Validating the SPIRIT Learning Model: Integrating Flipped Learning and Gamification for 3D Animation Education

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Abstract. The rapid expansion of the digital creative industry requires vocational higher education to develop not only students' technical skills but also their creativity, autonomy, and adaptability. However, current instructional practices in 3D animation education remain predominantly teacher-centered and product-oriented, limiting opportunities for reflective thinking and self-directed learning. Moreover, existing studies tend to implement flipped learning and gamification as separate approaches, lacking an integrated instructional framework specifically designed for creative vocational contexts. This study aims to develop and validate the SPIRIT Learning Model, an instructional framework that systematically integrates flipped learning and gamification to enhance student engagement and industry-relevant competencies in 3D animation education. The research employed a modified Research and Development (R&D) approach based on Borg and Gall, focusing on four stages: needs analysis, planning, prototype development, and expert validation. Three experts in instructional design, educational technology, and academic writing evaluated the model using content, construct, and syntax validity criteria. The validation results showed mean scores ranging from 4.14 to 4.58, indicating that the model is classified as *Valid* to *Highly Valid*. These findings demonstrate that the SPIRIT model is theoretically grounded, structurally coherent, and pedagogically feasible. The integration of flipped learning and gamification within the SPIRIT framework supports learner autonomy, collaborative problem-solving, and reflective practice aligned with real-world animation workflows. Practically, this model provides a structured instructional framework that can be adopted in vocational education to improve learning quality and better prepare students for the evolving demands of the digital creative industry.

Keywords: SPIRIT learning model, flipped learning, gamification, 3D animation, vocational education, expert validation

1 Introduction

The rapid expansion of the global digital creative industry has reshaped expectations for animation and multimedia education, particularly within vocational higher education institutions in Indonesia. These institutions, typically encompassing Diploma (D3/D4) programs, are required not only to produce technically proficient graduates but also to foster creativity, autonomy, and adaptability in response to dynamic technological changes. Despite

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these demands, instructional practices in many Indonesian animation programs remain predominantly teacher-centered and product-oriented, emphasizing final outputs rather than the learning process itself [1],[2]. This pedagogical misalignment often leads to limited learner autonomy, weak reflective thinking, and difficulties in mastering complex animation workflows [3].

Recent studies demonstrate that flipped learning and gamification have significantly enhanced learning motivation, engagement, and performance in vocational and higher education settings [4],[5]. Empirical evidence suggests that gamified flipped classrooms not only improve students' learning preparation and academic achievement but also reinforce self-regulation and long-term knowledge retention [6],[7]. These benefits suggest that structured, technology-supported learning models can create more effective conditions for student autonomy and active learning [8,9]. Meta-analyses have consistently confirmed that the flipped classroom model yields higher student performance across disciplines [10], while gamification interventions strengthen motivation and behavioral persistence when meaningfully integrated into learning activities [11],[12].

However, most existing implementations treat flipped learning and gamification as isolated pedagogical strategies. The absence of a coherent integration framework disrupts the learning continuum and limits opportunities for sustained reflection and iterative learning [13–15]. This gap indicates a critical need for an instructional model that holistically integrates self-directed learning, collaboration, formative feedback, and authentic practice, particularly in creative and production-based disciplines such as animation.

To address these challenges, this study proposes the SPIRIT Learning Model, which consists of six sequential and interrelated phases that form a coherent instructional cycle. Each phase represents a specific pedagogical function aligned with the principles of flipped learning and gamification, ensuring a balance between self-directed learning, collaborative engagement, and authentic practice. For clarity and structural representation, the components of the SPIRIT model are presented in Table 1.

Table 1. Phases of SPIRIT Learning Model

Symbol	Acronym	Phase Name	Description	Learning Focus
S	Self-study	Self-study Preparation	Students independently explore foundational concepts through videos and digital learning resources.	Autonomy
P	Pre-class	Pre-class Quiz	Short diagnostic quizzes are conducted to assess readiness and activate prior knowledge.	Readiness
I	Interactive	Interactive Group Work	Students collaborate in groups to solve animation-related design problems	Collaboration
R	Real-world	Real-world Application	Learners apply knowledge to authentic 3D animation projects simulating industry practice.	Authentic learning
I	In-class	In-class Supervision	Instructor provides guidance, feedback, and mentoring during project development.	Guidance
T	Test	Test & Feedback	Learning outcomes are evaluated through gamified assessments and reflective feedback.	Reflection

Each phase progressively strengthens learner autonomy, collaboration, and reflective thinking within a realistic animation production context. The model is theoretically grounded in Self-Determination Theory (SDT) [16[,[17] and Flow Theory [18]. SDT emphasizes that learning motivation is sustained when students experience autonomy, competence, and relatedness, conditions that are systematically embedded across SPIRIT's phases. Meanwhile, Flow Theory explains that optimal engagement occurs when challenges are balanced with learner skill levels, creating immersive learning experiences critical for creative tasks such as animation.

