A Pedagogical Authoring Platform for AI-Enhanced Educational Role-Playing Games in Requirements Engineering

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Abstract

Requirements Engineering (RE) education requires students to develop technical competencies and interpersonal skills through realistic learning experiences. Although numerous educational games have demonstrated the potential of game-based learning for RE education, existing approaches are typically implemented as standalone applications designed for predefined educational scenarios. This paper proposes an AI-enhanced authoring platform that enables instructors to create customized educational Role-Playing Games (RPGs) for RE without requiring expertise in game development. The platform adopts a pedagogical authoring model in which instructors configure knowledge topics, Bloom-based learning objectives, narrative structures, non-player characters, and assessment strategies. During gameplay, Large Language Models integrated with Retrieval-Augmented Generation support adaptive dialogue generation and AI-assisted formative assessment. A conceptual demonstration illustrates the authoring of an educational RPG covering RE activities, including stakeholder interviews, requirements specification, software modeling, and formative assessment. The proposed approach provides a reusable authoring environment that combines educational design, generative artificial intelligence, and game technologies to facilitate the development of adaptive educational RPGs for RE education.

Keywords

Requirements Engineering Education, Educational RPGs, Authoring Platform, Game-Based Learning, Generative Artificial Intelligence

1 Introduction

Requirements Engineering (RE) plays a fundamental role in software development by identifying, analyzing, specifying, validating, and managing stakeholders' needs throughout the software lifecycle [24]. Since deficiencies in RE activities frequently lead to software project failures [26], improving RE education remains an important challenge for Software Engineering programs [3]. Beyond mastering theoretical concepts, students must develop practical competencies such as stakeholder communication, negotiation, requirements elicitation, analysis, documentation, and decision making. These competencies are difficult to acquire through traditional lecture-based instruction alone.

Game-Based Learning (GBL) [21] has emerged as an effective strategy for supporting active learning [4] in Software Engineering education. Educational games create immersive environments where students experience realistic professional situations while applying theoretical knowledge to practical problems. Among the different game genres adopted for educational purposes, Role-Playing Games (RPGs) [15] are particularly well suited to RE because they naturally support interactions with stakeholders, collaborative problem solving, and narrative-driven decision making.

Several educational games have been proposed to support RE education [8, 9, 25]. Existing approaches employ simulations, role-playing activities, quizzes, artifact construction, and virtual environments to teach different RE concepts and practices. However, current research primarily focuses on the development of standalone educational games designed for predefined instructional scenarios. Consequently, educational content, gameplay mechanics, narrative, assessment strategies, and software implementation are tightly coupled into a single application. As a result, instructors wishing to adapt educational content, define new learning objectives, modify assessment strategies, or create new RPGs generally need to modify the software itself or develop another game.

Recent advances in Generative Artificial Intelligence (GenAI), particularly Large Language Models (LLMs) [10], create new opportunities for educational RPGs. Combined with Retrieval-Augmented Generation (RAG) [17], these technologies enable natural language interactions with non-player characters (NPCs), contextualized dialogue grounded in educational content, and AI-assisted formative assessment grounded in instructor-defined knowledge. However, despite these technological advances, the literature still lacks reusable authoring platforms that enable instructors to design AI-enhanced educational RPGs without requiring expertise in software or game development.

To address this research opportunity, this paper proposes an AI-enhanced authoring platform that enables instructors to create educational RPGs for RE without requiring expertise in software or game development. Rather than proposing another educational game, the contribution of this work is a reusable infrastructure that separates pedagogical authoring from game implementation. Through the authoring environment, instructors define knowledge topics, learning objectives based on Bloom's Revised Taxonomy, narrative structures, NPCs, and assessment strategies [5], while the

runtime environment automatically integrates these elements into executable RPGs supported by LLMs and RAG.

The main contributions of this work are: (1) a reusable authoring platform that enables instructors to create customized educational RPGs through pedagogical configuration instead of software implementation; (2) a pedagogical authoring model that explicitly integrates knowledge topics, learning objectives, narrative structures, NPC behaviors, and assessment mechanisms; (3) an AI-enhanced runtime architecture that combines LLMs and RAG to support adaptive dialogue and AI-assisted formative assessment aligned with instructor-defined learning objectives; and (4) a conceptual demonstration illustrating the authoring of an educational RPG covering multiple RE activities using the proposed platform.

