Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 12, Issue 7, July 2021: 10709 - 10721

Research Article

Teaching Writing School children through Tekster: Evidence from Strategy-Focused Program

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Abstract:
We test the effects of Tekster on writing capabilities in large-scale experiments involving 14,400 students and 600 teachers from 172 elementary and secondary schools, a comprehensive strategy-focused writing instruction program, using a switching replication design with three measurement occasions. The researchers formed two groups; Group 1 involved 6900 secondary school children and 310 high school teachers and Group 2 continued with 7500 elementary school children and 290 junior school teachers. The first experiment carried out during initial 18 weeks (between the first and second measurement occasions) in Group 1; while, the second experiment continued during the last 18-week period (between the second and third measurement occasions) in Group 2 implementing Tekster. The results confirm the writing quality of the students shows statistically significant improvements. Current both studies have shown a positive effect on the writing performance of students i.e., ES = 0.63 (Group 1), and ES = 0.75 (Group 2). Finally, the effect size of students completing all 72 Tekster lessons is 0.75. After two phases of eighteen weeks, students in both groups maintained their performance because three genres of writing were evaluated, allowing for generalization across students, classes, and writing assignments. We conclude that an effective way to develop secondary and elementary students' writing capabilities is through a strategy-based writing education tool like Tekster.

Keywords: strategy instruction, secondary and elementary grades, writing, observational learning, writing instruction, tester.

INTRODUCTION

Although writing is critical to academic and career success, many students from a variety of nations fall short in developing important writing capabilities (Renske et al., 2018; Samiullah et al., 2020). The review shows deficient writing skills of elementary and secondary school children globally (Glaser & Brunstein, 2007; Graham et al., 2005; Harris et al., 2018; Samiullah et al., 2020; Vazir et al., 2009); students' writing capabilities did not improve at the required level from fifth to eighth grade (Vacca & Linek, 1992; Valencia et al., 1994; Department for Education, 2018). This situation is worst in nations like Pakistan, less than a 25% of the country's schools provide adequate writing instruction, according to the study (Vazir et al., 2009). As a result, nations must improve their writing instruction at the secondary and elementary school level. In these large-scale experiments, Tekster, a strategy-focused writing program, is specifically adapted for this purpose. Focus and mode of instruction are addressed in Tekster, which incorporates several

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research-backed instructional practices (what to teach & how to teach). An evaluation of the efficacy of Tekster's among Pakistani students in the fifth through eighth grades was conducted as part of this study.

Purpose of Instruction

Aspiring writers face a major challenge in dealing with cognitive overload. Writers must keep the communication goal of their text and the intended audience in mind. Students should be taught how to deal with the cognitive overload that occurs when writing, says Troia. Growing writers tend to rely on the "knowledge-telling" and "knowledge-building approaches. Students learn thinking tactics which can reduce the number of cognitive processes who run in their heads simultaneously. For example, planned prewriting allows pupils to concentrate on other activities while drafting. Harris et al., (2018) found overt approach of teaching collective with self-regulation capabilities instruction has a greater impact on students' writing. Students' self-regulating improves as a result of achieving definite destination, that in response increases their writing self-perception and confidence. Students learn to arrange elements and different types of text through explicit instructions on text structure.

Approach of Instruction

Students must learn to write and produce texts simultaneously in the early stages of their careers. According to the international reports (e.g., Abadzi, 2009; Aga Khan Development Network (AKDN), 2018; Ahmed, M. et al., 2007; Andrabi et al., 2007; Annual Status Education Report (ASER), Jammu and Kashmir, 2011; Asher, 1977; Aturupane & Shojo, 2012; Azami, 2009; Bahry, 2013) the level of students' distraction increases time-to-time, as a result, they lack concentration to learn from their writing experiences. According to a new study by Abadzi (2009), thinking about the format and sequence of lessons is essential when teaching writing. Observing someone else perform an unfamiliar task requires less working memory than completing the task yourself (Bahry, 2013). This is especially true when learning a cognitively demanding skill such as writing (Aturupane & Shojo, 2012). Learning and performance can be distinguished through observation (National Commission on Writing, 2020). Teacher leveling is a frequent strategy for applying observational learning. Early on, leveling helps kids prepare for future writing problems. Samiullah et al., (2020) found that teacher leveling is an effective instructional strategy for teaching writing processes. The study was published in the journal Teaching and Learning. Harris et al. (2018) observed students' self-perception and performance more by observing a coping level than observing a mastery level. They found that weaker students benefit the most from witnessing how to overcome hurdles. This could happen as a result of witnessing someone who appears to be similar improving over time. The peer-to-observer similarity is perceived to be higher when peers serve as levels. Weaker students improved more than stronger students after focusing on weak peer levels. Peer leveling was found to be beneficial for both more and less skilled writers during a collaborative revising task. Students can gain a better understanding of how readers experience and perceive their texts by using observational learning.