Within the SPIRIT Learning Model framework, gamification mechanisms (e.g., levels, badges, and rewards) are deliberately designed to trigger the flow state, helping learners achieve deep concentration and intrinsic satisfaction as they complete progressively complex animation tasks. This combination of gamification and flipped learning thus creates a motivational ecosystem that aligns with both cognitive and affective dimensions of learning.

To ensure both theoretical soundness and practical feasibility, the model underwent expert validation before being implemented in the classroom. Previous research has shown that expert triangulation enhances the reliability of instructional model evaluation [9],[19],[20] and refines content accuracy, pedagogical structure, and linguistic clarity [21],[22]. Building on this foundation, the present study validates the SPIRIT Learning Model through expert review, focusing on three key aspects: content, construct, and syntax. The results of this validation will determine the model's readiness for implementation in vocational 3D animation education and its potential contribution to innovation in instructional design.

2 Methods

2.1 Research design

The research adopted the Research and Development (R&D) framework developed by Borg and Gall [23], which originally comprises ten systematic stages, ranging from research and information collection to dissemination and implementation. However, this study focused on the first four stages: (1) research and information collecting, (2) planning, (3) developing a preliminary product, and (4) expert validation, as an early validation phase of the instructional model. The subsequent stages, including field testing and dissemination, will be conducted in future research phases. This modification is consistent with the design-based research paradigm, emphasizing iterative development and expert-based refinement before empirical classroom implementation [21,23].

2.2 Expert participant

Three expert validators participated in the study, representing diverse specializations critical to the development of the SPIRIT model:

(1) Instructional design and curriculum development;
(2) Educational media and technology; and
(3) Learning materials and academic language.

Each expert held a doctoral degree and had at least 10 years of experience in their respective fields. Their expertise ensured a triangulated evaluation covering conceptual coherence, media suitability, and linguistic accuracy.

2.3 Research instrument

Validation instruments were adapted from established instructional design evaluation frameworks and contextualized for vocational 3D animation education. Four instructional products were evaluated:

(1) Model Book – conceptual and theoretical framework of SPIRIT
(2) Teaching Book – instructional content aligned with model phases
(3) Lecturer's Guidebook – classroom procedures and management guidelines
(4) Student Handbook – learner-centered activity steps

Each product was assessed using a five-point Likert scale (1 = very poor, 5 = excellent), with indicators categorized into content, construct, and syntax validity.

Definition of validation criteria:

(1) Content validity refers to the degree to which learning materials align with the intended learning objectives and theoretical principles.
(2) Construct validity assesses the internal coherence between learning activities and pedagogical structure.
(3) Syntax validity evaluates the logical sequence and flow of model implementation.

2.4 Data analysis

Quantitative data from validation sheets were analyzed descriptively to calculate mean scores for each aspect [21]. The percentage of expert validation (Va) was calculated using Equation (1), which determines the feasibility level of each instructional product based on the ratio between the total empirical score (TSe) and the maximum theoretical score ($TSmax$). This approach follows the validation analysis procedures proposed by Sugiyono [21] and Akker [22].

$$Va = \frac{TSe}{TSmax} \, x \, 100 \tag{1}$$

Quantitative data obtained from expert validation were analyzed descriptively by calculating mean scores for each assessment aspect. The interpretation of these mean scores followed the feasibility criteria adapted from Sugiyono (2020), as shown in Table 2.

Table 2. Criteria for interpreting expert validation mean scores

Mean range	Category	Interpretation
4.21-5.00	Highly Valid	Can be used without revision
3.41-4.20	Valid	Minor revision required
2.61-3.40	Fair	Needs major revision
1.81-2.60	Less Valid	Not yet feasible
1.00-1.80	Invalid	Rejected

2.5 Validation indicators

The SPIRIT Learning Model was considered valid for implementation if:

(1) All validation aspects achieved mean scores ≥ 4.21,
(2) Experts agreed on the theoretical grounding and structural coherence of the model, and
(3) Qualitative feedback indicated no major revisions were needed.

