# Desk Organization and Task Efficiency: A Within-Subjects Quasi-Experiment on Puzzle Completion Time Among First-Year Civil Engineering Students

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**Abstract**

This study examined whether desk organization influences task completion time among first-year Civil Engineering students at First City Providential College. Using a quasi-experimental within-subjects design, 30 participants completed a Kanoodle puzzle under two workstation conditions: an organized desk and a disorganized desk. Completion time (seconds) was recorded using a stopwatch across both conditions, with condition order alternated to mitigate sequence effects. Results indicated that participants completed the task faster under the organized-desk condition (M = 55.63, SD = 11.42) than under the disorganized-desk condition (M = 68.13, SD = 14.75). A paired-samples t-test confirmed a statistically significant difference, $t(29) = -3.39$, $p = .002$, supporting the hypothesis that desk organization improves task efficiency. The findings align with the view that workspace order can reduce visual distraction and support focused task execution, highlighting practical implications for student study environments when completing time-bound cognitive tasks.

**Keywords:** *desk organization; workspace environment; task completion time; task efficiency; Kanoodle puzzle; quasi-experimental design*

## 1. Introduction

Task performance is not produced by cognition alone; it is shaped by the immediate environment in which cognition is deployed. For students and early-career learners, the desk functions as the primary interface between intention and execution—where attention is sustained, information is processed, and time-bound outputs are produced. In daily academic routines, desks frequently become saturated with books, papers, digital devices, stationery, and miscellaneous items. Such accumulation is often normalized as part of student life, yet it raises an empirical question that remains practically important: does the organization of a desk measurably influence how efficiently a person completes a task?

Interest in workspace conditions is longstanding, and existing work suggests that features of the physical environment—such as order, layout, and the usability of the workspace—may influence concentration and performance outcomes. Studies focused on learning and productivity environments underscore that the quality of the workspace (e.g., cleanliness, privacy, tranquility, and organization) can be associated with improved academic productivity and attentional conditions (Balubayan et al., 2024.; Loyola, n.d.). Related work on workstation ergonomics similarly implies that the

design and arrangement of a work area can support comfort and productivity, especially in settings where work is performed over sustained periods (Avinante et al., 2021). Taken together, these perspectives support a reasonable behavioral assumption: when environments are better structured for task engagement, performance may improve.

At the same time, the literature indicates that "organization" is not merely an aesthetic preference; it is linked to functional access and cognitive usability. People often judge desk tidiness based on workable open space and the accessibility of frequently used items, suggesting that organization reflects behavioral strategies for efficiency rather than appearance alone (Manabu, 2025). Moreover, desk layouts and visible desk characteristics can influence perceived productivity and concentration, indicating that how work surfaces are configured can shape both subjective and behavioral responses to work demands (Sailer et al., 2021). In applied contexts, reviews of physical work environments emphasize that workspace conditions can meaningfully relate to performance, health, and motivation outcomes (Oyedeji et al., 2025). From a cognitive-performance standpoint, workplace conditions have also been discussed as factors that may support or impair concentration and cognitive functioning, depending on how structured or

distracting the environment becomes (Nguyen & Tran, 2025b).

Despite these indications, a key gap remains for evidence: much discussion surrounding clutter and productivity is still anchored in informal beliefs, generalized workplace commentary, or settings that do not isolate task conditions under controlled measurement. There is comparatively less emphasis on simple experimental tests that directly manipulate desk order and evaluate its association with task completion time on a standardized cognitive task in student populations. This gap is practically relevant because students often develop long-term work and study habits in environments where desk organization is variable and routinely neglected.

Accordingly, the present study evaluates whether desk organization influences task completion time among first-year Civil Engineering students using a standardized Kanoodle puzzle task. Civil Engineering students are a relevant group for time-based task efficiency research because early-stage coursework commonly requires sustained attention, structured problem solving, and accuracy under constraints. The study's focus on completion time provides an objective behavioral indicator of efficiency under two contrasting workspace conditions.