The shift of Learning Responsibility

Students must move from observing writing levels to creating their own to improve their writing abilities (Harris et al., 2018). Students must complete a written assignment at all stages of the writing process. You can ease the transition by gradually shifting responsibility (Graham et al., 2018). Using this method, the cognitive load shifts from observing levels to a guided practice to independent performance. The sociocultural theory of Vygotsky (1978) and the zone of proximal development concept of 1980 are the foundations for the level of gradual responsibility shift. The proximal development area is defined by Vygotsky (1978) as the student's independent performance and potential development, as defined by supporting performance. Teachers can use scaffolding techniques to facilitate the move of the student from being assisted to independent performance. To develop skills in the student's range, they may control elements of a task that are initially beyond the student's capacity (Bandura, 1977). As a result of scaffolding, teachers must help students establish techniques that can be applied to new activities and situations (Vygotsky, 1978). A gradual shift in responsibility and scaffolding can help students improve their written English abilities (Graham et al., 2018). This training is often provided explicitly to help students understand the strategy's goal and benefits. Students in upper elementary grades receive explicit and comprehensive instruction on how and when to apply a strategy (West & Saine, 2016).

AIM AND SCOPE OF THE STUDY

The researcher adapted Tekster (a comprehensive writing instruction program) for Pakistani general education teachers in grades 5th, 6th, 7th, and 8th. The major goal of the study was to see how beneficial the program was. It teaches pupils a method of writing capabilities as well as the self-control abilities they will need to put it to work. Text structure provides precise guidance on genre-specific aspects. Observational learning is the most prevalent style of education, with significant scaffolding and the gradual shift of responsibility as part of the process (Margarida et al., 2016). As such, Tekster is similar to Self-Regulated Strategy Development (SRSD) for reading and writing (Harris, 2018) and cognitive self-regulation education (Renske et al., 2018). Five, six, seven, and eighth-grade Pakistani pupils were examined to see if the writing quality improved after using Tekster and if it persisted over time. This study also examined the effects of grade level, gender, and writing proficiency on the outcome of the intervention.

METHOD

Description of the Sample

A total of 600 secondary and elementary school teachers from 172 different classes volunteered to participate in the study. Both teacher gender and professional certification were highly prevalent (88 percent each). There were 172 participating schools in Pakistan. These schools are located in the northern, western, and southern regions. There were 85 public and 87 private affiliated schools (50 Sindhi, 70 Urdu, and 52 Balouchi). There were 82 fifth-grade classes and 90 multi-grade classes. Each class was estimated to have a female student ratio of 45.6 percent on average (standard deviation of 5.6). Neither in sample nor the Pakistani population showed significant differences concerning gender or quantity (Federal Ministry of Education, 2021; Pakistan Bureau of Statistics, 2021). The total of 14,400 students participated in the study, including 3500 fifth graders ($\bar{x}$ age = 9.90, SD = 0.72), 3600 sixth graders ($\bar{x}$ age = 11.40, SD = 0.81), 3750 seventh graders ($\bar{x}$ age = 12.50, SD = 0.84), and 3550 eighth graders ($\bar{x}$ age = 13.40, SD = 0.81). There were a few students who dropped out due to school transfers.

Research Design

The experimental switching replication design (West & Saine, 2016) included two groups and three-dimension occasions (T1, T2, T3; follow Table 1). After 18 weeks of working with Tekster, students and their teachers in Group 1 finished the first part of the experiment, instead of traditional teaching of writing. As a control group, Group 2 continued its usual writing activities. Second eighteen-week phase: Treatment was switched between T2 and T3 during this period. As Tekster was implemented in Group 2, the original writing program was returned to Group 1. The students in Group 1 were given a delayed posttest, which allowed the researcher to determine their level of recall. It is implemented in both groups at different times in a switching replication design (Samiullah et al., 2020). The treatment's internal validity can also be tested in this manner, which is more ethical. Because the treatment must be equally effective in both groups, it is unlikely that one group's characteristics will have a greater impact than the other. If the treatment's effects are not equally effective in both groups, internal validity could be compromised. The treatment was found to be reproducible and generalizable in two different groups. Students in group 1 receive information about the effects of maintenance therapy after the delayed posttest (T3). School groups 1 and 2 were determined by the school holiday calendar. Specifically, western schools were grouped, while northern and southern schools were divided into two groups. The schools in groups 1 and 2 were randomly selected. There were 95 schools in Group 1, 310 male teachers, and 310 classes in Group 1. In group 2, there were 77 schools, 290 female teachers, and 290 classes Group 2. Table 2 provides a summary of the students' data. Students in each grade (y^2 (2) = 2.67) and age (t (1511) = -3.24, p =.21) were not statistically different between the two groups.

