How to be a Successful Student: An Intervention Study using a Gaming Method

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Will a quest game improve participants' mindset and increase their competitiveness? There is a great interest in leveraging quest games to improve the participants' growth mindset since little is known whether a quest game can affect mindset and competitiveness. This study investigates the effects of a quest-based intervention on students' psychological beliefs, specifically targeting growth mindset, fixed mindset, and competitiveness. A total of 64 UKM students participated, with 32 in the experimental group and 32 in the control group. The participants were required to play a game, which is a quest game for the experimental group and Tetris for the control group. At Weeks 1, 4, 8, and 12, participants completed a questionnaire battery comprising two instruments: the Implicit Theory of Intelligence Scale, which includes 6 items rated on a 6-point Likert scale to assess mindset orientation, and the Competitiveness Index, which consists of 14 items rated on a 5-point Likert scale to measure individual competitiveness. Findings revealed a significant increase in growth mindset over time within the experimental group, supporting the intervention's effectiveness in promoting adaptive beliefs through gamified learning. Fixed mindset and competitiveness remained stable across the 12-week period, suggesting that these constructs may be more resistant to short-term change or were not directly activated by the intervention design. The study underscores the potential of quest-based environments to influence mindset through lived experience, while also highlighting the limitations of indirect influence on more trait-like psychological dimensions.

Keywords: growth mindset, competitiveness, brain game

The beliefs individuals hold about their abilities can profoundly shape how they engage with challenge, persist through failure, and construct their future selves (Dweck, 2006). Nowhere is this more evident than in academic and learning environments, where mindset functions not merely as a cognitive orientation, but as a psychological filter through which effort, success, and identity are interpreted (Tan et al., 2025; Altikulaç et al., 2024; Stanley et al., 2023).

Yet despite decades of psychological insight, a global meta-analysis found that over 40% of students still believe intelligence is fixed and those who do are significantly more likely to withdraw when challenged (Sisk et al., 2018). These beliefs don't just shape academic performance; they shape identity, behaviour, and how young people learn to engage with struggle (Tong et al., 2023; Hallahan, 2020; Crocetti, 2017).

From ancient philosophy to modern pedagogy, one idea has endured: the belief that effort transforms potential (Karatsiori,

2023; Hecht et al., 2023). Yet despite centuries of progress in how we teach, many learning environments still operate on a silent assumption that ability is fixed, failure is threatening, and success belongs to the "naturally gifted." This belief system, often invisible and unspoken, shapes how students interpret challenges, respond to setbacks, and ultimately define their own capacity for growth.

The scientific framing of this phenomenon emerged with Carol Dweck's groundbreaking work on implicit theories of intelligence, which introduced the now widely studied constructs of growth and fixed mindsets (Dweck & Leggett, 1988; Dweck, 2006). A growth mindset reflects the belief that intelligence and ability can be developed through effort, strategy, and feedback (Dweck, 2006). In contrast, a fixed mindset assumes that these qualities are innate and largely unchangeable (Dweck, 2006). Over the past two decades, mindset theory has expanded beyond academic psychology into education, organizational development, and digital learning yet the core question remains: How do we design environments that teach students to believe in their own ability to grow?

Parallel to mindset, another psychological force has shaped how learners navigate achievement contexts: competitiveness. Historically rooted in trait-based research (Helmreich & Spence, 1978), competitiveness refers to the disposition to seek interpersonal comparison and outperform others. While once viewed narrowly as a personality trait, modern perspectives recognize its contextual and motivational dimensions (Houston et al., 2002; Murayama & Elliot, 2012). In learning environments, competitiveness can both energize performance and suppress collaboration making it a double-edged construct that interacts powerfully with students' beliefs about ability, effort, and success (Chen & Hu, 2024; Diver, 2022).

In recent years, game-based learning has emerged as a promising tool for reshaping these belief systems (Alotaibi, 2024). Unlike traditional instruction, games invite players into systems where failure is feedback, effort is rewarded, and progress is visible (Hartt et al., 2020; Edwards et al., 2023). Specifically, quest-based learning environments offer structured challenge, narrative immersion, and autonomy elements that echo the psychological conditions known to promote mindset change and motivation (Gee, 2007; Ryan & Deci, 2017). But while the theoretical alignment is compelling, empirical studies examining whether such environments can shift core psychological beliefs especially in short-term interventions remain limited.