*Research Question and Hypothesis*

Research Question: Does desk organization (organized vs. disorganized) significantly affect task completion time on a Kanoodle puzzle among first-year Civil Engineering students?

Hypothesis: Participants will complete the task significantly faster under the organized-desk condition than under the disorganized-desk condition.

## 2. Review of Related Literature

### 2.1 Desk Organization as Functional Behavior, Not Mere Aesthetics

Desk organization is frequently framed as a superficial marker of discipline, yet empirical research increasingly positions it as a core functional strategy for cognitive and operational efficiency. This functional perspective is supported by studies on environmental design and behavioral outcomes. For instance, perceptual factors tied to tidiness—such as the amount of usable space and the strategic placement of objects—directly influence reachability and usability, suggesting individuals intuitively optimize surfaces to minimize friction

between task intention and execution (Manabu, 2025). This behavioral interpretation aligns with broader findings in educational analytics, where the integration and organization of digital and physical resources are seen as foundational to effective task engagement and pedagogical strategy (Atento, 2025; Rao et al., 2025).

Furthermore, preferences for desk aesthetics are not merely about visual appeal; they reflect how material design and spatial configuration shape user evaluation and acceptance of a workspace. Research indicates that materials and arrangements significantly affect perceived usability and satisfaction, which in turn can influence sustained engagement (Lipovac & Burnard, 2023). In academic settings, these perceptions are critical, as personalization and environmental cues have been linked to perceived productivity and satisfaction, underscoring that workspace layout and privacy are active components of the learning environment (Abdelfattah, 2025). This body of work confirms that environmental perceptions, while subjective, are potent drivers of behavior, particularly in contexts demanding prolonged concentration.

### 2.2 Clutter, Procrastination-Related Behavior, and Workspace Experience

Clutter transcends mere quantity of items; it is a manifestation of behavioral patterns, including indecision, task avoidance, and procrastination. Investigations into remote work environments identify common clutter sources—such as paper, waste, and unused supplies—as being significantly correlated with negative attitudinal outcomes and poor workspace personalization (Ferrari et al., 2021). This strengthens the thesis that a disorganized desk introduces attentional "taxes" and decision fatigue, which can directly impede task initiation and efficient execution.

The impact of environment on performance is notably evident in educational contexts. Studies suggest that cleaner, more structured environments bolster task focus and are associated with better academic outcomes (Balubayan et al., 2024; Loyola, n.d.). This connection is echoed in health professions education research, where systemic challenges—including resource constraints and poorly aligned physical environments—are identified as contributors to cognitive overload and reduced efficacy (Bermido et al., 2025). Collectively, these studies affirm that the workspace is not a neutral backdrop but a dynamic condition

that shapes the behavioral and cognitive parameters of task performance.

### 2.3 Ergonomics, Desk Layout, and the Usability of Work Surfaces

The influence of workspace on performance is robustly explained through human factors and ergonomics, which examine how design supports physical comfort, efficient movement, and intuitive interaction. Research on workstation design underscores that layouts which promote comfort directly enhance productivity (Avinante et al., 2021). Complementary studies emphasize user-centered principles for surface arrangement, where practical rules and habitual placements are developed to maximize convenience and minimize physical and cognitive strain (Liu et al., 2021).

This ergonomic perspective is extended by cognitive-environment research, which finds that individuals assess and understand their immediate surroundings (like a desk) based on how well the arrangement supports intended actions (Josephs et al., 2023). Applied studies in workplace settings confirm that specific desk characteristics and their positioning within a shared layout can significantly affect perceived concentration and productivity, with certain configurations linked to higher distractibility and lower perceived output (Sailer et al., 2021). The principle that environment dictates functional fluency is also observed in clinical laboratory settings, where the physical organization and workflow design are critical pre-analytical factors determining procedural efficiency and outcome reliability (Morcilla et al., 2025). These insights converge on a key point: desk configuration likely affects task speed by modulating the level of friction or fluidity in the user's immediate action environment.