Instructing Writing Capabilities

Comparing Instruction Styles

A comparison was made between the pupils enrolled in the treatment program and those enrolled in schools

where writing instruction was already in place. As part of the English curriculum, writing is taught in Pakistani schools. Samiullah and his colleagues demonstrated that, only 15-20 minutes per day of the 4 hours of weekly English instruction are devoted to writing skills (Samiullah et al., 2020). In the majority of cases, writing lessons are product-centric. Students are also not taught how to approach writing assignments during the writing process. As with student compositions, most schools do not monitor them or provide feedback on them. To determine how secondary and elementary school teachers teach writing, West and Saine surveyed 1264 teachers in 2016. They found that 94 percent of teachers devote only 30 minutes or more a week for writing instruction to students.

Table 1

Research Design

Pretest Group	Phase 1 (18 weeks) (T1)	Posttest (T2)	Phase 2 (18 weeks)	Delayed posttest (T3)
1	Tekster treatment	Assignments	Existing writing instruction	Assignments
2	i, ii, iii Existing writing instruction	iv, v, vi	Tekster treatment	vii, viii, ix

Implementing the Tekster

To address both the mode and focus of instruction, Tekster also includes teacher guides (Graham et al., 2018), in addition to student portfolio development. Tekster employs a wide range of research-based practices and approaches, e.g., i) Text structure, ii) Self-regulation capabilities, and iii) Writing strategies —how were these three design principles translated into specific teaching and learning activities; follow Table 3. This large-scale intervention comprises of two phases of 18-week (36-week) each with two lessons per week, each made up the 72 lessons in the program for each grade level i.e., fifth, sixth, seventh, and eighth grade.

Table 2

Description of the Students

	Group I			Group II		
Grade	*N*	% female	Mean Age (SD)	*n*	% female	Mean Age (SD)
5	1700	47	9.91 (.72)	1800	53	9.39 (.65)
6	1720	54	11.40 (.81)	1880	52	11.42 (.79)
7	1790	46	12.50 (.84)	1960	58	12.55 (.82)
8	1690	52	13.40 (.81)	1860	50	13.50 (.87)
Total	6900	48	11.81 (1.17)	7500	52	11.71 (1.07)

Table 3 *Overview of Tekster*

Design Principles		Tekster Treatment	
Focus of instruction	Mode of instruction	Learning activities	Teaching activities
1. Text Structures	a. (Guided) Practice	In real-world situations, apply the discussed criteria to various genres with clear communicative goals and	Through scaffolding and product feedback, provide assistance as

			intended audiences. After you have finished writing: Peer-review and self-assessment	needed
		a. Observational learning	For a good text, compare and discuss model texts of a similar type before you begin writing. What are the criteria for various text types? What are the criteria for various text types? (Teacher or peer) discussing the criteria for various text types?	Before starting to write: The text type should be modeled in terms of its relevant aspects.
			After you have finished writing: Give feedback (reader reaction) on a peer's or your own text based on the previously discussed criteria.	After you have finished writing: Students' texts should be evaluated based on the previously discussed criteria, and readers' reactions should be solicited.
		b. Explicit instruction	Take notes and pay attention to what you hear.	Why and how criteria and conventions should be used, with the help of model text
2.	Self-regulation Skills	a. (Guided) Practice	The following steps should be taken before writing: establish a communicative goal, monitor progress towards this goal during the writing process, regulate one's own writing process and adapt if necessary, evaluate written product in relation to the communicative goal, and revise if necessary.	If needed, provide assistance by way of scaffolding and self-regulation feedback
		b. Observational learning	While writing, observe/discuss/compare (teacher or peer) a model(s) setting goals and assessing progress in relation to goals, and observe/discuss/compare (self- regulation's) influence.	Exhibit self-regulation while writing, by establishing and monitoring a goal for the piece.
		c. Explicit instruction	Take notes and pay attention to what you hear.	Why is it important to plan ahead and set communicative goals for writing? When and how can progress toward the communicative goal best be monitored during the writing process?
3.	Writing Strategies	c. (Guided) Practice	Apply the steps of the approach to authentic writing Assignments in a range of genres with clear communicative purposes and	Scaffolding can be used to provide assistance as needed, and feedback can be processed.

		intended audience	
b.	Observational learning	Analyze or compare a model (teacher or peer) to the writing strategy.	Demonstrate how to employ a method by thinking aloud while doing (part of) the writing activity.
c.	Explicit instruction	Remember relevant background information and take notes as you listen.	Use a writing strategy to educate students about its components, as well as its benefits, and to activate students' prior knowledge.

