Contribution of teachers' continuous improvement to enhancing pupils' academic achievement in Tanzania's primary schools

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https://doi.org/10.51867/ajernet.6.4.91

ABSTRACT

The application of continuous improvement theory to teachers' professional development in primary schools generally contributes positively to pupils' academic achievement. This cross-sectional study examined the contribution of school-based and self-based teachers' continuous improvement to pupils' academic achievement while considering urbanisation and pupil-to-teacher ratio (PTR) as supporting contexts. The study utilised data collected through a structured questionnaire administered to 78 teachers drawn using stratified sampling from approximately 872 teachers, which were then analysed using multiple linear regression with the aid of SPSS. The study revealed that school-based teachers' continuous improvement, as well as the context, each makes a significant positive contribution to pupils' achievement. However, the continuous improvement of self-based teachers does not significantly contribute to pupils' achievement. The study recommends that policymakers place more emphasis on school-based teachers' continuous improvement, urbanisation, and a PTR of at most 40:1, rather than self-based teachers' continuous improvement.

Keywords: Pupils' Academic Achievement, Pupil-to-Teacher Ratio (PTR) Context, School-Based Teachers' Continuous Improvement (Kaizen), Self-Directed Teachers' Continuous Improvement, Urbanisation Context

I. INTRODUCTION

Tanzania has made concerted efforts to promote learner-centred approaches through its primary education Continuous Professional Development (CPD) and Teacher Continuous Professional Development (TCPD) initiatives. However, a teacher-centred approach still dominates, while pupils' academic achievement continues to improve steadily (Ishemo, 2021; United Republic of Tanzania - Ministry of Education, Science and Technology [URT-MoEST], 2025). This situation led us to question the contribution of CPD and TCPD in improving pupils' academic achievement. Teachers' continuous improvement (Kaizen) is a key Total Quality Management (TQM) factor that can help explain the reasons for this situation (Caraan & Caraan, 2023). It emphasises ongoing improvement in employees' performance in meeting customer needs and specifications effectively (Bouranta et al., 2020; Caraan & Caraan, 2023).

One of the structural education problems in developing countries, such as Tanzania, is the implementation of abrupt, revolutionary changes without providing social agents with sufficient time to adapt to and become familiar with the new curriculum program (Duran & Mertol, 2021). In fact, Kaizen was first employed formally in Japan. It was an inexpensive way to improve productivity and reduce costs within a limited timeframe, utilising extremely scarce resources to meet the government's demand for national reconstruction immediately after World War II (Kato & Smalley, 2015). Hence, a continuous improvement approach to educational structure changes is expected to be more appropriate for developing countries facing education resource constraints.

The Kaizen philosophy focuses on long-term benefits achieved through human effort. In teacher development programs, it corresponds to teachers' training, motivation, self-discipline, engagement, teamwork, and the sustainable achievement of learning outcomes (Arsyad, 2021; Bouranta et al., 2020; Imai, 2014), thereby achieving the highest pupil-learning outcomes. In the cognitive domain, the desired learning is staged in a taxonomy developed by Bloom (1956), which progresses from basic knowledge to comprehension, application, analysis, synthesis, and finally evaluation. Anderson and Krathwohl (2001) refined Bloom's taxonomy stages to action states that involve remembering, understanding, applying, analysing, evaluating, and finally creating. This study examined how the continuous improvement of teachers enhances pupil learning outcomes, as measured by improvements in the dimensions of Bloom's taxonomy.

Successful continuous improvement is supported by long-term orientation plans and a sustainable improvement culture that aims to eliminate waste in all organisational systems and processes, involving all people working together

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(Béndek, 2016; Bhuiyan & Baghel, 2005). Hence, it is crucial to formalise Kaizen in an organisation's programmes for quickly and significantly developing its community (Duran & Mertol, 2021). In fact, Kato and Smalley (2015) suggest that formal Kaizen stages in curriculum development should involve identifying areas for learning improvement, facilitating simple learning and teaching methods, helping people generate original ideas for improvement, carefully creating coordination plans, implementing the plans, and evaluating the results. However, the formal curriculum should not be taken as the sole factor for maintaining a curriculum based on Kaizen principles (Duran & Mertol, 2021), because Kaizen extends to personal, home, social, and work life, involving everyone in the workplace (Imai, 1986).