This study responds to that gap. By investigating the effects of a quest-based intervention on students' growth mindset, fixed mindset, and competitiveness, this research explores whether carefully designed game experiences can act as more than just engagement tools, whether they can rewire the way students interpret effort, ability, and performance itself. In doing so, it offers insight into how belief systems evolve not through lecture, but through lived experience one quest at a time.

Research Objectives

1. To compare the pre-test growth mindset, fixed mindset, and competitiveness scores between the experimental and control groups prior to the intervention.
2. To examine whether there is a statistically significant change in growth mindset, fixed mindset, and competitiveness scores from pre-test to post-test within each group (experimental and control).
3. To evaluate whether the experimental group demonstrated

greater improvement in growth mindset, fixed mindset, and competitiveness compared to the control group over the 14-week intervention period.

Method

Research Design

This study employed a quasi-experimental, pretest-posttest control group design to examine the effects of a quest-based intervention on students' growth mindset, fixed mindset, and competitiveness over a 12-week period. Participants were assigned to either an experimental group, which received the intervention, or a control group, which did not. On Day 1 (Week 1), participants were briefed and completed the baseline questionnaire before the intervention commenced. Participants in the experimental group engaged with a quest-based game, while those in the control group played Tetris, both on a daily basis throughout the 12-week study period. To monitor psychological changes over time, all participants completed the same set of questionnaires at four time points: Week 1, Week 4, Week 8, and Week 12. At each data collection interval, participants were encouraged to seek clarification if they encountered any difficulties in understanding the items.

Demographic Data

The participants were recruited among students of Universiti Kebangsaan Malaysia (UKM). A total of 64 participants among UKM students consist of 32 experimental groups and 32 control groups. Table 1 presents the demographic characteristics of the sample.

Table 1

Demographic characteristics of the sample

Demographic variables		Frequency	Percentage (%)
Gender	Male	12	18.8
	Female	52	81.3
Faculties	Citra	5	7.8
	Education	43	67.2
	Science & Technology	3	4.7
	Social Sciences & Humanities	13	20.3
Year of Study	1	14	21.9
	2	45	70.3
	Final year	5	7.8
Race	Chinese	5	7.8
	Indian	2	3.1
	Malay	53	82.8
	Others	4	6.3
Residence	City	28	43.7
	Rural	36	56.3

Research Instruments

During the 12-week experiment, participants were required to complete a questionnaire at four time points: Week 1, Week 4, Week 8, and Week 12. The questionnaire included two instruments: the Implicit Theory of Intelligence Scale by Carol Dweck, consisting of 6 items rated on a 6-point Likert scale to assess mindset. The internal consistency, measured by Cronbach's alpha coefficient, was 0.843. The instrument was used in the previous research by Meanwhile, the Competitiveness Index, consisting of 14 items rated on a 5-point Likert scale to measure individual competitiveness. The internal consistency, measured by Cronbach's alpha coefficient, was 0.841.

Data Analysis

All statistical analyses were conducted using Jamovi version 2.6.45. Independent samples t-tests compared group differences at each time point, while paired samples t-tests assessed within-group changes. Statistical significance was set at $p < .05$, and effect sizes were reported. To examine the intervention's effects, repeated measures ANOVAs were conducted for growth mindset, fixed mindset, and competitiveness, with Time (Pre vs Post) as the within-subjects factor and Group

(Experimental vs Control) as the between-subjects factor.

Results

To compare the pre-test growth mindset, fixed mindset, and competitiveness scores between the experimental and control groups prior to the intervention

Independent samples t-tests were conducted to compare control and experimental groups at both pre- and post-intervention for competitiveness, fixed mindset, and growth mindset. The results showed that the experimental group scored significantly higher in competitiveness at both time points. For fixed mindset, no significant group differences were found at either pre- or post-test. In contrast, while growth mindset scores were similar at baseline, a highly significant difference emerged post-intervention, favouring the experimental group. Detailed results are presented in Table 2.

Table 2

Independent samples t-tests

Time	Variable	Statistic	df	p
Pre (Week 1)	Competitiveness	-2.2432[a]	62	0.028
	Growth Mindset	-0.086	62	0.932
	Fixed Mindset	-0.9105	62	0.366
Post (Week 12)	Competitiveness	-2.329	62	0.023
	Growth Mindset	-4.4436	62	<.001
	Fixed Mindset	-1.5754	62	0.12

[a]Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

To examine whether there is a statistically significant change in growth mindset, fixed mindset, and competitiveness scores from pre-test to post-test within each group (experimental and control)

Paired samples t-tests were conducted separately for the control and experimental groups to examine within-group changes in competitiveness, fixed mindset, and growth mindset from pre-test to post-test.