Reliability of the Treatment

To determine whether teachers had implemented the software in the manner intended, a variety of reliability procedures were applied. To investigate the degree of reliability, three factors were taken into consideration for data collection e.g., a) Students' lesson completion rates and teachers' fidelity to Tekster based lesson plans, b) classroom observations, and c) teachers' reflection books, student portfolios.

Teachers' reflection books

Tester's implementation required that each teacher keep a lesson reflection book to keep track of completed lessons and their duration. Approximately 75 percent of the reflection books were returned after the treatment period. On average, teachers taught 72 Tekster lessons, according to the analysis of the data. Lessons range in length from 25-59 minutes, with the average lesson lasting about 43 minutes.

Student portfolios

After the treatment period, we collected and reviewed each student's portfolio to determine how many lessons he or she had completed. Students' portfolios were deemed to be complete when they were filled with writing practice exercises that corresponded to the lesson. Student completion rates varied widely when these data were analyzed. Student completion rates ranged from 8 percent to 53 percent, with the average being 65 lessons (SD = 4).

Observations during Interim

Two-thirds of the randomly selected classrooms in Groups 1 and 2 were observed. During the interim, each observation lasted the duration of the lesson. Each group's observations differed slightly because they were spread evenly over two weeks. As observers in this study, experts who had been trained by undergraduate students served as experts. Observational data could not be verified because only one person was assigned to each class. It was decided to collect two types of data using an observation instrument based on the work of Samiullah et al. (2020). Every 20 seconds, the teacher's on-task or off-task status was recorded. Involving individual students or a small group of students (involving in either form of participation) a total number of individual students and groups participated in each task. Observers noted how often teachers used acronyms to describe writing strategies or steps, in addition to leveling for students. Ninety percent of the instructional time observed was spent with teachers focused on their tasks, on average. According to Tekster, they followed the general framework and key elements. In the same way, group sessions (54 percent on average) and one-on-one instruction were divided as intended (46 percent). In addition, teachers demonstrated writing strategies through leveling and usage (an average 2.1 and 2.4 X each lesson).

Assessing the Writing Quality

Assignments of Writing Skills

To assess the students' capabilities of writing, 3 varied kinds of texts were introduced to them, as shown in Table 1. To assess students' writing capabilities on three separate occasions, we used three different types of texts. The three assignments for each type needed to be as similar as possible. The authors collaborated with other experts in the field to develop all nine writing assignments for this study. As a result, special care was taken to ensure that the texts were of a manageable length and that the level of difficulty and topical interest was appropriate. This was achieved by providing them with a written prompt, an image, and

space to prewrite before beginning the task (if desired).

Writing assignments Administration

Within their normal teaching time, teachers assigned writing assignments to students during this study. To ensure that the three writing assignments were completed on time, teachers were given a week to complete the three assignments. Every writing assignment was completed independently and without a time constraint. Teachers were guided and restricted not to support students during the tests.

Ranking of Quality Writing

The constructs, for example, grade level and gender might tempted evaluator's assessment, all texts were coded (West & Saine, 2016). However, due to the large size of the sample (14,400 students and nine writing assignments), handwritten work of students to control presentation effects could not be typed. As a result, the West and Saine (2016) international text quality rating scale was adopted. With the help of a continuous (interval) rating scale, Bouwer and his colleagues (2016) assessed global text quality. Texts with an average quality score of 100 fell in the middle. Each of the other benchmark texts received a score between 80 and 150. Different types of rubrics were used for all three different types of texts. A pilot study was conducted on all three varied text types i.e., all four grades and types written while T1 before the creation of the benchmarks. Overall, 150 experienced teachers in grades 5–8 scored the subsample. The average of these teachers' scores was then determined. In selecting benchmarks, two factors were taken into account, including: (1) an accurate reflection of the text's quality level (-2/-1/-1/0/+1/+2/+2) and (2) a high level of rater agreement. Two hundred and sixty-seven experienced teachers in grades five through eight rated the entire assessment sample. Researchers pre-trained scales and hid experimentation from raters. If the student's text resembles a benchmark, the grade will be given accordingly. Using a teacup system that interlocked, each text was scored. In this way, a random subsample of all student texts was created. On a preset design, each rater was provided with three samples. We were able to approximate the dependability of raters and juries by using subsample overlap (West & Saine, 2016), the average dependability of jury ratings varied by 0.86–0.91 across assignments.

