Students' Behavioral, Cognitive and Affective Outcomes in Gamified Flipped Classrooms: A Meta-analysis

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What we do?

Gamified flipped classroom has attracted a great deal of interest from educational researchers over the past decade, and is now widely used in the disciplines of science, education, and technology. This study extracted 73 effect sizes from 29 high-quality, peer-reviewed articles to clarify the effect of gamified flipped classrooms on students' behavioral, cognitive, and affective outcomes.

The main research gaps in this filed

- Study designs vary widely, leading to inconsistent findings.
- Most meta-analyses examine flipped classrooms or gamification separately, rarely their combination.
- Existing research lacks a systematic comparison of the three dimensions of behavioral, cognitive, and affective outcomes of students.

What is Gamified Flipped Classroom (GFC)?

Flipped classroom & Gamification

Gamified flipped classroom combines two emerging pedagogies to address challenges of flipped and gamified learning when used separately (Zainuddin et al., 2024).

Conceptual Framework

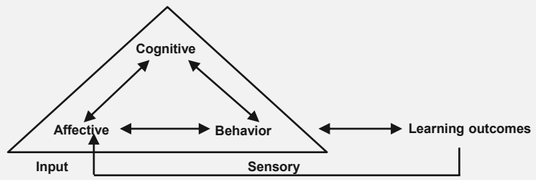
Three learning domains of Bloom's Taxonomy

Cognitive: Knowledge, information, and intellectual skills acquired by learners.

Affective: Learners' attitudes, feelings, and motivation toward the course(e.g., satisfaction, perceived experience, perceived gains).

Psychomotor (Behavior) : Learners' actual engagement in learning activities (e.g., watching videos, participating in discussions, completing assignments).

Eiss's Model for Learning



The main findings

The following moderators have a significant impact on students' learning outcomes.

Year of publication

Before 2020: Low number, High effect size

After 2020: High number, low effect size

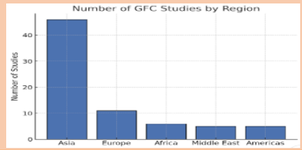
Most studies used blended learning environment

Offline gamification is most effective

Subject: Subject compatibility with gamified flipped classroom varies (especially gamification implementation).

- **Business education** → Gamification improved engagement and performance significantly (Fisher et al., 2014).
- **Computer science (animation design)** → Gamification encouraged creativity and active participation (Villagrasa et al., 2014).
- **Media studies (theory classes)** → Gamification increased motivation and attentiveness (Leaning, 2015).

Region



Treatment Duration:

Short-term were more effective than long-term

Possible reasons include.

(1) Motivation declines over time

(2) Longer courses often involve harder content

(3) Shorter durations sustain higher engagement

Conclusion

Gamified flipped classrooms are superior to conventional flipped and traditional classrooms.

The effects were greater on **behavioral** & **affective** outcomes and weaker on cognitive outcomes.

Require **deep processing**, **transfer**, and integration of knowledge

Influenced by **assessment type** and **task complexity**

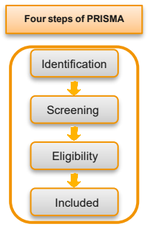
Research questions

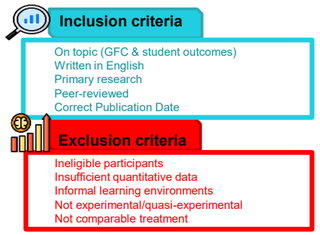
1. What is the effect of the Gamified Flipped Classroom (GFC) on students' behavioral, cognitive and affective outcomes?
2. What moderator variables influence the effect of Gamified Flipped Classroom (GFC) on students' behavioral, cognitive and affective outcomes? (e.g. region, educational level, subject, research design, etc.)

Literature Search & Screening

The analysis in this study was conducted based on the PRISMA 2020 guidelines.

Databases: Scopus, Web of Science, Wiley, ProQuest, ERIC
Timeframe: Jan 2015 – May 2024
Keywords: gamification, flipped classroom, GFC, etc.





Extracted information

1. *Author*
2. *Title of the article*
3. *Type of publication*
4. *Year of publication*
5. *Region*
6. *Educational level*
7. *Subject*
8. *Research design*
9. *Number of participants*
10. *Treatment duration*
11. *Control & experimental group*
12. *Domain of learning outcomes*
13. *Learning environment*
14. *Statistical data*

Analyzing process

Tool: Comprehensive Meta-Analysis (CMA) 3.0

Model type: Random effects model

Effect size indicator: Cohen's *d*

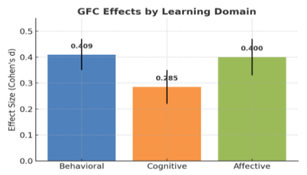
Heterogeneity test: I Square

Publication bias: Funnel plot, Begg and Mazumdar rank correlation, Egger's regression

Analysis of moderating variables

Result

Number of studies: 29 (73 effect sizes)
Overall effect size (all outcomes):
d = 0.37, 95% CI [0.28, 0.46], $p < .001$
Heterogeneity:
Q = 505.513, $p < .001$
I^2 = 85% (high heterogeneity)
Egger regression: intercept = 0.186, standard error = 0.633, t = 0.294, P = 0.769
Begg and Mazumdar rank correlation: Tau = 0.153, z = 1.910, P = 0.056
No significant publication bias



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