Within the experimental group, there were no significant changes in competitiveness ($t(31) = –0.33$, $p = .746$) or fixed mindset ($t(31) = –1.41$, $p = .169$) from pre- to post-test. However, there was a highly significant increase in growth mindset, $t(31) = –5.12$, $p < .001$, indicating a strong effect of the intervention on enhancing growth mindset.

For the control group, no significant pre-post changes were found in competitiveness ($t(31) = 0.21$, $p = .838$), fixed mindset ($t(31) = –0.45$, $p = .656$), or growth mindset ($t(31) = –1.96$, $p = .059$). Although the growth mindset result approached significance, it did not reach the conventional threshold ($p < .05$).

To evaluate whether the experimental group demonstrated greater improvement in growth mindset, fixed mindset, and competitiveness compared to the control group over the 14-week intervention period

Growth Mindset

A repeated measures ANOVA was conducted to assess the effects of time (pre-

test vs. post-test) and group (control vs. experimental) on participants' growth mindset scores. Mauchly's test of sphericity was not violated (since only two levels were present), and Greenhouse-Geisser correction was applied as a safeguard.

The analysis revealed a significant main effect of time, $F(1, 62) = 26.76$, $p < .001$, with a large effect size ($\eta^2_p = .302$), indicating that participants demonstrated a statistically significant improvement in growth mindset scores from pre- to post-intervention across groups.

A significant main effect of group was also observed, $F(1, 62) = 6.69$, $p = .012$, $\eta^2_p = .097$, suggesting that the experimental group reported higher overall growth mindset scores compared to the control group.

Critically, there was a significant time × group interaction, $F(1, 62) = 6.97$, $p = .010$, with a moderate effect size ($\eta^2_p = .101$), indicating that the increase in growth mindset scores over time was significantly greater in the experimental group compared to the control group. This interaction effect highlights the effectiveness of the intervention in enhancing participants' growth mindset.

Fixed Mindset

A repeated measures ANOVA was conducted to examine the effects of time (pre-test vs. post-test) and group (control vs. experimental) on fixed mindset scores.

The analysis revealed no significant main effect of time, $F(1, 62) = 1.403$, $p = .241$, indicating that participants' fixed mindset scores did not significantly change from pre- to post-test across both groups. There was also no significant time × group interaction, $F(1, 62) = 0.211$, $p = .648$, suggesting that the change in fixed mindset scores over time did not differ between the control and experimental groups.

The main effect of the group approached significance, $F(1, 62) = 3.04$, $p = .086$, but did not reach the conventional threshold of $p < .05$. This suggests that the two groups did not differ significantly in their overall fixed mindset levels across both time points.

Competitiveness

A repeated measures ANOVA was conducted to examine the effects of time (pre-test vs. post-test) and group (control vs. experimental) on competitiveness scores.

The analysis showed no significant main effect of time, $F(1, 62) = 0.016$, $p = .898$, suggesting that competitiveness levels remained stable from pre- to post-intervention across both groups. There was also no significant time × group interaction, $F(1, 62) = 0.148$, $p = .702$, indicating that the change in competitiveness scores over time did not differ significantly between the control and experimental groups.

However, a significant main effect of the group was observed, $F(1, 62) = 9.98$, $p = .002$, indicating that participants in the experimental group reported significantly higher competitiveness scores compared to the control group across time points.

Discussion

This study examined the impact of a targeted psychological intervention on growth mindset, fixed mindset, and competitiveness among participants using a pre-post design with control and experimental groups. The findings provide clear support for the intervention's effectiveness in enhancing growth mindset, while suggesting more limited or stable effects on fixed mindset and competitiveness.

Unlike traditional educational tasks, which often emphasize correctness and discourage

failure, quests are designed to immerse students in challenge and uncertainty, encouraging active problem-solving and resilience (Masten et al., 2022; Betts et al., 2020; Goodenough et al., 2017). By design, these environments normalize struggle as a necessary condition for growth, offering scaffolded, real-time feedback that feels more like coaching than correction (Loebel, 2023; Snelson, 2021; Gee, 2007). Every failed attempt is not a measure of inadequacy, but a calibrated push into the next learning zone, a cognitive stretch that builds stamina for ambiguity and intellectual risk. This repeated exposure to incremental challenge cultivates not only skill, but also a deep psychological shift: the realization that competence is elastic and forged through effort, not granted by default (Dweck, 2006; Mangels et al., 2006). In this way, quest games do more than simulate learning where they train students to crave difficulty, rewire the meaning of failure, and internalize the logic of continuous self-upgrade.