Analyzing the Data

In this study, the hierarchy of data was formed to nest the scores of students' and their assignments, following cross-classified classifications. Hence, the data were analyzed by using a variety of multidimensional (cross-classified) levels with a systematic addition of parameters in a model. Therefore, all models nested into each other. The group includes all students, even those with partial grade discrepancies. Efficacy was measured at each level across groups and grade levels. Level 1 was a basic Null Level in which the comparisons were made on: a) Random errors (S^2 *errors*); b) Random student effects (S^2 *effects*); c) Random assignments (S^2 *Assignments*); and d) Random classes (S^2 *classes*). A student's score could fluctuate within and between classes, and even between different types of writing assignments. It was possible to test for differences in average scores concerning measurement time at Level 2. Comparing three measurements, we examined student variances and class-to-class differences using Level 3. Groups were added to Level 4 to see if there were any differences in average scores between groups of students. According to the findings, level 5 accurately predicted the interaction between measurement occurrence and the group. Level 5 required a treatment to have the same effect on both groups. This restriction was removed from Level 6 because it was determined that Groups 1 and 2 were equally effective. This test was used to verify the experiment's internal validity. In order to determine whether the treatment had long-term health maintenance effects, students from group 1 were evaluated as part of a certain contrast analysis. In this study student post-test and delayed post-test results were compared. To determine, if the treatment was equally effective across grade levels, two additional levels were developed. There were differences in scores between grades when a fixed effect was included. In addition, a grade interaction effect was added to determine if the treatment was equal in all four grades (group x measurement occasion). Two additional levels were added to test for gender-related effects on treatment effectiveness, in addition to the original test. The average scores of male and female students were found to be different. The relationship between intervention (group x measurement occasion) and gender was also examined at the second level of analysis. An aptitude treatment relationship analysis was conducted, to test student's varying levels of writing

proficiency. Therefore, students' pretest scores were compared to their posttest results.

RESULTS

Impact of the Treatment (Tekster)

Table 5 summarizes the results of the six levels that were fitted to the data. These results indicate that over time, average writing scores have changed (Level 2 vs. Level 1, x^2 (2) = 249.22, P < .001). We find, the level improves by allowing the variation to fluctuate between varied measurement occasions —Level 3 compared to Level 2 (x^2 (12) = 857.31, p < .001). As a result, the variance was not homogenous (for at least one level) across measurement occasions (e.g., random error, students, assignments, and/ or classes). Because there was no statistically significant effect for Group 1 and 2, the average scores for students in both groups were the same. Level 5 was statistically significantly different from Level 4, as measurement occasion and group interaction indicates. There were two measurement occasions i.e., the first and second /second and third, when students in the treatment and control conditions had different scores (x^2 (1) = 124.98, p < .001). Level 6 vs. Level 5 did not affect scores between students in Groups 1 and 2. In this case, x^2 (1) = 13.12 and p =.73. x^2 (1) = 19.54 and p.001 respectively for the first two measurement occasions; group 1 had a larger difference in mean scores between measurement occasions. Statistics also indicated that Group 2's second and third measurement occasions had a larger difference in mean scores (x^2 (1) = 54.86; p < .001). Based on parameter estimates from Level 5, Figure 1 depicts the treatment effects graphically. Varying characteristics of students and classrooms have become less pronounced over time, since classes became more homogeneous, the variance between them decreased. Therefore, writing abilities of students become more harmonized, when variances decrease among them due to fewer interactions between students and assignments. We compared its impact with the variance in estimation of Tekster's effect (Cohen's d). On the bases of average number of completed lessons by students, the ES was 0.46 (i.e. in all teachers, students, and tasks). The statistically significant positive relationship was recorded between the students' number of lessons completed and the treatment effect: β = 0.27 (SE =0.09; p < .001). All 72 Tekster lessons had an average increase score of 7.89, that interprets to an ES of 0.57.

Treatment

A second evaluation was conducted on students in Group 1 eighteen weeks after the treatment period (T2) (T3). Analyses of specific contrasts showed a time-dependent effect. Student scores increased statistically significantly between T1 and T3 (X^2 (1) = 27.04, p < .001), but not between T2 and T3 (x2 (1) = 2.02, p =.13).