The remainder of this paper is organized as follows. Section 2 presents the adopted research methodology. Section 3 reviews existing educational games for RE and identifies the research opportunity addressed by this work. Section 4 describes the proposed authoring platform. Section 5 demonstrates the platform through an educational RPG for RE. Section 6 discusses the contributions and limitations of the proposed approach, and Section 7 concludes the paper.

2 Research Method

This research adopted the Design Science Research (DSR) methodology [7, 14], which provides a systematic process for designing, developing, and demonstrating technological artifacts intended to solve practical problems while contributing new knowledge to the research community. DSR is particularly appropriate for this work because its primary outcome is a software artifact rather than an empirical model or explanatory theory. The research was conducted through five iterative activities, illustrated in Figure 1.

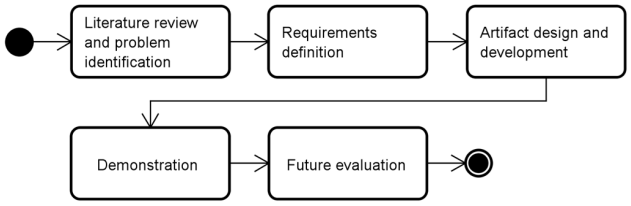

Figure 1: DSR process adopted in this work.

Literature Review and Problem Identification. The research began with two complementary rapid literature reviews conducted to identify the research opportunity. The reviews were performed in *IEEE Xplore* and *Scopus*, using combinations of search terms such as "educational RPG", "authoring platform", "serious game", and "Requirements Engineering". The first review focused on identifying authoring platforms for educational RPGs and characterizing their authoring capabilities and pedagogical support. Because only a limited number of reusable platforms were identified, a second review analyzed educational games for RE to investigate which pedagogical and technological capabilities had already been explored and whether reusable authoring environments or standalone applications supported them. These findings revealed that existing studies successfully employ educational games to support RE learning but predominantly deliver standalone applications designed for predefined instructional scenarios. This research opportunity motivated the development of a reusable authoring platform capable of supporting the authoring of multiple educational RPGs.

Requirements Definition. Based on the identified research opportunity, the functional and pedagogical requirements of the platform were specified. Educational requirements were derived from the Requirements Engineering Body of Knowledge (SWEBOK Guide V4.0) [26] and Bloom's Revised Taxonomy [2], ensuring explicit alignment between learning objectives, gameplay mechanics, and assessment strategies. Technical requirements focused on supporting reusable authoring, AI-assisted dialogue, adaptive assessment, and configurable educational content.

Artifact Design and Development. The proposed platform was then designed and implemented. The architecture separates the Authoring Environment, where instructors configure educational RPGs, from the Runtime Environment, responsible for executing authored games. LLMs integrated with RAG were incorporated to support contextualized dialogue generation and AI-assisted formative assessment throughout gameplay.

Demonstration. To demonstrate the feasibility of the proposed artifact, an educational RPG entitled *Reinos e Software* (Kingdoms and Software) was created using the authoring platform. The demonstration illustrates the complete authoring process.

Future Evaluation. Although this paper focuses on demonstrating the proposed platform, future work will include empirical evaluations with instructors and students to investigate usability, authoring effort, and learning effectiveness.

3 Related Work

This section presents the results of the two rapid literature reviews described in Section 2. The first review analyzed educational RPG authoring platforms, while the second examined educational games for RE. Together, these reviews characterize the current state of the art and identify the research opportunity addressed by this work.

3.1 Educational RPG Authoring Platforms

Only three educational RPG authoring platforms were identified: (1) *The Adaptive Learning RPG Engine* [28], (2) *The Multiplayer Online Role-Playing Game-based Learning System* [19], and (3) *ARQS* [1].

The *Adaptive Learning RPG Engine* [28] extends the *Neverwinter Nights* game engine by incorporating Knowledge Space Theory to dynamically adapt gameplay according to the learner's knowledge. However, its contribution focuses on adaptive navigation rather than providing a complete pedagogical authoring environment.

The *Multiplayer Online Role-Playing Game-based Learning System* (MORPG) [19] provides visual editors that enable instructors to create educational RPGs through configurable maps, NPCs, missions, and educational content. Nevertheless, learning activities remain centered on question-based interactions, without explicit support for learning objectives, AI-assisted dialogue, or adaptive formative assessment.

Similarly, *ARQS* [1] facilitates the authoring of educational RPGs through reusable game components, but does not integrate pedagogical authoring based on learning objectives, intelligent tutoring, AI-assisted interactions, or domain-specific educational support.

