KMSW

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INTERVENTION:
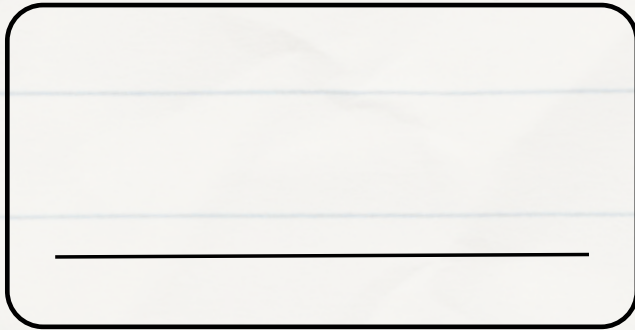# DEVICE-FREE DISCIPLINE

Prepared By
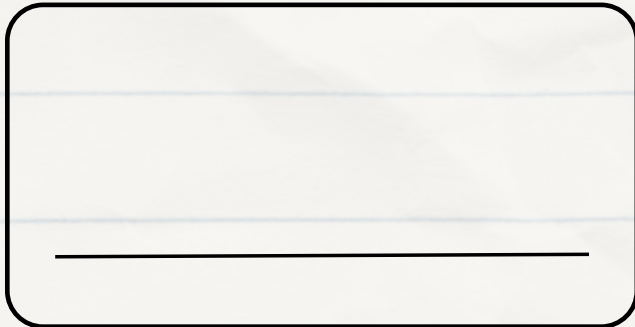**Shafiq R**
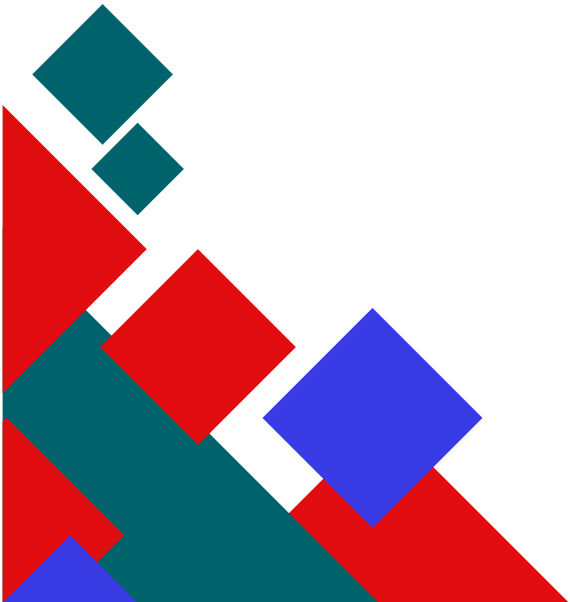
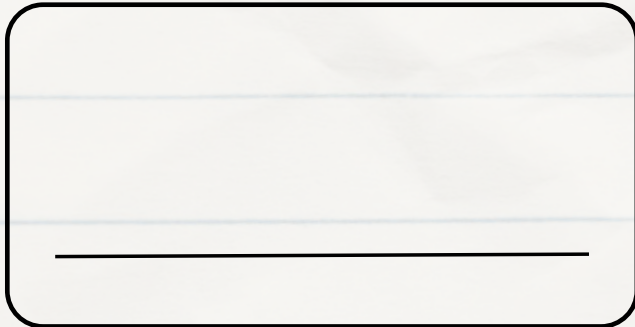**DISEDIAKAN OLEH,**