Table 4. *Fit and Comparison of Nested Models*

Model	N *parameters*	-2LL	Comparisons			
			Models	*Difference of X^2*	*Difference of df*	*P*
1 Null	5	97764.61				
2+ dimension occasion (fixed)	7	89753.26	2vs1	249.22	2	<.001
3+dimension occasion (random)	19	68777.33	3vs2	857.31	12	<.001
4 + group	20	98788.42	4vs3	16.32	1	.25
5 + treatment	21	78766.84	5vs4	124.98	1	<.001
6 + treatment X Group	22	78763.22	6vs5	13.12	1	.73

Among Grades

There were significant differences between the scores of students in grades 5, 6, 7, and 8. Student age and grade level affected the treatment's effectiveness, but the treatment and grade level interaction was statistically significant (x^2 (2) = 14.21, p < .001). A total of 6.46 points (ES = 0.38) were added to students' scores in grades 5, 6, and 8 while 5.23 points (ES = 0.31) were added to students' scores in grades 7. Figure 2 illustrates the treatment effect for each grade level.

Sex

Variance on the gender indicated the statistically significant analysis x^2 (1) = 719.92 ($p < .001$). It was found that female students scored an average of 8.69 points higher than their male counterparts. When the interaction between gender, measurement occasion, and group were allowed, it indicated that the Tekster's effect was not gender-bound, score x^2 (1) = 0.13, p =.72.

The expertise** of **Writing Capabilities

With a regression coefficient of 0.63 (SE = 0.12), student scores from the first measurement occasion were regressed to the second measurement occasion. For Group 2, as a result of this difference, the regression coefficient was 0.75 (SE = 0.13). This means that the treatment's effects were independent of writing ability.

DISCUSSION

This study evaluated the effectiveness of the Tekster writing instruction program for Pakistani students in grades 5 through 8. Those who took part in the program were hired as teachers after the program concluded.

Table 5 *Variances on Pre- and Posttest Measures*

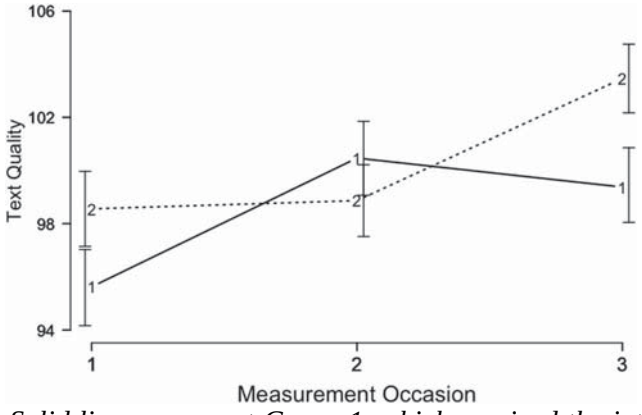
Measure	dimension occasions		
	1	2	3
Fixed Part			
Group I	99.83 (1.58)	107.36 (1.76)	100.76 (1.73)
Group II	99.14 (1.91)	99.68 (1.52)	109.51 (1.98)
Random Part			
S^2 *Classes*	63.92 (11.38)	69.79 (10.87)	73.73 (9.40)
S^2 *Assignments*	10.20 (1.72)	09.29 (1.73)	9.88 (1.92)
S^2 *Students*	89.99 (5.33)	64.98 (3.15)	64.31 (3.77)
S^2 *Errors*	168.48 (6.68)	98.11 (2.13)	99.98 (2.17)

Note. Standard errors are included in parentheses.

For eighteen weeks, they received the treatment in their general education classes. The results showed that Tekster significantly improved the quality of students' writing. Gradually, the student's writing quality improved, and they became more consistent in their efforts. It was determined that both groups benefited equally from this treatment after comparing their results. This suggests that the treatment's effects were sustained after two months of instruction. But the treatment's effects were the same for both girls and boys. Based on an aptitude treatment analysis, another study found that the treatment had no impact on students' writing abilities. Despite its effectiveness, the treatment on students' writing had a moderate effect size (ES) of 0.36. While the average number of lessons completed (60) was used to calculate this ES, it's still a pretty accurate estimate, the effect is therefore overstated.

Figure 1

Figure 1. The effect of Tekster, averaged across all three grade levels. Error bars indicate 95% confidence



intervals for the means. Solid lines represent Group 1, which received the intervention between first and

second measurement occasion. Dashed lines represent Group 2, which received the intervention between second and third measurement occasion.

