

collaboration highly resulted in high levels of communication, since communication stems from collaboration (Pardede, 2020; LanSchool, 2021; Kulikovskikh, *et al.*, 2017; DeWitt *et al*., 2014; Cheong & Cheung, 2008; Sohaya, 2020; P21, 2009). Nonetheless, this result resonates with the fact that communication still occurs in teacher-centred approaches, but is less effective than in student-centred pedagogies (Harshbarger, 2016; Taylor,1998).

5.3 Perception of critical thinking

Critical thinking was ranked third, aligning with Landon (2019), Ye and Xu (2023) and Bray, Girvan and Chorcora's (2023) findings. This finding supports the view of Dambudzo (2015), who reported the prevalence of low-slung understanding of critical skills in secondary school students. In addition, this finding is consistent with findings by numerous authors (Chimbi & Jita, 2021; Madondo, 2020; Makonye, 2019; Geisinger, 2016; Elisanti *et al*., 2017; Harshbarger, 2016; Dambudzo, 2015; Chukwuyenum, 2013), who postulated that teacher-centred strategies (rather than student-centred pedagogies) curtail the growth of critical thinking. Moreover, the finding resonates with those of Selman (2020) and Makonye (2019), who attribute low critical thinking to the lack of teaching resources, poor learning environments, poor socioeconomic backgrounds, inadequate support from teachers, and teachers' lack of skills to incorporate critical thinking into teaching and learning and a lack thereof of technological tools in Zimbabwean schools.

5.4 Perception of creativity and innovation

Creativity and innovation were ranked fourth and last, thus consistent with the findings of Landon (2019) and Ye and Xu (2023), but inconsistent with Bray *et al.*'s (2023) findings, where creativity and innovation were ranked second. The lack of technology-mediated learning in Zimbabwe contributes to the poor endorsement of creativity and innovation (Lepe-Salazar & Cortes-Alvarez, 2023). Furthermore, teachers in Zimbabwe use teacher-centred strategies (Chimbi & Jita, 2021; Madondo, 2020), leading to passive thinking and poor creativity and innovation, unlike student-centred approaches (Pardede, 2020; LanSchool, 2021). The poor endorsing of creativity and innovation by the Zimbabwean teachers confirms that the teachers favour traditional teaching strategies.

5.5 The influence of gender, age and population group on COL, COM, CI and CT

In this study, population group and gender did not influence elements of the 4Cs (COL, COM, CI and CT). Nevertheless, age influenced CT (p =0,021) where the mean (4,17) of the 16–17-years-old was greater and statistically significant to the mean (3,54) of 18 years old and above. We expect 18-year-old and older students to have higher critical thinking skills because they are more mature.

5.6 Theoretical contribution

The applicability of the Partnership for 21st-Century Learning (P21) learning and innovation theme (4Cs) was successfully determined and reproduced in a different cultural context in a developing economy, Zimbabwe. The second-order CFA results indicate that collaboration, communication, critical thinking, creativity and innovation belong to another higher-order abstract factor called 4Cs (Learning and Innovation theme), hence confirming earlier studies in the Western world.

5.7 Practical contributions

This study's findings provide teachers and school heads with feedback on how students conceive the 4Cs. Hence, relevant intervention measures can now be implemented to address the poorly endorsed 4Cs (CT, CI, COM), alongside collaborative activities, thus improving the teaching practice and educational outcomes.

5.8 Limitations of the study

Four secondary schools in one district took part in the study. Extending the study to other schools, forms and districts in Zimbabwe, as well as other developing countries will confirm the factor structure of the learning and innovation theme in developing countries. The study used self-reported scales, which are liable to social bias. Therefore, using multiple scales and methods to measure the same constructs will limit social bias. The study was quantitative, and employing a mixed methods approach would capture more insights. In addition, the study was cross-sectional and captured data at a specific time. Learning 21st-century skills such as the 4Cs is dynamic; therefore, a longitudinal study will be suitable.

5.9 Recommendations

Future research could involve investigating the effectiveness of integrating communication, critical thinking, creativity and innovation alongside collaboration and investigating the role of technology in fostering communication, critical thinking and creativity alongside collaboration.

6. Conclusion

The students endorsed collaboration the most, followed by communication, critical thinking, creativity and innovation. The results are similar to a study in the USA by Landon (2019), probably indicating that today's students in developed and developing countries have similar needs that stem from globalisation, which has recently accelerated due to rapid technological changes.

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