



Evaluating an ADRI-Based Digital Intervention for Bullying Prevention: A Preliminary Framework for Enhancing Student Self-Efficacy and Social Resilience

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Abstract. Addressing the risks of campus bullying in higher education, this pilot study evaluates a digital framework for Krav Maga instruction structured through the ADRI (Approach, Design, Results, Implementation) management model. By integrating non-linear, logic-driven branching scenarios, the intervention provides a "safe failure environment" to cultivate situational response capabilities and adaptive self-protective behaviors. A mixed-methods evaluation (N = 200) demonstrated significant immediate improvements in student engagement (from 3.2 to 4.5, $p < 0.01$), self-defense confidence (48%), and perceived self-efficacy in managing bullying-related threats (44.5%). The findings indicate that systematically governing safety education via interactive digital pedagogy offers a scalable pathway to strengthen proximal psychosocial resilience. While longitudinal validation remains necessary, this approach establishes a sustainable preliminary framework for proactive bullying prevention in universities.

Keywords: Campus Safety, Social Resilience, Bullying Prevention, Non-linear Digital Pedagogy, ADRI Model, Self-Efficacy, Scenario-Based Learning, Higher Education.

1. Introduction

1.1 Research Background: Enhancing Resilience in Higher Education

Digital pedagogy is increasingly recognized for its potential to foster "resilience capital" during undergraduate education [11, 13]. Although traditional self-defense

training like Krav Maga offers mental and situational preparedness [5, 9, 12], standard delivery models remain instructor-centered and lack scalability [12]. Concurrently, school bullying continues to threaten student well-being and academic retention [2, 3]. While scenario-based learning (SBL) [8] and governance models like ADRI (Approach, Design, Results, Implementation) [1] provide frameworks for active learning, a critical empirical gap remains in integrating high-pressure safety training with interactive digital architectures to enhance task-specific self-efficacy [7, 13]. Traditional passive safety education fails to develop situational awareness and lacks scalable feedback loops, leading to intervention decay across institutions [1, 8].

1.2 Problem Statement: The Social Safety Deficit in Educational Settings

Despite the recognized importance of safety education, many existing instructional approaches remain limited in their ability to promote active learner engagement. Traditional models often rely on passive observation, which constrains the development of situational awareness and adaptive response skills [8]. In addition, current interventions tend to prioritize physical techniques while underemphasizing psychological dimensions such as self-efficacy and perceived control. This imbalance creates a gap between skill acquisition and real-world application in complex social contexts such as bullying [3, 13].

Beyond these pedagogical limitations, there is a lack of scalable models that effectively integrate interactive learning, psychological development, and systematic evaluation [1]. Without embedded feedback mechanisms, safety education programs may remain fragmented and difficult to sustain across diverse institutional settings [7]. This gap underscores the need for empirically grounded, scalable frameworks that link interactive design to measurable psychosocial outcomes, thereby addressing the deficiencies in current campus safety training.

1.3 Research Aim and Questions

The present study aims to evaluate a digital, scenario-based intervention for bullying prevention, structured using the ADRI framework. Specifically, the study examines how interactive digital pedagogy influences student engagement, task-specific self-efficacy, and perceived response capability in bullying-related situations.

In this study, self-efficacy refers to task-specific beliefs regarding one's ability to effectively manage bullying-related situations, as conceptualized within social cognitive theory.

To address these objectives, the study is guided by the following research questions:

- RQ1: What design features drive learner engagement in digital safety training environments?
- RQ2: How does interactive digital learning influence task-specific self-efficacy in bullying-related contexts?
- RQ3: To what extent does the ADRI framework support the scalable implementation of digital safety education in higher education?

1.4 Significance of the Study

This study makes three primary contributions to the literature. First, it provides empirical evidence that interactive digital pedagogy can enhance student engagement and task-specific self-efficacy in bullying-related contexts [6]. Second, it demonstrates how scenario-based learning, when structured through the ADRI framework, can support the design and implementation of scalable safety education interventions [1, 8]. Third, it contributes to the literature on digital pedagogy by shifting the analytical focus toward psychosocial outcomes, thereby offering a more nuanced understanding of how technology can support adaptive responses in higher education settings [4, 13].

1.5 Scope and Limitations

This study focuses on undergraduate participants from institutions in Chengdu, China, and examines the short-term effects of a four-week digital intervention. Accordingly, the findings are limited to immediate changes in engagement, self-efficacy, and perceived response capability.