Figure 2

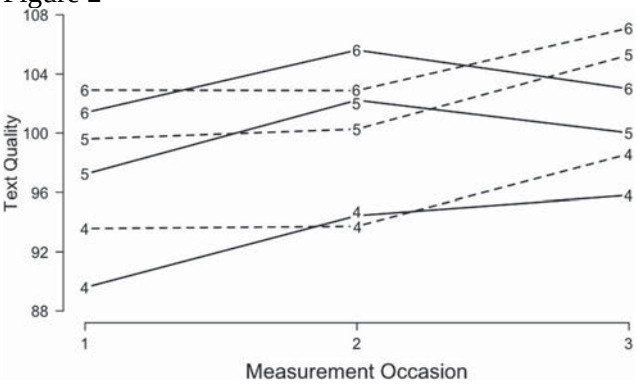


Figure 2. The effect of Tekster, by grade level. Solid lines represent Group 1, which received the intervention between first and second measurement occasion. Dashed lines represent Group 2, which received the intervention between second and third measurement occasion

According to the results, the ES of students who completed all 72 lessons increased from 0.49 to 0.58. Students make more progress when they must complete the entire program. A longer implementation period (e.g., two lessons per week) and/or more lessons in the curriculum will make this easier to achieve. Further research is required to gain a deeper understanding of this issue. For a more intuitive interpretation, compare the impact of the treatment on writing capabilities between Grades 4 and 6. Renske et al. (2018) posted, it took him two months to improve writing quality by an average of 4.73 points. This increased students' writing capabilities of more than a half-grade level. Students in grades 5 and 6 had slightly better writing capabilities than students in grade 8. Grade-specific abbreviations may differ slightly despite a similar general approach. Students learn how to evaluate and revise explicitly in the sixth grade. It was found that students have a hard time revising, according to a study (Graham, 2018; Hsiang et al., 2018). So that they can successfully modify their texts, students must first be aware of their texts' goals, as well as their intended audience. This includes the ability to read and evaluate their texts critically, as well as knowing how to deal with issues both locally and textually. Students should begin working with Tekster in Grade 5 because prewriting capabilities are a major focus of the course. The review becomes the focus of instruction in Grade 6. Because this was a cohort study, sixth graders were not taught these fundamental capabilities. Students in Grade 7 may have found it more difficult to learn the entire acronym at once than they did in Grades 5 and 6. This question would be answered by a longitudinal investigation. An extended study of kids' learning paths across grades may also be revealed by a Tekster longitudinal study. According to Pakistan's Department of Education, students' writing capabilities do not improve much from fifth to eighth grade (Samiullah, 2020). In the upper primary grades or upper elementary grades, we plan to use a systematic approach to teaching writing.

Generalizability

Students in grades 5 to 8 in general education settings had an average ES of 2.42 and 1.93, respectively, compared with this study's ES of 0.36. This Tekster study entailed a huge number of pupils, with 14,400 students from 172 classes across 172 schools taking part. Students' general writing ability was assessed through descriptive, persuasive, and narrative writing assignments, as well as oral presentations. As a result, students, teachers, and assignments, in general, can benefit from the effects of the program. Without the assignment and class variance, it is more in line with other treatment studies.

Treatment Effects

As of three months after the program began, the students' writing quality is still significantly better than it was before. This suggests that the treatment had a lasting impact. After the treatment period, the students' writing scores did not improve. Pakistani students' writing does not improve significantly after regular writing lessons, according to Samiullah et al. (2020). When compared to Group 1, the writing quality of the students in Group 2 did not improve between the first and second measurement occasions. There is a possibility of a maintenance effect if assignments were equally difficult for both groups and if treatment effects (the interaction between condition and time) were similar. We calculated mean of achievement scores concerning three writing assignments per measurement occasion using the same scoring procedure. Consequences could be to blame for different or similar results over time (within conditions).

Applicability of Tekster for Different Grades

As a result of the program, no evidence of an aptitude treatment interaction could be found. Both the less-proficient and proficient students benefited equally from this. It is encouraging that the program meets all students' requirements in general education classrooms. From the program, at least three different types of students will benefit: (Samiullah et al., 2020). By teaching students how to regulate their writing processes, Tekster's first goal was to reduce cognitive overload during the writing process and thus reduce cognitive overload. While Tekster, which finished in third place, took a different approach, it provided a variety of learning opportunities. Peer leveling of coping and mastery, for example, was included in the study (Harris et al., 2018; Renske et al., 2018). This makes Tekster a good choice for upper elementary classrooms. The program's components as a whole indeed helped students improve their writing capabilities, but we can't make any claims about their effectiveness. Also, we don't know which part of our strategy is most successful. According to previous research, combining strategy-focused instruction with observational learning can improve students' writing capabilities (Renske et al., 2018). Four different instructional components were tested during writing-strategy training: i) teaching by example and reflection, ii) direct instruction, iii) group instruction, and iv) small group instruction When the instructional sequence is changed, students in the sixth grade can receive peer feedback and practice independently. All positive outcomes were found to be strongly correlated with leveling and reflection, according to the study's findings. The leveling of our program may have improved its effectiveness, based on Renske et al (2018). Further research will be required to determine the relative importance of each component.