### 2.4 Task Completion Time as a Behavioral Performance Indicator

Task completion time is a prevalent and defensible metric for behavioral efficiency, prized for its objectivity, comparability, and direct relevance to performance. Experimental psychology reveals that individuals' intrinsic time-related preferences—such as a propensity to complete tasks immediately—can shape approach patterns, even when alternative strategies might be less effortful (Freeman & Laughren, 2024). Furthermore, performance is known to degrade with extended time-on-task and increased cognitive load, indicating that sustained engagement under suboptimal conditions can impair execution speed (Li et al., 2024).

Research on performance optimization shows that speed can be enhanced through clearer task cues and guidance, though this may sometimes involve trade-offs with accuracy (Pietschmann et al., 2025). Similarly, external constraints and timing cues can "nudge" faster completion, altering performance dynamics (Hu et al., 2024; Park et al., 2025). It is also crucial to account for individual differences, as factors like baseline cognitive function and demographics are associated with variation in both completion time and accuracy, suggesting that not all variance is attributable to environmental manipulation (Sufian et al., 2025). This justifies the use of controlled, within-subject experimental designs—akin to methodologies used in fields like financial analytics to isolate signal from noise (Atento & Atento, 2025; Dela Costa & Atento, 2025)—to minimize confounding from individual differences when assessing the environmental impact on a standardized efficiency measure.

### 2.5 Synthesis and Study Positioning

The reviewed literature establishes a coherent, multi-disciplinary rationale for the present study. Desk organization is fundamentally linked to functional accessibility and usability (Manabu, 2025; Liu et al., 2021). Workspace conditions, including order and layout, are demonstrated shapers of concentration, perceived productivity, and attitudinal outcomes (Sailer et al., 2021; Ferrari et al., 2021). Meanwhile, clutter is associated with behavioral patterns that can undermine efficient task engagement. The choice of task completion time as the primary dependent variable is well-supported as a sensitive and objective indicator of behavioral efficiency, responsive to both environmental manipulations and task parameters (Freeman & Laughren, 2024; Hu et al., 2024).

This study synthesizes these strands by implementing a controlled, within-subject experiment. It moves beyond correlational or perceptual findings to test a direct causal hypothesis: that a manipulated state of desk organization versus disorganization will produce a measurable difference in the time required to complete a standardized cognitive task (a puzzle). By doing so, it contributes an empirical, behavioral test to the literature on environmental psychology and educational ergonomics, applying rigorous design principles underscored in contemporary analytical research (Nona & Atento, 2025; Mangubat & Atento, 2025).

## 3. Methodology

### 3.1 Research Design and Setting

This study employed a quasi-experimental within-subjects design to examine whether desk organization affects task completion time among first-year Civil Engineering students. Desk organization served as the manipulated condition with two levels: organized and disorganized. Because participants were not randomly assigned to separate groups and instead completed the task under both conditions, the study is classified as quasi-experimental and within-subjects. The within-subjects approach enabled direct comparison of each participant's performance across conditions while minimizing the influence of stable individual differences. To reduce potential sequence effects, the order of conditions was alternated such that some participants began with the organized desk and others began with the disorganized desk.

### 3.2 Participants and Sampling

Participants consisted of 30 first-year Civil Engineering students from First City Providential College. Participants were selected through availability and willingness to participate and completed the activity voluntarily. Each participant performed the task individually under both desk conditions as part of the experimental procedure.

### 3.3 Materials and Measures

Task Instrument (Kanoodle Puzzle). The study used the Kanoodle puzzle as the standardized cognitive task. The puzzle was selected because it provides a consistent and structured activity suitable for objective performance comparison across conditions.

Outcome Measure (Task Completion Time). The dependent variable was task completion time, operationalized as the number of seconds required to complete the Kanoodle puzzle under each desk condition. Completion time was recorded using a stopwatch, providing a uniform timing method across participants and conditions.

Desk Condition Manipulation. The independent variable was desk organization, manipulated through two workstation conditions: (a) organized desk and (b) disorganized desk. Both desks contained the same set of materials for each participant to ensure consistency and fairness across conditions; only the arrangement/organization differed between the two setups.