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<u>Executive Summary</u>

This case study examines the academic transformation of a pre-university physics student who voluntarily sought help to improve her performance. Despite a history of underachievement and frequent digital distraction, the student demonstrated strong motivation to change. The intervention introduced was intentionally minimalist: a daily one-hour study session free from all electronic devices, using only a reference book, paper, pen, and calculator. The student surrendered her phone to a peer during each session to ensure compliance. Over the course of two semesters, the student showed substantial academic improvement, with quiz scores rising from 38% to 82% and consistent achievement of 80% in both semester-end examinations. Qualitative changes included deeper conceptual engagement, increased classroom participation, and improved self-confidence. The intervention's effectiveness is interpreted through the lenses of Cognitive Load Theory, Self-Regulated Learning, and media multitasking research. By reducing cognitive distractions and supporting environmental control, the student was able to shift from passive to active learning. This case highlights the impact of simple behavioural changes on academic outcomes. It suggests that supporting students in managing their learning environments—particularly in minimizing digital interference—can lead to measurable gains. For educators and institutions, the findings reinforce the importance of addressing not only what students learn, but *how* and *under what conditions* they learn.

Contents

Background and Context

This case study focuses on a pre-university physics student enrolled in a two-semester foundational program designed to prepare learners for undergraduate studies in science and engineering. The course covers a wide range of topics in mechanics, thermodynamics, waves, electricity, and modern physics, with continuous assessment through quizzes, midterms, and a final examination.

The student featured in this case had a history of poor academic performance, consistently placing in the lower quartile of the class across several science subjects. Notably, the student approached the instructor independently at the beginning of Semester 2, expressing concern over her academic standing and requesting guidance to improve. This initiative was a key factor in selecting her for this case study, as it signalled a strong intrinsic motivation to change.

The student reported significant difficulty in concentrating during revision sessions and identified social media use—particularly through her mobile phone, as a major source of distraction. Despite having access to learning materials and revision tools, she struggled to make effective use of them due to frequent multitasking and procrastination facilitated by digital devices.

At the time of the intervention, no formal learning support structures were in place beyond regular classroom instruction. The learning environment was typical of most pre-university settings: weekly lectures, tutorial classes, and independent revision time. There were no additional remedial sessions, making the student's self-driven effort a particularly important feature of this case.

The student voluntarily agreed to participate as the subject of a teaching-focused case study. Her identity is anonymized, and all academic data used are with her consent. This background establishes the foundation for understanding the intervention, outcomes, and implications described in the following sections.

The Learning Challenge

The primary challenge faced by the student was a persistent inability to maintain focus during revision sessions. While she regularly attended lectures and tutorials, her engagement with independent study was undermined by habitual use of digital devices, particularly for non-academic purposes. She often attempted to revise while simultaneously checking notifications or browsing social media, resulting in fragmented attention and shallow processing of physics concepts.

This pattern of distracted learning had contributed to weak foundational understanding across multiple topics in both semesters. Her performance in quizzes and written assignments reflected surface-level comprehension and a reliance on memorization rather than conceptual reasoning or problem-solving skills. The student herself acknowledged that she would often revise "just to finish," rather than with the intent to understand.

Despite these difficulties, the student displayed a positive attitude when discussing her challenges. She was candid about the effect of her phone use on her study habits and appeared receptive to suggestions for behavioural change. The turning point came during a review of her Semester 1 performance, where she recognized a clear disconnect between her effort and her outcomes.

This willingness to reflect and seek improvement distinguished her from peers in similar academic standing. However, it also underscored the depth of the challenge: it was not simply a matter of "trying harder," but of rethinking how she engaged with learning altogether. Her difficulties were not due to lack of access to resources or content but stemmed from environmental and behavioural factors—namely, the inability to create a cognitively focused revision environment.

This section frames the rationale for the intervention, which was designed not to increase the quantity of study hours, but to improve their quality through a disciplined, distraction-free approach.

Intervention Design

The intervention was introduced midway through Semester 1, following a reflective conversation initiated by the student regarding her underwhelming academic performance. It continued consistently through to the end of Semester 2. The central idea was simple but strict: create a cognitively uncluttered study environment by removing all sources of digital distraction. The intervention emphasized quality over quantity. Specifically, cultivating focused, **device-free revision habits.**

The student committed to a daily 1-hour revision session using only non-electronic tools: a calculator, a relevant physics reference book, paper, and a pen. These sessions were carried out in her dorm room, an environment she found comfortable and controllable. The most critical element of the design was the enforcement mechanism: the student was required to physically hand over her mobile phone and other devices to a trusted friend before each session. The friend acted as a form of accountability, reporting any breaches to the instructor during weekly informal check-ins.