Continuous improvement can take a self-based or school-based form. Suárez-Barraza et al. (2021) hold that Kaizen can be applied at both the individual and organisational levels. However, the complexity of educational processes and the diversity of stakeholders can pose challenges (Suárez-Barraza et al., 2021). School-based teachers' continuous improvement is a pupil-centred approach that involves ongoing, collaborative, and active learning among teachers to improve pupils' achievement. Additionally, the constant improvement of school-based teachers is claimed to enhance knowledge sharing among teachers, which in turn improves pupils' academic achievement (Asmare, 2025; Lyengemekeja, 2016). However, Johnson and Johnson (2015) argue that collective agency involves individuals working together to achieve what they cannot achieve individually. This study aims to clarify the differences in the contributions of these two approaches to pupils' academic achievement, while considering their interactions with contextual supporting factors in primary schools in Tanzania.

The self-based teachers' continuous improvement, such as self-directed learning (SDL), emphasises autonomous, self-discipline, self-motivation, self-reflections and self-evaluation (Dahal & Bhat, 2023; Mihai, 2021). It is claimed to enhance personal skills and flexibility in critical thinking, problem-solving, and tool usage by exploring freely available knowledge and discovering new, more effective ways (Dahal & Bhat, 2023; Mihai, 2021; Murniati et al., 2023). The self-based teachers' continuous improvement is similar to a teacher-centred approach (Ishemo, 2021), which seeks to meet the teacher's teaching needs rather than the learner's needs, as advocated by the learner-centred approach in education.

Nevertheless, the mainly larger pupil-to-teacher ratio (PTR) and seemingly entrenched teacher-centred approach threaten learner-centred approaches and continuous improvement in Tanzania (Ishemo, 2021; URT-MoEST, 2025). In fact, the national average PTR in 2023 was 55:1, whereas the Pupil-to-Qualified-Teacher Ratio (PQTR) was 56:1 in Tanzania. Moreover, significant discrepancies exist across regions, with the PQTR ranging from 11:1 to 76:1, highlighting the need for the Teachers Service Commission to ensure the equitable deployment of teachers across regions and districts. (The URT- MoEST, 2025). The higher PTR and PQTR that require a PRT of 40:1 (URT-MoEST, 2025) can reduce the time teachers need to spend on continuous professional development programs and increase the likelihood of using a learner-centred approach to meet the learning needs of each pupil. In fact, the government's goal is to improve the pupil-to-qualified-teacher ratio in primary education from 61:1 in 2023 to 53:1 by 2030, which is still a considerable distance from the required ratio.

Furthermore, industrialisation is also one of the factors associated with the evolution of the continuous improvement philosophy. Edwards Deming is credited with introducing the concept of TQM in Japan in the late 1950s, with the focus on improving the performance of manufacturing companies such as Toyota Motor Corporation (Duran & Mertol, 2021). Additionally, the Japanese implemented successful TQM practices (Deming, 1986). The successful implementation of TQM in the manufacturing sector has also led educational institutions to adopt TQM, aiming to improve the learning process in education (Duran & Mertol, 2021; Sfakianaki, 2019). Currently, Kaizen supports more digitalised industrial processes for organisational success (Dang-Pham et al., 2022). However, many primary schools, particularly in rural areas, still lack reliable electricity, which is necessary for most ICT devices (URT-MoEST, 2025). Furthermore, schools in rural areas tend to receive less capitation funds compared to those in urban areas, as the distribution is based solely on the number of students without considering associated fixed costs (The URT-MoEST, 2025). Hence, the impact of industrialisation and the PTR context on pupil-learning outcomes was also examined.

1.1 Statement of the problem

Different studies have demonstrated that teachers' continuous improvement is a critical and successful factor in pupils' learning achievement (Asim et al., 2019; Asmare, 2025; Mohamed et al., 2024; Ochar et al., 2025). However, no study examined the contribution of school-based and self-based teachers' continuous improvement to pupils' academic achievement in primary schools in Tanzania, as covered by this study, particularly in the context of urbanisation and PTR.