Given the short duration of the intervention and the reliance on self-reported measures, conclusions regarding long-term behavioral change should be interpreted with caution. In addition, the use of a one-group pretest–posttest design may limit causal inference. While this design is appropriate for exploratory and pilot studies aimed at assessing intervention feasibility, future research employing randomized controlled trials (RCTs) is necessary to account for potential history and maturation effects. Further studies using longitudinal designs and more diverse samples are also needed to evaluate sustained impacts.

2. Review of Related Literature and Studies

2.1 Self-Defense Training and Digital Preparedness

Modern self-defense training (e.g., Krav Maga) serves as stress inoculation by recalibrating threat appraisal and enhancing perceived control under pressure [5, 9, 12]. However, traditional delivery models remain instructor-centered and lack adaptive variability [12]. Digital scenario-based learning (SBL) resolves these constraints by providing non-linear, risk-free decision branching that mirrors real-world situational judgment [8, 10], thereby fostering both engagement and task-specific self-efficacy [3, 6].

2.2 Institutional Sustainability via ADRI

The ADRI (Approach, Design, Results, Implementation) model operationalizes educational governance by establishing closed cybernetic feedback loops [1]. By systematically reintegrating evaluation metrics into iterative scenario design, ADRI addresses "intervention decay," ensuring scalable and standardized safety pedagogy across resource-constrained institutions [7].

2.3 The ADRI Model for Institutional Sustainability

The ADRI (Approach, Design, Results, Implementation) model provides a cyclical framework for aligning educational objectives with evaluation processes [1]. Within the context of safety education, ADRI extends beyond a design framework to function as a mechanism of educational governance. By establishing a closed-loop system, the model ensures that intervention data are systematically reintegrated into subsequent iterations, thereby facilitating the accumulation of organizational memory. This mechanism directly addresses the challenge of "intervention decay" in educational technology, ensuring that safety education remains standardized and sustainable in resource-constrained institutional settings [7].

2.4 Theoretical Foundations and Research Gap

As conceptualized in Fig. 1, our framework synthesizes Social Cognitive Theory (self-efficacy as behavioral driver) [3, 13], Constructivist Learning (immersive problem-solving) [8, 10], and Cognitive Load Theory (scenario segmentation) [4]. A key gap remains in unifying self-defense logic, SBL, and ADRI into a scalable digital asset, which this study directly addresses [2].

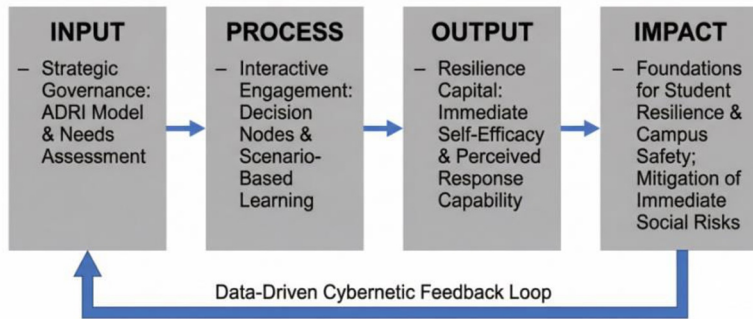


Fig. 1. The Conceptual Framework of the ADRI-Governed Intervention. A Cybernetic Model for Translating Digital Strategic Governance into Foundations for Student Resilience. This diagram illustrates the iterative cycle of the intervention, emphasizing the role of the feedback loop in maintaining institutional sustainability and prioritizing the mitigation of early-life social risk factors over speculative long-term outcomes.

2.5 Research Gap and Interdisciplinary Contribution

Despite advances in these domains, a clear methodological disconnect persists. First, the translation of self-defense training into scalable digital formats remains limited. Second, digital learning literature often overlooks psychosocial mediators like self-efficacy in bullying contexts. Third, the ADRI framework’s potential as a governance mechanism remains underexplored. The present study addresses these gaps by synthesizing Krav Maga-based decision logic, scenario-based learning, and ADRI into a unified model, contributing to a human-centered understanding of scalable resilience development.

3. Methodology

3.1 Research Design and ADRI Operationalization

This study used an exploratory sequential mixed-methods design with a one-group pretest–posttest approach to evaluate feasibility and immediate psychosocial shifts. The ADRI framework operationalized the intervention:

- Approach: Identified core bullying scenarios (e.g., verbal boundary violations) via needs assessment.
- Design: Developed a 36-decision-node branching architecture adhering to cognitive load principles.