The instruction given was deliberately minimalist: "You are not allowed to use any devices and must rely on non-electronic sources. You must hand over your devices to your friend and they will keep it from you throughout your study session." No specific structure was imposed on how to organize the revision sessions. The intention was to reduce reliance on search engines, videos, and AI tools, which, while helpful, had become vehicles for distraction and procrastination. The student was expected to engage directly with the material, solve problems independently, and revisit content using analogue means.

Initially, the student found the shift difficult. Accustomed to quickly searching for answers online or watching solution videos, she experienced cognitive discomfort and frustration. However, this friction was expected and after approximately three weeks, she reported feeling "more clear-headed" during her study sessions and less anxious about checking her phone. Her adaptation was reinforced by observed improvements in quiz results, further motivating her to continue.

Notably, the intervention did not demand a complete rejection of digital tools outside study hours. The emphasis was on controlled disconnection during periods of deliberate practice. The change did not require more time or effort, but rather a reconfiguration of the learning environment, reducing the burden of self-regulation by eliminating the temptation altogether.

Intervention Rationale

The intervention was grounded in a straightforward goal: to improve the quality of the student's cognitive engagement by eliminating digital distractions during revision. This minimalist approach—removing all electronic devices during study sessions—was not merely a disciplinary measure, but a strategy informed by well-established cognitive and educational research.

One of the core theoretical foundations for this intervention is **Cognitive Load Theory** introduced by Sweeler in 1988, which emphasizes the limitations of working memory in learning. According to this framework, effective learning occurs when instructional design reduces *extraneous cognitive load*, the mental effort not directly related to the task at hand. Constant notifications, multitasking, and the temptation to passively consume content on digital devices dramatically increase extraneous load, leaving fewer cognitive resources for problem-solving, concept integration, and memory consolidation.

The intervention also aligns with **Self-Regulated Learning (SRL)** theory by Zimmerman in 2002, which highlights how successful learners plan, monitor, and control their cognitive, motivational, and environmental factors. While SRL usually assumes that students have the capacity to manage distractions, this case recognizes that environmental restructuring, such as removing phones entirely, can scaffold students toward eventual self-regulation. By outsourcing control to a trusted friend, the student reduced her self-regulatory burden and focused on task completion, an approach similar to what researchers term *environmental control strategies* within SRL literature.

Furthermore, the negative academic effects of **media multitasking** have been documented extensively. Studies show that students who frequently toggle between academic work and digital media tend to perform worse in comprehension, retention, and GPA. The student in this case exhibited this exact pattern prior to the intervention, frequent interruptions from social media during study time contributed to shallow engagement and reduced performance. Removing the medium allowed for deeper, uninterrupted processing of physics content.

Importantly, the intervention emphasized **simplicity and sustainability**. Unlike elaborate learning schedules or technology-based interventions that require additional onboarding, this method relied only on basic materials and a repeatable structure. This minimalist approach not only promoted metacognitive awareness but also cultivated a sense of control—an important element in fostering academic resilience.

By applying these frameworks practically—reducing cognitive load, enforcing environmental control, and minimizing opportunities for media multitasking—the intervention aimed to create a fertile context for focused, independent learning. The next section details how the student responded to this structure, both emotionally and behaviourally.

Student Experiences & Turning Points

The student's experience with the intervention evolved markedly over time. At the outset, she expressed discomfort and frustration with the sudden removal of digital devices. Having previously relied on online videos, quick internet searches, and messaging apps while studying, she initially found herself "stuck" during revision sessions, unsure of how to proceed when encountering unfamiliar problems without immediate access to answers. This reaction was consistent with her prior dependency on technology not just as a learning tool, but as a cognitive crutch.