1.2 Research Objectives

i. To determine the contribution of school-based teachers' continuous improvement on pupils' academic achievement in the context of urbanisation and pupil-to-teacher ratio in Tanzania.
ii. To examine the contribution of self-based continuous improvement for workers on pupils' academic achievement in the context of urbanisation and pupil-to-teacher ratio in Tanzania.

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II. LITERATURE REVIEW

2.1 Theoretical Review

The Continuous Improvement (also known as Kaizen) philosophy is a quality movement initiated by Shewhart in the 1920s, based on the Plan-Do-Check-Act (PDCA) cycle. In 1950, Edwards Deming further expounded his philosophy of TQM, as established by Zangwill and Kantor (1998). Since the theoretical framework for continuous improvement is weak (Bhuiyan & Baghel, 2005; Zangwill & Kantor, 1998), it remains primarily supported by contingency theory, learning curve theory, and TQM philosophy. The contingency theory claims that the best process for the best solution is contingent on the particular situation, such that an improvement that works well in a given organisation context or period might not work well in other contexts or periods (Netland, 2016). Social cognition theory is closely connected to self-efficacy theory and organisational learning theory, in that individuals learn by doing or acquire new knowledge and behaviours by collaborating with others (Bandura, 2001). Besides, the learning curve theory illustrates how performance (output or cost reduction) improves over time as individuals gain experience or learn from performing the input; however, it does not suggest how to reduce costs or how to achieve continuous improvement, as constant improvement does (Zangwill & Kantor, 1998). In the TQM philosophy, Deming used the term "continual improvement" (regular check and adjust), which is in harmony with the PDCA (Plan-Do-Check-Act) cycle, rather than "continuous" (non-stop) improvement without pause (Deming, 1986).

This study adopted the TQM philosophy, which describes continuous improvement as the small, ongoing, systematic development of processes brought about by the engagement of all employees, enabling them to meet or exceed customers' needs effectively (Duran & Mertol, 2021; Shanmuganathan & Sathishkumar, 2019). Hence, the contribution of continuous improvement (or kaizen) to teacher-pupil learning outcomes was examined in this study. In this case, a customer-focused continuous improvement initiative targets teachers, who are then expected to enhance pupil learning achievement through improved teaching skills.

2.2 Empirical Review

Duran and Mertol (2021) also argued that collective agency requires collective synchronisation, coordination, cooperation, as well as a collective goal resulting in collective goal-directed behaviour in which the actions of the individual agents must be directed at the same goal. Their behaviour must be coordinated in a specific way in terms of behavioural and cognitive dimensions. They conducted a qualitative study based on a document analysis to analyse different perspectives of kaizen in curriculum development between Japanese culture and Western culture. They found that in the West, perceived kaizen improvement is driven by stakeholders, depending on their respective positions and roles. In contrast, the Japanese perceive Kaizen as improvement brought about by all staff and stakeholders working in harmony together as equal, valuable partners, which gives the Japanese a competitive advantage in the global market.

The success of teachers' CPD initiatives varies across countries, depending on the context that supports them. In Rwanda, for example, CDP is successful because the government has invested in information and communication technology (ICT) systems that facilitate teachers' CPD (Nkundabakura et al., 2024). In Kenya, teachers' CDP is also successful because the government require teachers to meet established CPD points to be promoted in the teaching profession (Shayo & Sonola, 2025). Kariuki and Mbugua (2018) examined the role of teacher professional development in Kenya using a parallel mixed design, based on surveys of 197 teachers from public primary schools and 144 teachers from private primary schools. The study found that teacher participation in collaborative professional development improves their teaching skills. Additionally, Yangambi (2021) surveyed 108 teachers in the Democratic Republic of the Congo to examine the role of in-service training for primary school teachers on pupils' academic achievement in Kinshasa and found a positive association between them at a high cost.