This multi-criteria evaluation ensured that the SPIRIT model met both conceptual and practical standards before classroom application.

3 Results and discussion

3.1 Results: Expert validation and Quantitative Findings

The expert validation confirmed that the SPIRIT Learning Model is pedagogically sound and feasible for use in 3D animation education. The six learning phases of the model, illustrated in Figure 1, were evaluated by specialists in instructional design, media development, and academic writing to ensure a comprehensive assessment across multiple dimensions of educational quality. The review covered three aspects: content, construct, and syntax to verify the coherence, relevance, and clarity of each instructional product developed under the SPIRIT framework.

Fig. 1. SPIRIT Learning Model Design

Figure 1 illustrates the cyclical and iterative structure of the SPIRIT Learning Model, where each phase is interconnected to support continuous learning, reflection, and skill development in a real-world animation workflow. Experts noted that the model demonstrates clear theoretical grounding, a coherent instructional flow, and language that is accessible to vocational learners. They highlighted that the SPIRIT framework reflects authentic workflows in animation production, supports learner autonomy, and facilitates structured collaboration and reflection.

Suggestions for improvement were minimal and primarily focused on refining wording and enhancing clarity in a small number of instructional steps, without affecting the model's overall integrity.

The results of expert validation demonstrated that the SPIRIT Learning Model is pedagogically sound and feasible for application in 3D animation education. Across all evaluated instructional components: Model Book, Teaching Book, Lecturer's Guidebook, and Student Handbook, the validation results yielded mean scores ranging between 4.14 and 4.58, corresponding to the *Valid* and *Highly Valid* categories (see Table 3). These findings confirm that the model's structure, content, and syntax are well-aligned with the principles of flipped learning and gamification, meeting the standards of quality in vocational higher education.

The Model Book obtained the highest construct validity score (M = 4.58), indicating strong theoretical coherence and internal logic. This result can be attributed to the deliberate integration of Self-Determination Theory (SDT) [16] within the SPIRIT framework. By systematically embedding the principles of autonomy (through self-study preparation) and competence (through progressively challenging 3D animation tasks), the Model Book establishes a pedagogical sequence that fulfills learners' basic psychological needs. Furthermore, expert reviewers noted that the SPIRIT construct supports the emergence of a 'flow state' by maintaining an optimal balance between challenge and skill during the Interactive Group Work and Real-world Application phases. This theoretical alignment ensures that the model functions not merely as a collection of activities but as an integrated instructional system designed to foster intrinsic motivation and deep engagement in authentic animation workflows.

Table 3. Summary of expert validation results for SPIRIT learning model

Product	Aspect	Average Expert Score			Mean (M)	Category
		Learning Design Experts	Media Experts	Material Experts		
Model book	Content	-	-	4.35	4.35	Highly Valid
	Construct	4.58	-	-	4.58	Highly Valid
	Syntax	4.48	-	-	4.48	Highly Valid
Teaching book	Content	-	4.23	4.31	4.27	Highly Valid
	Construct	-	4.24	-	4.24	Highly Valid
Lecturer's guidebook	Content	-	-	4.14	4.14	Valid
	Construct	4.48	4.15	-	4.31	Highly Valid
Student handbook	Content	-	-	4.34	4.34	Highly Valid
	Construct	4.52	-	-	4.52	Highly Valid

Finally, more recent innovations combining gamification with emerging media (e.g., augmented reality) in vocational settings report comparable expert-validation profiles, high feasibility for structured, industry-aligned designs, with suggestions usually focused on usability and clarity rather than conceptual overhaul [9],[24–26]. This pattern parallels our experts' comments, which mostly requested wording or procedural clarifications without challenging the model's theoretical core. Figure 2 visually summarizes the percentage distribution of expert validation results across all instructional components.