The first week was particularly difficult. The absence of instant feedback and the temptation to retrieve her phone, held by a trusted peer, highlighted her initial reliance on passive learning strategies. She admitted to feeling anxious and restless during the early sessions, frequently glancing at the clock or feeling tempted to end sessions prematurely. Nevertheless, she adhered to the routine, supported by the structure of accountability built into the intervention.

Over the following two weeks, a noticeable shift occurred. She began to report a sense of mental clarity and improved concentration. Without the option of quick distractions, she was compelled to engage more deeply with the material. Instead of switching contexts every few minutes, she persisted with problem-solving, often revisiting textbook explanations or reworking calculations on her own. This discomfort gave way to a stronger sense of self-efficacy.

The most critical turning point came when she broke the routine during Week 4 by keeping her phone during a study session and subsequently performed poorly in a quiz. She immediately linked her lapse in focus with her result, calling it a "wake-up call." This direct feedback loop between behaviour and outcome reinforced the value of the minimalist approach more effectively than external instruction could have.

By the third week of consistent implementation, she had fully embraced the system. She no longer needed reminders or supervision and began to look forward to her device-free study hours. Her self-reported levels of confidence increased, and she noted feeling more in

control of her study time. Casual check-ins revealed that she began recommending the method to peers, though few had the discipline to replicate it.

The student's journey was not without minor setbacks, but each lapse served as an opportunity for reflection. Her increased resilience and self-awareness became evident not only in conversation but also in her engagement during class, where she began to ask more precise and conceptually grounded questions.

This section illustrates that while initial resistance to behaviour change is natural, a structured and supported intervention can foster meaningful transformation in both habits and mindset. The following section will describe the concrete learning outcomes that emerged from this behavioural shift.

Outcomes

The intervention yielded clear and measurable improvements in the student's academic performance, as well as qualitative gains in engagement and confidence. These outcomes were tracked through a series of quizzes conducted throughout Semester 2, culminating in the final examination. While academic improvement was the primary aim, several affective and behavioural shifts were also observed.

Quantitative Outcomes

The intervention produced sustained and measurable improvements in the student's academic performance, particularly visible through a series of ten quizzes and two semester-end examinations (PSPM 1 and PSPM 2). These outcomes support the effectiveness of the distraction-free revision strategy over time.

Student Performance throughout Intervention Period
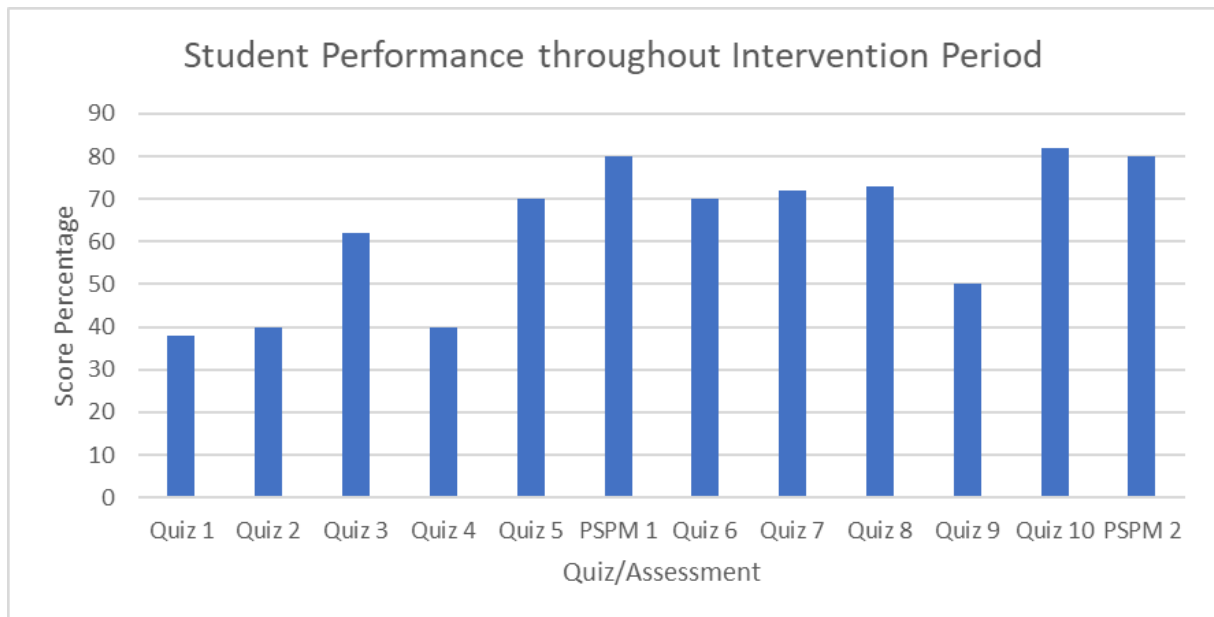
The student began the semester with a low baseline:

Item	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5
Percentage (%)	38	40	62	40	70

By the time she sat for **PSPM 1 (Semester 1 Final Exam)**, her score had increased to **80%**, a dramatic improvement from her early quiz results. This signalled not only recovery, but mastery of foundational topics covered in the first half of the course.

In Semester 2, her performance remained consistently strong:

Item	Quiz 6	Quiz 7	Quiz 8	Quiz 9	Quiz 10	PSPM 2
Percentage (%)	70	72	73	50	82	80

Despite the drop in Quiz 9, she regained her footing quickly, scoring her highest in Quiz 10. Her final examination score for Semester 2 (**PSPM 2**) remained solid at **80%**, demonstrating both retention and continued progress.

Trend Summary

- **Overall improvement**: From 38% to 82% in quizzes; maintained 80% in both PSPM exams.

- **Mid-semester setbacks**: Notable dips in Quiz 4 and Quiz 9 aligned with breaks in routine, reinforcing the importance of sustained focus.

- **Post-setback recovery**: Demonstrated strong rebound after each lapse, showing resilience and commitment.

Qualitative Outcomes

In tandem with the numerical data, the student showed qualitative gains in learning behaviour:

- She engaged more actively in class, asking deeper questions.
- Her written responses became more structured, conceptually accurate, and reflective of independent reasoning.
- Weekly check-ins revealed growing confidence, better self-monitoring, and greater enjoyment of the subject matter.

These outcomes validate not just academic recovery but a shift toward self-regulated learning habits. The next section will explore how these results can be interpreted within established educational theories and frameworks.

Interpretation & Analysis

The student's trajectory throughout the intervention period reveals a pattern of steadily increasing academic performance, punctuated by brief setbacks that ultimately reinforced the value of the minimalist study approach. Her progress can be interpreted through several educational frameworks, providing insight into both the mechanisms of improvement and the challenges she faced along the way.

Self-Regulated Learning (SRL)

Zimmerman's model of Self-Regulated Learning posits that effective learners engage in a cycle of planning, monitoring, and evaluating their learning behaviours. In this case, the student initially struggled with the self-monitoring component—specifically in managing distractions and maintaining attention. The external constraint of surrendering her phone acted as a scaffold, helping her regulate her environment until self-discipline took over. By the midpoint of the intervention, she demonstrated increased self-efficacy, persistence, and the ability to evaluate the quality of her effort based on quiz results. This shift marked a move from reactive learning to proactive self-regulation.

Cognitive Load Theory

Her improvement also aligns with Cognitive Load Theory, which highlights the limits of working memory in learning complex information. Prior to the intervention, her study sessions were burdened by *extraneous cognitive load*—constant switching between apps, passive video

watching, and mental fragmentation. By removing these elements, the student reduced cognitive interference, allowing more working memory to be allocated to *germane load*—the process of schema building and problem-solving essential in physics. This simplification of her learning environment led to clearer thinking and deeper conceptual engagement.