Table 1: Pedagogical characteristics of educational games for RE Education

Work	Learning Objectives	RE Activities	Assessment	Bloom Level
ReqEngin	Understand concepts and terminology of ISO/IEC/IEEE 29148. Enhance technical skills.	Elicitation, Analysis, Specification	Yes	Remember, **Understand**, **Apply**, Analyze, Create
AD-RPG	Practice requirements elicitation techniques	Elicitation	No	Remember, Understand, **Apply**, Analyze
EAReq-GAME	Develop elicitation and analysis skills	Elicitation, Analysis	Limited	**Apply**, **Analyze**
LevReq3D	Practice stakeholder interviews in virtual environments	Elicitation (Interview)	No	Apply
EvacSIM	Practice elicitation through simulated scenarios	Elicitation	Limited	Remember, **Understand**, **Apply**, Analyze
Element	Train requirements elicitation techniques	Elicitation Techniques	Limited	Analyze
Modelando	Develop requirements modeling skills	Requirements Modeling	Limited	Remember, Apply, Analyze, **Create**
ERQuiz	Reinforce conceptual knowledge of RE	Concept Reinforcement	Yes	**Remember**, **Understand**
Proposed Approach	Develop conceptual and practical RE competencies	Elicitation, Analysis, Specification	Yes	Remember, Understand, Apply, Analyze, Evaluate, Create

Table 2: Technological and game design characteristics of educational games for Requirements Engineering. "Partial" indicates that the feature is available only for specific aspects of the game and not as a generalized authoring capability.

Work	Game Mechanics	Narrative-driven Gameplay	NPCs	AI Dialogue	Formative Assessment	Pedagogical Authoring	Reusable Platform
ReqEngin	Structured missions, predefined tasks	Partial	Yes	No	Yes	No	No
AD-RPG	Narrative missions, exploration, quests	Yes	Yes	No	No	No	No
EAReq-GAME	Role-playing scenarios, requirement classification	Yes	Yes	No	Partial	No	No
LevReq3D	3D virtual environment, stakeholder dialogue	Partial	Yes	No	No	No	No
EvacSIM	Virtual simulation, stakeholder interaction	Partial	Yes	No	Partial	No	No
ELEMENT	Scenario selection, decision making	No	No	No	Partial	Partial	No
Modelando	Artifact construction, competition, validation	No	No	No	Partial	No	No
ERQuiz	Quiz rounds, score ranking, multiplayer	No	No	No	Yes	Partial	No
Proposed Approach	RPG quests, AI-driven NPC dialogue, dynamic missions	Yes	Yes	Yes	Yes	Yes	Yes

Although these platforms demonstrate the feasibility of reusable RPG authoring environments, none explicitly integrates pedagogical planning, AI-supported interactions, and formative assessment within a unified authoring process.

3.2 Educational Games for Requirements Engineering

Because only a limited number of reusable educational RPG authoring platforms were identified, the second literature review focused on RE educational games to investigate which pedagogical and technological capabilities have already been explored and whether they rely on reusable authoring platforms or standalone implementations. Table 1 summarizes the pedagogical characteristics of the analyzed educational games, while Table 2 compares their technological and game design characteristics.

ReqEngin [12] represents one of the most comprehensive RE educational games. Based on ISO/IEC/IEEE 29148 [16], it supports stakeholder identification, interviews, requirements specification, use case construction, scenario development, requirements analysis, and traceability within a three-dimensional virtual environment. The game incorporates NPC interactions, scoring, rewards, and teacher-mediated formative feedback, demonstrating that educational games can effectively support multiple RE activities.

Other studies investigate more specialized educational experiences. AD-RPG [18] and EAReq-GAME [20] employ role-playing mechanics to simulate stakeholder interactions and support requirements elicitation through narrative-driven gameplay. ELEMENT [27] emphasizes elicitation techniques through interactive scenarios, whereas Modelando [23] focuses on constructing UML artifacts from elicited requirements. These approaches strengthen specific competencies while concentrating on particular phases of the RE process.

Simulation-based games further increase the realism of learning environments. LevReq3D [6] recreates three-dimensional environments where students conduct stakeholder interviews, while Back to the Promotion – EvacSIM [11] employs virtual reality to simulate requirements elicitation in organizational scenarios. Both

approaches promote communication skills by reproducing realistic software engineering situations.