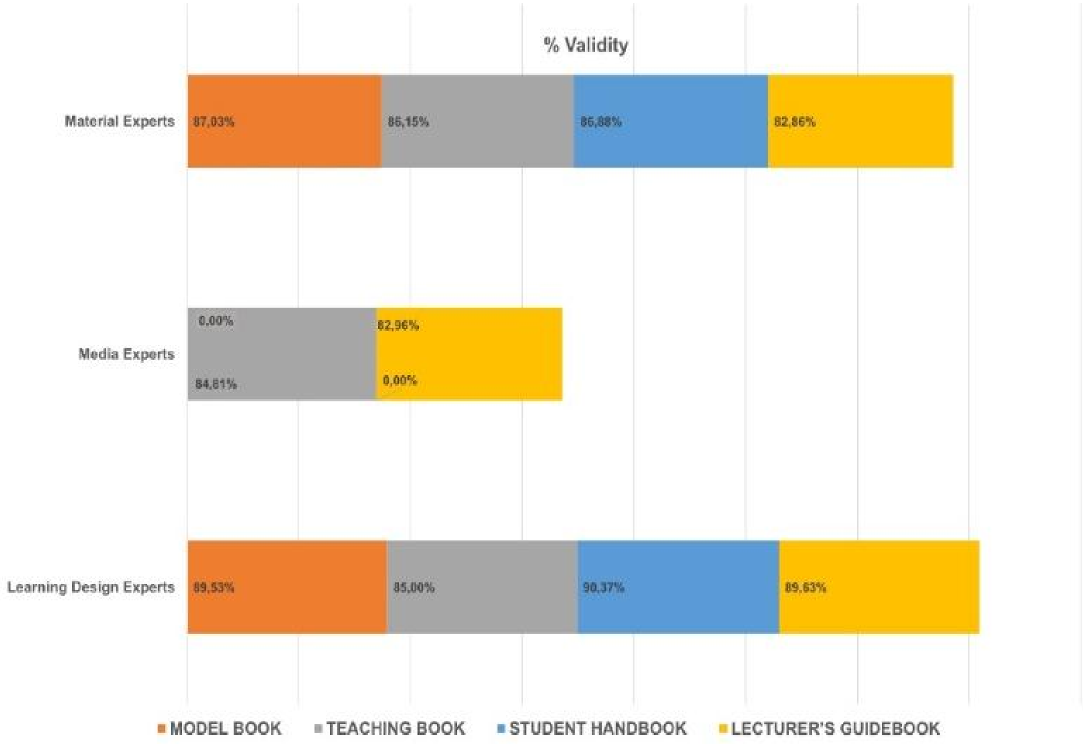

Fig. 2. Percentages of expert validation

Figure 2 shows that all instructional components achieved high validation percentages, indicating strong agreement among experts regarding the feasibility and quality of the SPIRIT Learning Model.

To complement the mean score analysis, a percentage-based validation was also conducted to provide a more detailed representation of expert agreement across all instructional components. As shown in Table 4, all instructional components achieved high validity percentages, ranging from 82.86% to 91.56%. The Model Book demonstrated the highest level of validity, particularly in the construct aspect, indicating strong theoretical coherence. Meanwhile, the Teaching Book and Lecturer's Guidebook showed slightly lower percentages in certain aspects, suggesting the need for minor revisions. Overall, the consistently high percentage scores reinforce the robustness and feasibility of the SPIRIT Learning Model for implementation in vocational education.

Table 4. Validation percent of expert judgment

Product	Aspect	Validity level				Category
		Learning design experts	Media experts	Material experts	Average	
Model book	Content	-	-	87.03%	87.03%	*Highly Valid* and can be used without revision
	Construct	91.56%	-	-	91.56%	*Highly Valid* and can be used without revision
	Syntax	87.50%	-	-	87.50%	*Highly Valid* and can be used without revision
Teaching book	Content	-	84.62%	86.15%	85.38%	*Highly Valid* and can be used without revision
	Construct	85.00%	85.00%	-	85.00%	*Valid* and still needs minor revision.
Lecturer's guidebook	Content	-	-	82.86%	82.86%	*Valid* and still needs minor revision.
	Construct	89.63%	82.96%	-	86.30%	*Highly Valid* and can be used without revision
Student handbook	Content	-	-	86.88%	86.88%	*Highly Valid* and can be used without revision
	Construct	90.37%	-	-	90.37%	*Highly Valid* and can be used without revision

These quantitative patterns are consistent with findings from prior validations of gamified and flipped instructional models in vocational and higher education [27,28]. Hidayat et al. [19] reported similarly strong feasibility outcomes in a gamification-based e-learning system, in which expert reviewers provided overwhelmingly positive ratings for usability and instructional coherence. Likewise, Rochmawati et al.'s [1] blended learning media for 2D/3D animation also received predominantly *Highly Valid* classifications, particularly in areas related to alignment with industry workflows, supporting the consistency of SPIRIT's validation profile with existing literature.