The intervention may have successfully opened a door to growth, but it did not directly confront what fixed mindset guards: the need to feel capable without the threat of being wrong. Despite efforts to cultivate adaptive beliefs, the fixed mindset remained unmoved: silent, steady, and resistant to change (Tan et al., 2025; Stanley et al., 2023; Hopkins et al., 2023). This lack of movement may seem like a null result, but in reality, it reveals something deeper: fixed beliefs are not just cognitive positions, they are defensive structures (Goldberg et al., 2020; Kaplan et al., 2016; Boudry & Braeckman, 2011). While a growth mindset invites possibility, a fixed mindset protects certainty. It operates less like a personality trait and more like a psychological shield, one built from years of praise for being "smart," fear of failure, or the cultural weight of perfectionism (Hong et al., 1999; Mueller & Dweck, 1998).

Although competitiveness remained stable over time, the experimental group consistently scored higher than the control group at both time points, suggesting that these differences may stem from pre-existing motivational traits rather than the intervention itself. Given that competitiveness is often viewed as a stable personality orientation (Houston et al., 2002; Murayama & Elliot, 2012), short-term interventions may not be sufficient to shift it, especially if not explicitly designed to do so. One compelling explanation is that the quest-based game lacked overt competitive elements (Flores & Pinto, 2023). Unlike formats with leaderboards or peer comparison, this game prioritized personal mastery and self-paced progress (Pighetti et al., 2023; Ansems et al., 2019). As such, the gameplay environment may have encouraged engagement without invoking competitive impulses, particularly if students were not directly aware of how others were performing.

Conclusion

This study offers a compelling glimpse into how psychologically-informed, quest-based learning environments can shape student beliefs, not through instruction alone, but through experience, immersion, and narrative. The clear gains in growth mindset underscore the value of learning structures that reward effort, normalize struggle, and frame progress as a personal journey rather than a race. When challenge is reframed as opportunity, learners begin to associate difficulty with growth rather than inadequacy, a shift that lies at the core of mindset transformation.

While the growth mindset responded meaningfully to the intervention, the fixed mindset remained largely unchanged suggesting that deeper or more targeted strategies may be needed to shift beliefs that are more entrenched. Likewise, the consistent pattern of competitiveness across time points indicates that some traits may

be less malleable in the short term and more reflective of enduring motivational styles.

These findings reveal that mindset is not a uniform construct, it unfolds differently depending on what is being challenged, what is being affirmed, and how the learner engages with the environment. Designing effective interventions, therefore, is not about building universal solutions, but about tuning learning experiences to meet diverse psychological entry points. As education continues to evolve through game-inspired design, such approaches hold promise not only for enhancing engagement, but for fostering the kind of self-belief that makes learning sustainable.

Implications and Future Directions

This study provides valuable insight into how psychologically grounded, quest-based interventions can influence students' beliefs about learning. The observed improvement in growth mindset reinforces the potential of experiential, game-informed learning to shape motivation, not through persuasion, but through participation. When learners are immersed in environments that reward persistence, scaffold challenge, and normalize failure, they begin to internalize the belief that ability is developed, not predetermined. For educators and instructional designers, this suggests a critical shift: mindset change is not solely a matter of what is taught, but how learning is experienced.

Practically, these findings support the use of quest-based systems in academic or training contexts seeking to enhance resilience, engagement, and learner agency. However, they also reveal the limits of one-size-fits-all design. Traits like fixed mindset and competitiveness, which remained stable over time, may require more targeted, reflective, or emotionally resonant interventions to shift. Future efforts should consider incorporating elements such as narrative reflection, peer dialogue, or emotionally challenging decision points, all of which could deepen self-awareness and gently disrupt more rigid belief systems.

Moreover, future research should explore how individual differences shape the effectiveness of such interventions. For instance, learners with high trait competitiveness may respond differently to game environments that foreground cooperation versus rivalry. Similarly, those with strong fixed beliefs may benefit from interventions that include not only growth-affirming tasks but also opportunities to safely confront and deconstruct their existing assumptions.

Finally, these results call for a broader rethinking of how we design for mindset development. Rather than isolating belief change as a separate goal, it can be woven directly into the learning architecture, embedded in challenge design, feedback style, and the emotional tone of the experience. As educational practice continues to evolve, the next generation of interventions should aim not only to inform, but to transform the psychological frameworks through which students interpret their own potential.

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