Asim et al. (2019), who employed regression analysis to investigate the impact of teachers' improvement on pupils' academic achievement, based on data from 400 public primary schools in Tanzania, found that teachers' improvement enhances pupils' academic achievement. Even though the Tanzania government introduced the National Framework for Teacher Continuous Professional Development (TCPD) (The URT- MoEST, 2025), the CPD is not successful compared to that in Kenya and in Rwanda, possibly due to context factors such as gender, age, education level, urbanization level, school ownership or PTR which do not support pupils' academic achievement. For example, Asim et al. (2019) found that primary schools with adequate physical facilities achieve higher learning outcomes, while schools in urban areas scored about 75% on average, versus 61% of primary schools in rural areas, even after controlling for amenities such as piped water, road access, and the number of pupils.

III. METHODOLOGY

3.1 Research Design and Approach

This quantitative survey study was conducted in the Missenyi District of Kagera Region, Tanzania, where various factors, such as PTR and urbanisation level, as defined by the United Republic of Tanzania – Ministry of

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Education, Science, and Technology (URT-MoEST, 2025), are essential for the regression analysis. It employed explanatory (causal-effect) research design as recommended by Creswell (2014) because the study sought to examine the contributions, as effects, of school-based and self-based teachers' continuous improvement to pupils' academic achievement based on urbanisation and PTR context, based on regression analysis with the aid of the Statistical Package for Social Sciences (SPSS).

3.2 Sampling Strategy

The study employed stratified sampling to select a diverse group of 78 teachers from an initial pool of 872 primary school educators. This approach guaranteed that each stratum was represented through random or convenience sampling. These teachers were chosen for their extensive experience in advancing teaching practices and their ability to assess students' academic progress. Their insights are highly valuable, as they are actively involved in enhancing educational results in primary schools. The resultant sample size of 78 teachers exceeds the minimum sample size of 50 members recommended by VanVoorhis and Morgan (2007) for regression analysis.

3.3 Data Collection

The study employed a structured questionnaire to collect quantifiable data systematically aligned with the research objectives. After obtaining necessary permissions from the District Executive Director (DED), data was collected in 2024 from 78 teachers using a structured questionnaire, as outlined in Appendix I.

3.4 Data analysis

Multiple linear regression, a dependable method for analysing the relationships between one dependent variable and multiple independent variables, was used in the analysis of quantitative data with the help of SPSS software. This approach provides valuable insights into the factors that influence the results. The findings can inform future policies and interventions, thereby deepening our understanding of the educational environment.

3.5 Ethical Considerations

Besides obtaining authorisation from the DED, the study also adhered to ethical standards by prioritising honesty, integrity, and responsibility throughout all stages of the research. Central to our approach was the securement of informed consent, which upheld participant autonomy. We were committed to transparency in data reporting, including the disclosure of any conflicts of interest. Furthermore, we ensured compliance with relevant ethical guidelines and safeguarded confidentiality by anonymising the data. The rights and well-being of research participants remained at the forefront of our efforts.

IV. FINDINGS & DISCUSSION

4.1 Findings

This section presents, analyses and discusses the study findings. It begins with the demographic profile before progressing to detailed statistical findings.

4.1.1 Demographic Characteristics

The demographics helped determine a better context for pupils' academic achievement, as presented in Table 1.

Table 1

Demographic Characteristics

Demographic	Respondents' group	Total members	Percent
Gender	Male	44	56.4
	Female	34	43.6
Age	Youth age (18-35 years)	38	47.7
	Adult age (35 years and above)	40	51.3
Education	Less than bachelor	61	78.2
	At least bachelor	17	21.8
School Ownership	Public (government)	57	73.1
	Private	21	26.9
Urbanization	Rural	24	30.8
	Middle	32	42.3
	Urban	21	26.9
Total	**sample size**	**78**	**100%**

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The demographic characteristics show that 56.4% of teachers were male, while 43.6% were female. Additionally, 47.7% of teachers were youth, and 51.3% were adults. Additionally, 78.2% of all teachers had an education level of less than a bachelor's degree, while 21.8% had a bachelor's degree or higher. Furthermore, 73.1% of all teachers were from public schools, and 26.9% were from private schools. Moreover, 30.8% of all teachers are in rural areas, 42.3% in middle-urbanised regions, and 26.9% in urbanised areas.