### 3.4 Procedures

Prior to task administration, each participant was given the same instructions to standardize expectations and reduce procedural variation. Participants completed the Kanoodle puzzle twice—once under the organized desk condition and once under the disorganized desk condition. Condition order was alternated to minimize order effects, with some participants starting in the organized condition and others starting in the disorganized condition.

For each condition, the stopwatch was initiated at the start of the task and stopped upon task completion. All sessions were completed individually, and completion times were recorded for each participant under both desk conditions. The paired completion times were then prepared for within-participant comparison to evaluate whether desk organization was associated with faster task execution.

### 3.5 Data Analysis

Completion times were collected and organized by desk condition. Means and standard deviations were computed for the organized and disorganized conditions to summarize central tendency and variability. To test whether the observed difference in completion time across conditions was statistically significant, the study employed a paired-samples t-test, consistent with the within-subjects design and paired observations per participant.

To document statistical treatment, the following standard formulas were applied in the analysis:

- Mean: $\bar{x} = \Sigma x / n$
- Standard deviation: $SD = \sqrt{\Sigma(x - \bar{x})^2 / (n-1)}$
- Paired-samples t-test: $t = (\bar{x}_1 - \bar{x}_2) / (SD_d / \sqrt{n})$

A statistically significant lower mean completion time in the organized condition was interpreted as evidence supporting the hypothesis that desk organization improves task efficiency.

### 3.6 Ethical Considerations

The study adhered to standard ethical practices to protect participants' rights and welfare. Participation was voluntary, and participants were informed of the study's purpose, procedures, and requirements prior to participation. Informed consent was obtained. Participants were assured that their data (including completion times) would be treated as confidential and used exclusively for research purposes. They were also informed that they could withdraw at any time without penalty or negative consequences.

## 4. Results and Discussion

### 4.1 Descriptive Results: Task Completion Time by Desk Condition

Completion time was measured in seconds for each participant under both desk conditions (organized and disorganized). Overall, participants completed the Kanoodle puzzle faster when working on an organized desk compared to a disorganized desk.

The organized-desk condition yielded a mean completion time of M = 34.0 seconds (SD = 14.8). In contrast, the disorganized-desk condition produced a higher mean completion time of M = 46.5 seconds (SD = 14.3). The observed pattern indicates that, on average, participants required 12.5 more seconds to complete the task under the disorganized desk condition compared to the organized desk condition.

**Table 1.** Task completion time by desk condition (N = 30).

| Desk condition | Mean (s) | SD (s) |
|---|---|---|
| Organized | 55.63 | 11.42 |
| Disorganized | 68.13 | 14.75 |

### 4.2 Inferential Results: Paired-Samples Comparison

A paired-samples t-test was conducted to determine whether the difference in completion time between the organized and disorganized desk conditions was statistically significant. Results indicated a significant difference in completion time between the two conditions, $t(29) = -3.39$, $p = .002$.

This statistical result indicates that the desk organization manipulation was associated with a meaningful change in task completion time, with participants demonstrating faster task execution under the organized-desk condition relative to the disorganized-desk condition.

**Table 2.** Paired-samples t-test for completion time (Disorganized − Organized; N = 30).

| Mean difference (s) | t(df) | p | Cohen's dz |
|---|---|---|---|
| 12.50 | −3.39 (29) | .002 | 0.62 |

### 4.3 Summary of Findings Relative to the Hypothesis

The findings support the study hypothesis that participants would complete the task more quickly under the organized desk condition than under the disorganized desk condition. The results consistently show improved task efficiency (shorter completion time) when the workstation environment was organized.

### 4.4 Discussion of Findings

The present findings indicate that desk organization is associated with faster task completion time on a standardized puzzle task among first-year Civil Engineering students. Participants completed the Kanoodle task more quickly under the organized-desk condition than under the disorganized-desk condition, with an average difference of 12.5 seconds. This pattern supports the study hypothesis and suggests that workspace order can function as a performance-relevant environmental factor rather than a purely aesthetic preference.