- **Results & Implementation:** Formatively evaluated completion metrics and deployed the system via a hybrid LMS to establish an institutional knowledge base.

3.2 Participants and Measures

Participants included 200 individuals (n=158 undergraduates, n=27 faculty, n=15 staff) from three higher education institutions in Chengdu, China. Outcomes were measured using a 15-item self-efficacy scale ($\alpha = 0.88$) adapted from Bandura's framework, covering verbal de-escalation, situational awareness, and behavioral confidence. Paired-samples t-tests, Shapiro-Wilk normality tests, and Cohen's d effect sizes were processed in SPSS (v26), supplemented by qualitative thematic analysis in NVivo (v12). Ethical standards were strictly maintained with pre-screened scenarios to ensure a safe failure environment.

3.3 Ethical Considerations

The study adhered to rigorous ethical standards, with all participants providing informed consent. Scenarios were pre-screened by subject-matter experts and psychologists to ensure they provided a "safe failure environment" without inducing trauma, prioritizing constructive coping strategies over distressing content.

4. Results and Discussions

4.1 Technological Readiness

Evaluation of technical infrastructure revealed that high-speed internet (78.5%) and high-quality visual equipment (81.0%) were essential for optimal delivery, with 100% consensus on the need for institutional support (N=200). As noted by qualitative feedback, visual clarity in branching videos directly impacted threat recognition accuracy. Suboptimal visual fidelity increases extraneous cognitive load, underscoring infrastructure as a necessary prerequisite for digital safety pedagogy.

4.2 Pedagogical Efficacy: Engagement and Social-Cognitive Development

The interactive intervention significantly outperformed traditional instructional modalities in both engagement and perceived efficacy, directly addressing RQ1 regarding design features. Non-linear, scenario-based environments appear to mitigate the constraints of passive learning by incentivizing active agency.

Table 1. Paired-Samples t-test Results for Pre–Post Changes ($N = 200$)

Variable	Pre-test (M $\pm$ SD)	Post-test (M $\pm$ SD)	t-value	p-value	Cohen's d
Engagement	3.20 $\pm$ 0.64	4.50 $\pm$ 0.58	3.92**	<0.01	0.85
Self-efficacy	3.35 $\pm$ 0.60	4.40 $\pm$ 0.62	3.67**	<0.01	0.78
Response Capability	3.28 $\pm$ 0.66	4.35 $\pm$ 0.59	3.74**	<0.01	0.80

Note: M = Mean; SD = Standard Deviation. ** $p < 0.01$.

Statistically significant improvements were observed across all variables, with large effect sizes (d ranging from 0.78 to 0.85). These gains are attributed to the branching decision architecture, which necessitates active participation rather than passive observation. By redistributing decision-making agency to the learner, the system transforms passive exposure into active cognitive participation, reinforcing the task-specific self-efficacy required in bullying-related contexts (RQ2). This finding extends prior research by suggesting that the simulation of high-pressure social interactions is more effective for confidence building than linear video-based instruction.

4.3 Psychosocial Outcomes: Self-Efficacy and Response Capability

Pearson correlation analysis demonstrated a significant positive relationship between learner engagement and both self-efficacy ($r = 0.62$, $p < 0.01$) and response capability ($r = 0.59$, $p < 0.01$). Qualitative reflections highlighted that experiencing mistakes in a risk-free simulation without real-world consequences was the primary catalyst for confidence growth, confirming engagement as a key mediator in resilience formation.

4.4 ADRI as a Governance Framework (RQ3)

The ADRI framework prevented "intervention decay" by establishing closed feedback loops. Interaction metrics ("Results") continuously informed scenario updates ("Design"), transitioning safety education from isolated instructional events to a standardized, scalable institutional asset across diverse educational settings.

5. Conclusion and Recommendation

This study demonstrates that ADRI-governed, scenario-based digital interventions significantly enhance student engagement and task-specific self-efficacy in campus bullying prevention. Conceptually, it integrates social cognitive theory with interactive pedagogy to highlight self-efficacy as a pivotal protective factor. Practically, the ADRI framework transforms isolated safety instruction into scalable, continually optimized institutional assets.

Primary limitations include the single-group pretest–posttest design, brief 4-week duration, and reliance on self-reported metrics, which constrain causal inference and long-term impact evaluation. Future research should utilize randomized controlled trials (RCTs) and longitudinal tracking to assess sustained behavioral outcomes. Higher education institutions are urged to strengthen technical infrastructure and adopt governance-oriented digital models to ensure scalable, evidence-based safety education.

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