4.1.2 Validity and Reliability of the Instruments

The validity and reliability of the instruments listed in Appendix I were evaluated before using the constructs in the regression analysis. Several studies supplied demographic data, including pupils' academic performance, and contextual information (Asim et al., 2019; Anderson & Krathwohl, 2001; Lyengemekeja, 2016; URT-MoEST, 2025). Items related to ongoing school environment improvements were then developed (Sfakianaki, 2019; Caraan & Caraan, L., 2023). Following Schindler's (2022) guidance, a management expert and an education expert reviewed the content validity of each construct, which was confirmed by both. Additionally, Cronbach's alpha values above 0.7 demonstrated the reliability of the measurement tools, as confirmed by the SPSS reliability analysis of their constructs (Lyengemekeja, 2016; Schindler, 2022).

4.1.3 Regression Analysis

Regression analysis was conducted using SPSS, with the pupils' academic achievement serving as the dependent variable. In contrast, the independent variables comprised both school-based and self-based teachers' continuous improvement and context supporting learning. The findings were presented in Table 2.

Table 2

Regression Analysis Findings

The dependent variable is pupils' achievement	Beta	Std. Error	Std Beta	t	Sig.	Collinearity	
						Tolerance	VIF
Independent variables:							
(Constant)	1.910	.298		6.413	.000		
School-based teachers' continuous improvement	.495	.091	.588	5.456	.000	.575	1.740
Self-based teachers' continuous improvement	-.134	.088	-.162	-1.516	.134	.580	1.724
School context support	.230	.042	.454	5.526	.000	.986	1.014

Note: R-Square = 0.507; Standard error of the Estimate = 0.470; F = 25.35, df = 77, Sig = .000; The determinant is significant (*) at 0.05 where p-value ≤ 0.05

The coefficient of determination (R-squared) indicates that 50.7% of the variation in the dependent variable is explained by the variation in the three independent variables. Moreover, the model does not exhibit multicollinearity problems, as the VIFs of all independent variables are less than five. Moreover, the F-value of 25.35 at df = 77 and a significance level of p = .000 implies that the regression model provides a significant fit to explain the impact of three independent variables on pupils' achievement. The context that supported the explanation of the contribution of both school-based and self-based teachers 'continuous improvement to pupils' academic achievement was a combination of urbanisation and the required PTR context. The supporting context revealed a significant contribution to pupil-learning achievement (β = .230, p-value = .000).

4.2 Discussion

4.2.1 Contribution of School-Based Teachers' Continuous Improvement

The primary objective of this study was to investigate the impact of school-based teachers' continuous improvement on pupil academic achievement in the context of urbanisation and pupil-to-teacher ratios in primary schools in Tanzania. The regression analysis revealed that under a supporting context, the school-based teachers' continuous improvement has a significant positive contribution to pupils' academic achievement at a significance level of .05 (β = .495, p-value = .000). This result is supported by different studies (Asim et al., 2019; Asmare, 2025; Mohamed et al, 2024; Ochar et al., 2025) and is similar to the positive impact of a learner-centred approach on pupil-academic achievement (Ishemo, 2021). Additionally, the findings reveal that the contribution of school-based teachers' continuous improvement to pupils' academic achievement (standardised β = .588) was greater than that of the supporting context (standardised β = .454) and that of self-based teachers' continuous improvement (standardised β = -.162). This can explain why pupils' academic achievement in Tanzania improved despite the dominance of a teacher-centred approach (Ishemo, 2021).

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4.2.2 Contribution of School-Based Teachers' Continuous Improvement

The second objective of this study was to examine the contribution of both self-based teachers' continuous improvement to pupil academic achievement in the context of urbanisation and pupil-to-teacher ratio in primary schools in Tanzania. The regression analysis revealed that under a supporting context, the self-based teachers' continuous improvement has no significant contribution to pupils' academic achievement at a significance level of .05 (β = -.134, p-value = .134). However, this insignificant contribution contradicts school-based teachers' continuous improvement and other different studies (Asim et al., 2019; Asmare, 2025; Mohamed et al, 2024; Ochar et al., 2025), most likely due to different contexts used and their failure to differentiate the contribution of school-based and self-based teachers' continuous improvement. The insignificant contribution of self-based teachers' continuous improvement is similar to a teacher-centred approach, which tends to enhance personal teachers' learning outcome (Dahal & Bhat, 2023; Mihai, 2021; Murniati et al., 2023) but can hardly contribute to pupils' academic achievement.