Behavioural Feedback Loop

A key turning point in her learning behaviour occurred after she scored poorly on Quiz 4 and Quiz 9, both of which followed a lapse in routine. These low scores provided a behavioural feedback loop that connected her actions directly with outcomes. The internalization of this cause-and-effect relationship reinforced the benefits of the minimalist method far more effectively than abstract advice or general encouragement.

Affective and Motivational Shifts

Alongside cognitive changes, the student's attitude toward learning shifted. Her initial anxiety and dependency gave way to intrinsic motivation and a sense of ownership over her progress. This affective transformation, characterized by increasing confidence, reduced anxiety, and proactive classroom participation, is consistent with growth mindset principles (Dweck, 2006), where students begin to view ability as improvable through effort and strategy rather than fixed talent.

Together, these frameworks help explain how a simple intervention—minimizing distractions and enforcing routine, can trigger a cascade of behavioural, cognitive, and emotional gains. In the next section, we explore how this case can inform broader teaching practices and institutional approaches.

This case offers several insights into how targeted, low-cost interventions can support students who struggle not from lack of ability, but from poor learning habits shaped by digital distraction. The implications span teaching practice, instructional design, and institutional support.

Implications for Teaching Practice

This case reinforces the importance of explicitly addressing **how students' study**, not just **what they study**. While content delivery in pre-university physics often emphasizes conceptual understanding and problem-solving, it is easy to overlook the need to guide students on how to structure their independent learning. In this case, simple, behaviour-focused guidance led to substantial gains. Teachers might consider incorporating brief sessions on study strategies, environmental control, or focused attention management into the regular curriculum.

Moreover, the use of **peer accountability**, the student handing over her devices to a friend, proved to be an effective and sustainable mechanism. This suggests that building structured peer support systems, even informally, could enhance student follow-through in self-regulated learning efforts.

Implications for Instructional Design

Instructional materials and assessments should assume that not all students possess the metacognitive skills needed to manage their own learning environments. Embedding reflective prompts ("How did you study for this quiz?") or including optional **tech-free study challenges** could nudge students to evaluate the quality of their study habits. The intervention here did not rely on extra resources, only on routine and structure, making it scalable and adaptable.

For instance, physics instructors might create "device-free problem-solving workshops" or assign paper-based revision sessions to help students build academic stamina and deeper processing skills without reliance on search-based scaffolding.

Institutional Considerations

At the program level, institutions might consider providing guidance on **digital wellness** as part of student onboarding or study skills modules. Many students, particularly at the pre-university level, have never been taught how to protect their attention or structure independent learning time effectively. This case shows that even a single student, with the right structure, can break habitual multitasking behaviours and thrive.

Additionally, academic advising systems could benefit from using short diagnostic conversations about learning behaviours to recommend tailored strategies for improvement, similar to how this case began.

In short, the core lesson is that **simplifying the learning environment can be as impactful as enriching it**. When combined with routine, accountability, and reflective learning, even basic strategies can empower students to take control of their academic journey.

Conclusion

This case study highlights how a simple, non-technological intervention can produce meaningful changes in student learning outcomes when supported by structure, accountability, and personal motivation. The student, who initially struggled with academic performance and distraction, made significant progress over two semesters through the adoption of a minimalist, device-free revision routine.

Her improvement was not only quantitative, demonstrated through steady increases in quiz and examination scores, but also qualitative, reflected in greater confidence, stronger conceptual understanding, and more proactive engagement in the learning process. The turning points in her journey, particularly following lapses in the routine, emphasized the effectiveness of focused attention and deliberate practice in physics learning.

The intervention did not rely on additional instructional content or technology. Instead, it reinforced the value of creating a cognitively clear and distraction-free environment, allowing the student to build habits of persistence and reflection. This aligns with well-supported theories of cognitive load, self-regulated learning, and attention management.

As educators, this case encourages us to look beyond content delivery and consider the conditions under which our students learn. By supporting learners in managing their environments—and equipping them with the tools to reduce distractions, we empower them to engage more deeply and take ownership of their academic development.

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