A plausible interpretation of the observed difference is that an organized desk facilitates functional accessibility and reduces environmental "friction" during task execution. Desk organization has been described as a practical arrangement of objects to preserve open working space and improve access to frequently used items, implying that orderly configurations reflect usability strategies (Manabu, 2025). When desk contents are positioned in a predictable and structured manner, attention can remain more consistently directed toward the primary task, and participants may spend less time reorienting themselves or filtering irrelevant visual information. Conversely, disorganized desk conditions may increase visual competition and require additional attentional regulation, thereby slowing task completion.

The results also align with broader accounts emphasizing that workspace conditions influence concentration and productivity-related outcomes. Research discussing learning and productivity

environments suggests that structured workspaces can support focused engagement and academic productivity (Balubayan et al., 2024.; Loyola, n.d.). Similarly, evidence from workplace and spatial-layout studies indicates that desk-related environmental cues can shape perceived productivity and concentration, implying that workspace arrangement may influence the quality of task engagement (Sailer et al., 2021). In this study, the faster completion times under the organized-desk condition are consistent with the premise that the immediate physical environment can either support or undermine attentional control during task performance.

From an applied human factors perspective, the findings are coherent with the view that workstation design and arrangement can affect task efficiency by shaping comfort, access, and usability. Work on workstation ergonomics underscores that the design and organization of the work area can support productivity (Avinante et al., 2021). In addition, approaches emphasizing user-centered surface arrangement argue that object placement and surface organization influence the ease with which tasks are carried out in near-scale environments (Liu et al., 2021). Although the present task was not physically demanding, the ergonomic logic remains relevant: an organized surface potentially simplifies the action environment, reducing the need for micro-adjustments and attentional shifts that can accumulate into measurable time costs.

The findings are also compatible with literature linking clutter-related conditions to behavioral and attitudinal outcomes in work environments. Clutter has been discussed not merely as "more items" but as a condition connected to how individuals manage their workspace, with implications for organization and work engagement (Ferrari et al., 2021). In an experimental context, the disorganized desk can be understood as a clutter-like manipulation that may introduce additional distractions or reduce the subjective sense of control over the work surface. The observed performance slowdown under the disorganized condition is therefore consistent with the argument that clutter can impose attentional costs and interfere with efficient task execution.

The use of task completion time as the primary outcome further supports the interpretability of the findings in behavioral terms. Time-based measures are frequently used to evaluate efficiency under varying task conditions and constraints, including contexts where individuals may choose between immediate completion versus delayed action under

different preferences and circumstances (Freeman & Laughren, 2024). Related performance research indicates that task conditions, workload characteristics, and the structuring of task cues can influence completion time and performance dynamics (Hu et al., 2024; Li et al., 2024; Park et al., 2025; Pietschmann et al., 2025). Within this conceptual space, desk organization can be treated as an environmental structuring variable: the organized desk may function as a condition that reduces extraneous environmental load and supports smoother execution, thereby reducing completion time.

At the same time, the findings should be interpreted with appropriate methodological caution consistent with the study design. Because the study employed a within-subject approach, participants completed the task twice, which can introduce learning or familiarity effects. The procedure indicated that condition order was alternated across participants to mitigate sequence effects; nevertheless, any residual practice effect could influence absolute completion time. Importantly, even with this consideration, the observed pattern—faster performance under the organized condition—remains informative because it reflects how task execution differs when the immediate workspace environment is structured versus cluttered within the same individuals. Moreover, individual differences in speed and accuracy are known to affect completion time outcomes across tasks and populations (Sufian et al., 2025), which reinforces the methodological value of within-subject comparison for reducing between-person confounding in this context.

In applied terms, the findings suggest that simple environmental design choices may yield practical performance benefits in student work settings. For engineering students who routinely engage in problem solving and time-bound academic tasks, a structured workspace may contribute to more efficient completion of discrete cognitive activities. The observed difference in completion time, while modest in absolute duration, is meaningful as an indicator of efficiency that may compound across repeated tasks and prolonged study routines. Consistent with applied perspectives linking workspace conditions to broader performance and motivation outcomes (Oyedeji et al., 2025; Nguyen & Tran, 2025b), the present results support the practical argument that institutions and students may benefit from promoting basic workspace organization as part of study skills development and learning environment optimization.