3.2. Discussion: Interpretation and Theoretical Implications

The findings of this study indicate that the SPIRIT Learning Model achieved high levels of validity across content, construct, and syntax dimensions, confirming its pedagogical feasibility for vocational 3D animation education. The consistently high validation scores suggest that the model is not only structurally coherent but also aligned with the instructional needs of creative, technology-driven learning environments. These results demonstrate that the integration of flipped learning and gamification within a structured framework can produce a comprehensive instructional model suitable for vocational contexts.

From a comparative perspective, these findings are consistent with previous studies demonstrating that the integration of flipped learning and gamification enhances student engagement, motivation, and academic performance. Prior research has shown that gamified flipped classrooms significantly improve students' learning preparation and academic achievement [4],[6]. In addition, meta-analytic evidence confirms that flipped learning contributes to higher student performance across disciplines [10], while gamification has been shown to strengthen motivation and behavioral persistence when effectively integrated into instructional design [11], [12]. However, unlike these studies, which tend to apply flipped learning and gamification as separate or loosely connected strategies, the SPIRIT Learning Model offers a structured and sequential integration within a unified pedagogical framework. This integrated approach ensures continuity across learning phases, enabling a more holistic learning experience.

Theoretically, the strong validation results indicate that the SPIRIT Learning Model successfully operationalizes key principles of Self-Determination Theory (SDT), particularly autonomy, competence, and relatedness [16],[17]. Each phase of the model is deliberately designed to support these psychological needs. The Self-study phase promotes learner autonomy through independent exploration, while the Interactive Group Work and Real-world Application phases foster competence through authentic and progressively challenging tasks. At the same time, collaborative learning activities enhance relatedness by encouraging peer interaction and shared problem-solving. This alignment is crucial, as fulfilling these psychological needs has been widely associated with increased intrinsic motivation and sustained learning engagement. Furthermore, the incorporation of gamification elements within the SPIRIT framework supports the emergence of flow experiences, where learners achieve deep concentration and optimal engagement by balancing task difficulty with skill level [18].

In addition, the SPIRIT Learning Model reflects authentic industry practices in 3D animation workflows, which strengthens its relevance for vocational education. This finding is consistent with previous research emphasizing the importance of process-oriented, experiential, and project-based learning approaches in vocational and digital education settings [13], [14]. Unlike conventional instructional approaches that emphasize final products, the SPIRIT model focuses on iterative learning cycles, continuous feedback, and reflective practice. This process-oriented approach better prepares students for real-world professional environments, where problem-solving, collaboration, and adaptability are essential competencies.

In addition to the quantitative validation results, qualitative feedback from expert validators further reinforces the robustness of the SPIRIT Learning Model. The feedback primarily focused on improving clarity, consistency, and usability rather than suggesting fundamental structural changes, indicating that the model is conceptually sound. For example, recommendations regarding consistent terminology usage highlight the importance of linguistic precision in instructional materials, which is essential for reducing cognitive load and improving learner comprehension. Suggestions to integrate QR codes for video-based resources reflect the growing need for seamless access to digital learning materials in vocational education environments. Furthermore, feedback on refining the operational definitions of each SPIRIT phase emphasizes the importance of instructional clarity to ensure effective classroom implementation. These qualitative insights suggest that the required revisions are minor and refinement-oriented, further confirming the model's readiness for practical application.

Despite these strengths, this study is limited to the expert validation stage and has not yet been tested through empirical classroom implementation. Therefore, future research should focus on experimental or quasi-experimental studies to evaluate the effectiveness of the SPIRIT Learning Model in improving student learning outcomes, engagement, and industry readiness across different vocational contexts. Such studies would provide stronger empirical evidence of the model's impact and scalability. Overall, this study contributes to the field of instructional design by proposing a novel and integrated learning model that bridges the gap between flipped learning and gamification within a coherent pedagogical structure. The SPIRIT Learning Model not only advances theoretical understanding but also offers a practical framework for enhancing the quality of vocational education in the digital creative industry.

4 Conclusion

The expert validation results provide strong empirical evidence for the SPIRIT Learning Model's feasibility and pedagogical soundness. All instructional components achieved mean scores between 4.14 and 4.58, placing them within the '*Highly Valid*' category across content, construct, and syntax dimensions. Minor revisions recommended by experts resulted in several functional optimisations, including terminology consistency, clearer operational definitions, and enhanced multimedia accessibility through QR integration. These improvements strengthened the model's usability and classroom applicability. The validated SPIRIT model effectively cultivates learner autonomy, collaboration, and reflective competence, which align directly with the skill demands of the digital creative industry. Future research should examine the model's scalability to other vocational or digital disciplines to assess its adaptability and long-term educational impact.

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