Teachers' Use of Tekster

In general education classrooms, Tekster was used by teachers in the fifth, sixth, seventh, and eighth grades. Researchers recruited teachers from a range of schools for the study. Accordingly, the study's ecological validity was greatly enhanced, but class differences widened. Other factors that influence teacher effectiveness include teaching experience, background, and style as well as personal preferences (Renske et al., 2018). Teacher implementation of the program must be verified in the classroom before it can be considered successful or unsuccessful. For example, Renske and her colleagues (2018) and Graham et al. (2018) trained teaching assistants and/or teachers for the intervention implementation (Graham, 2014). However, rigorous and exhaustive training is very difficult in a large-scale treatment. The number of lessons taught can be the reason for some difference in class size. Students' writing capabilities improved as the number of lessons taught increased from one class to the next, according to our research. Results show that teachers' instructional practices changed after participating in the program. Teacher fidelity was measured by closely following lesson plans and applying key treatment components, such as levels, acronyms, and steps. It took teachers only a short time to learn how to use the program's key components in their instruction. Please remember that observations do not provide information about the quality of lessons; they only provide information about the activities that occurred during the lesson itself. Improve your teaching by observing not only what teachers do, but also how they do it. The videotaping of teachers and the analysis of their practices are examples of this.

Study shows that elementary students' writing capabilities can be improved by using Tekster. According to the authors of this study, the effect was replicated in one study with the same results. Results of treatment do not appear to be affected by sample characteristics.

Limitations

The results of the current study were limited due to some possibilities. For example, the random sample solely represented only one nation (i.e., Pakistan); consequently, the results may be limited to a pluralistic culture like Pakistani that might hinder in framing the generalizations for other countries or nations. Furthermore, female samples were higher as compared to men; although, this was possible due to Pakistan's feminine cultural setting. For this reason, the multi-cultural and multi-national investigation may be carried out in masculine cultures and both types of countries i.e., pluralistic and individualistic.

Implications

The current study exhibited indispensable implications for faculty, students, policymakers, curriculum designers, and educational management. As aforementioned, writing capabilities are vital academic capabilities that students should possess. And possibly can play an indispensable role for their upcoming employment and excellence; consequently, best writing skills are the prerequisite for it. A thoughtful investigation of the Tekster mediating writing capabilities may help curriculum designers, policymakers, teaching faculty, educational management (e.g., at top and low level), and government to plan and design educational settings that would support and enhance the writing potentials of all level of students. Based on the findings of the current metadata, demonstrated that students with high motivation through Tekster are likely to be more confident in writing skills, which would, in turn, promote their perceptions for writing tasks. The current findings demonstrated the predominant function of Tekster that arbitrated for the interrelationship between writing; which demonstrated the most dominant role of the predictor of better writing skills. Policymakers, curriculum designers, and educational management may utilize this data for the enhancement of students' writing skills and their confidence in their writing abilities by designing classroom settings and effective instruction; while understanding the significance of Tekster toward writing independently. For example, instructors may foster students' writing through Tekster's innovative techniques and approaches, writing assignments (Samiullah et al.,, 2020), use of activities (Graham et al., 2018), and use gasification rules for changing the classroom setting from a traditional one to a more challenging, independent, open, curious, free and autonomous (Samiullah et al.,, 2020).

Ethical Statement

As well as following the HEC policy of 2020-2021 and its later amendments or comparable ethical guidelines when researching humans, researchers adhered to institutional and/or national/international research committee ethical standards.

Informed Consent

All study participants signed a written consent form after receiving information about the study.

Conflict of Interest

There is no conflict of interest on the part of the authors, who declare that they have none.

Data Availability

An author will provide access to the datasets generated and/or analyzed for this study upon reasonable request.

Acknowledgment

We acknowledge the efforts of all facilitators and supporters of this study.
Funding. The authors of this study did not receive any direct funding for their work.

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