The study highlights the need to emphasise the continuous improvement of school-based teachers, particularly in light of increasing urbanisation, rather than relying solely on self-based teachers' continuous improvement to ensure better academic achievement for pupils. This aligns with Shayo and Sonola (2025), who demonstrated the need for a context that fosters CPD in Tanzania. It is thus crucial to ensure that the context supports school-based teachers' continuous improvement by increasing the urbanisation level while maintaining a PTR of 40:1.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Based on study findings, it is apparent that both 'school-based teachers' continuous improvement and supporting context have a significant positive bearing on pupils' academic achievement, but not the self-based teachers' continuous improvement. The conclusion highlights the need to differentiate the contributions of school-based and self-based teachers' continuous improvement, where school-based teachers' continuous improvement has a significant contribution to pupils' academic achievement. In contrast, self-based teachers' continuous improvement has no significant contribution.

5.2 Recommendations

Hence, primary education regulators, managers, leaders, policy makers and government in Tanzania can help to improve the learning process and pupils' academic achievement in Tanzania through knowledge contributed in this study by emphasizing on formal school-based teachers' continuous improvement, enhancing urbanization level and fostering required pupils to teacher ratio (PTR) of 40:1 instead of emphasizing on self-based teachers' continuous improvements.

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APPENDIX I: QUESTIONNAIRE ITEMS AND STATISTICS

A: Quality of Measurement Tool for Each Construct

The Likert scale used in the measurement tool for each construct is as follows: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Undecided (UD), 4 = Agree (A), and 5 = Strongly Agree (SA). Note also that STD =Standard deviation.

Pupils' achievement items	**Mean**	**STD**
Pupils in primary school are creative in doing things.	3.49	1.016
Pupils in primary school do well on examinations.	3.91	1.022
Pupils in primary school investigate things effectively.	3.44	1.100
Pupils in primary school remember well what they learn.	3.73	.976
Pupils in primary school can explain well what they learn.	3.71	1.008
Pupils in primary school use what they learned well.	3.90	.920
Pupils in primary school make good decisions.	3.71	.913
Pupils in primary school are enthusiastic to learn more.	4.12	.738
Mean of pupils' academic achievement.	3.75	.997
Reliability measured by Cronbach's Alpha (α) = .845		
School-based teachers' continuous improvement items	**Mean**	**STD**
Tools and services offered to teachers are constantly improving their teaching	3.36	1.044
Daily school activities constantly improve teachers' skills	3.26	1.133
In-service training helps teachers improve their teaching skills	3.22	1.276
My school leaders always help each teacher to improve skills.	3.29	1.207
My school leaders always ensure that each teacher's skills are improved.	3.71	1.129
Always, teachers use better teaching strategies that each pupil enjoys.	3.81	1.106
Teachers' collaboration here constantly improves teaching methods	3.82	1.041
Means of school-based teachers' continuous improvement	3.55	1.136
Reliability measured by Cronbach's Alpha (α) = .812.		
Self-based teachers' continuous improvement items	**Mean**	**STD**
I mainly use my effort to improve the teaching process	3.64	1.105
I always improve my teaching by listening to each pupil carefully	3.94	.972
I always value pupils and their ideas in improving my teaching	4.06	.931
Means of self-based teachers' continuous improvement	3.88	1.005
Reliability measured by Cronbach's Alpha (α) = .715.		

B: Quality of Measurement Tool for Supporting Context

The Likert scale used for urbanisation levels: 1 = rural, 2 = Middle rural, and 3 = urban. The pupil-to-teacher ratio (PRT), as inquired from school leadership for each school, was ranked from the best PRT (e.g., 20:1) to the worst PRT (e.g., 64:1).

Supporting context items	**Mean**	**STD**
Urbanisation level of the school surroundings	2.86	1.657
Rank of pupils to pupil-to-teacher ratio at the school, where 1 is the best ratio	3.00	1.162
Mean of supporting context for pupils' academic achievement	3.88	1.005
Reliability measured by Cronbach's Alpha (α) = .810.		

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