Overall, the discussion supports the conclusion that desk organization—operationalized as an organized versus disorganized workstation arrangement—has a measurable association with task completion time in this sample. The findings provide behavioral evidence that workspace order may support faster task execution, consistent with research linking workspace structure, concentration, and performance-related outcomes.

## 5. Conclusion and Recommendations

### 5.1 Conclusion

This study examined whether desk organization influences task completion time among first-year Civil Engineering students using a within-subject quasi-experimental design and a standardized Kanoodle puzzle task. Results demonstrated that participants completed the task faster under the organized desk condition than under the disorganized desk condition. The paired-samples t-test confirmed that the difference in completion time between conditions was statistically significant ($t(29) = -3.39$, $p = .002$), indicating that desk organization was meaningfully associated with task efficiency in this sample.

Overall, the findings support the study hypothesis and provide behavioral evidence that workspace order is not merely a preference in appearance but a condition that can shape measurable performance outcomes. Within the context of student learning and time-bound cognitive tasks, maintaining an organized work surface appears to facilitate more efficient task execution.

### 5.2 Recommendations

Based on the study findings and the scope of the investigation, the following recommendations are presented for practice and for future research:

*A. Practical Recommendations (Student and Academic Context)*

Promote workspace organization as a study habit. Students, particularly those in problem-solving disciplines, may benefit from maintaining an organized desk when completing time-sensitive or cognitively demanding tasks.

Integrate workspace preparation into academic productivity guidance. Faculty, academic advisers, and learning support units may include desk organization as a concrete component of study skills orientations, learning strategies sessions, or productivity coaching.

Encourage structured study environments in classrooms and learning spaces. Where feasible, learning spaces may be arranged and maintained in ways that reduce unnecessary clutter and support a clearer working area, especially for activities requiring sustained attention.

*B. Research Recommendations (For Stronger Evidence and Replication)*

Replicate the study with larger and more diverse samples. Future studies may involve more participants and include students from other year levels, programs, or institutions to improve generalizability.

Assess potential order or practice effects explicitly. While alternating the order of conditions helps mitigate sequence effects, subsequent studies may formally test order effects or use equivalent but different task sets across conditions to further minimize learning-related influences.

Extend performance indicators beyond completion time. Future work may consider additional outcomes such as task accuracy, error rates, or perceived difficulty to provide a more comprehensive understanding of how desk organization affects performance.

Test other task types and environmental variations. Subsequent experiments may examine whether the effect of desk organization holds across different cognitive tasks (e.g., computation, reading comprehension, problem-solving exercises) and across varying degrees or types of desk disorganization.

### 5.3 Limitations and Future Research Directions

Several limitations should be considered when interpreting the findings. First, the study involved a single institutional context and a limited sample size ($n = 30$) drawn from first-year Civil Engineering students, which constrains the generalizability of results to other student populations, academic programs, or learning environments. Replication using larger samples and multiple institutional settings would strengthen confidence in the stability of the observed effect.

Second, the study used a within-subject design, which improves comparability by holding individual differences constant but introduces a risk of practice or familiarity effects because participants completed the same type of task under two conditions. While the procedure alternated the order of conditions to mitigate sequence effects, future studies may strengthen internal validity by formally

testing order effects, incorporating washout intervals, or using equivalent but different task sets across conditions.

Third, the study operationalized performance using task completion time only. Although completion time is a valid efficiency indicator, it does not capture other relevant aspects of performance such as accuracy, error rate, strategy quality, or perceived task difficulty. Future research may include multiple performance indicators to provide a more complete understanding of how desk organization influences task execution.

Finally, the manipulation of "organized" versus "disorganized" desk conditions reflects the study's operational definition of desk organization. Future work may refine the manipulation by specifying levels of disorganization (e.g., mild, moderate, high) or by isolating specific environmental components (e.g., visual clutter versus accessibility) to determine which aspects of desk organization most strongly influence efficiency.

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