Assessment-oriented games pursue a different objective. ERQuiz [22] adopts a configurable multiplayer quiz environment that reinforces conceptual RE knowledge through competitive assessment activities. Although its primary contribution is conceptual assessment rather than complete RE simulation, it demonstrates the value of configurable educational infrastructures for supporting Software Engineering education.

3.3 Comparative Analysis and Research Opportunity

Tables 1 and 2 reveal two complementary findings. First, educational games for RE have reached considerable pedagogical maturity, addressing multiple RE activities through role-playing, simulations, virtual environments, quizzes, and artifact construction. Collectively, these studies demonstrate that game-based learning effectively supports both conceptual understanding and practical competencies required in Requirements Engineering.

Second, despite their pedagogical diversity, almost all identified solutions are implemented as standalone applications designed for predefined instructional scenarios. In these approaches, educational content, narrative, gameplay mechanics, assessment strategies, and software implementation remain tightly coupled. Consequently, adapting a game to different RE topics, learning objectives, instructional strategies, or educational contexts generally requires modifying the software itself or developing another educational game.

Only limited configurability is observed in some studies. For example, ERQuiz allows instructors to configure question sets, while ELEMENT supports the creation of instructional scenarios. However, these customization mechanisms remain constrained by the original application architecture and do not provide a generalized environment for authoring entirely new educational RPGs.

The analysis of reusable authoring platforms reveals a complementary limitation. Although these platforms simplify RPG development through reusable software infrastructures, they do not explicitly integrate pedagogical authoring based on learning objectives, configurable assessment strategies, AI-assisted dialogue, and domain-specific educational knowledge within a unified environment.

Therefore, the research opportunity addressed in this work is not the development of another educational RPG for Requirements Engineering. Instead, it is the proposal of a reusable authoring platform that separates pedagogical design from software implementation. By enabling instructors to configure knowledge topics, learning objectives, narrative structures, NPC behaviors, assessment strategies, and AI-assisted interactions within a unified environment, the proposed platform transforms educational RPG creation from a software development activity into a pedagogically driven authoring process.

4 The Authoring Platform

The proposed solution is a reusable authoring platform that enables instructors to design, configure, and deploy AI-enhanced RPGs for RE education. Rather than implementing individual educational games, instructors configure pedagogical elements—including knowledge topics, learning objectives, narrative structures, assessment strategies, and NPC behaviors—which are automatically transformed into executable RPG campaigns by a common runtime infrastructure. This separation between pedagogical authoring and game implementation enables the authoring of multiple RPGs adapted to different learning objectives, instructional strategies, and educational contexts without requiring programming or game development expertise.

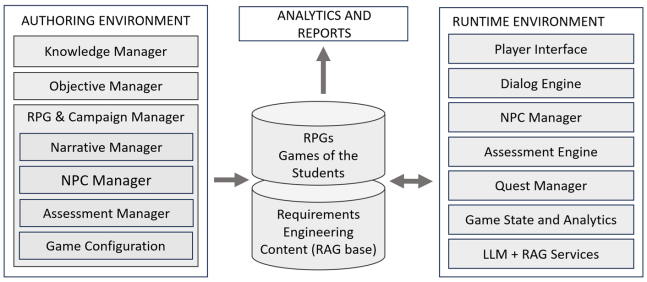

Figure 2: Overall architecture of the proposed platform illustrating the separation between pedagogical authoring and AI-enhanced runtime execution.

Although 3D games can provide immersive experiences [13], their development typically requires specialized technical skills and significant effort. Therefore, the proposed platform adopts a frame-based RPG structure in which gameplay is organized into scenes composed of narrative descriptions, visual elements, and character interactions. This design reduces development complexity while allowing instructors to create educational RPGs without the technical cost associated with 3D game development.

Figure 2 presents the overall architecture of the proposed platform. The architecture is organized into two complementary environments that separate pedagogical authoring from game execution. The *Authoring Environment* enables instructors to configure educational content, narrative structures, NPCs, assessment strategies, and gameplay elements. The *Runtime Environment* automatically instantiates these configurations to execute educational RPG campaigns, manage player interactions, control game progression, and perform AI-assisted formative assessment. This separation promotes software reuse while allowing multiple RPGs and campaigns to share the same execution infrastructure.

4.1 The Authoring Process

Figure 3 illustrates the authoring process adopted by the proposed platform. Rather than designing gameplay directly, instructors progressively configure pedagogical and narrative elements that are automatically integrated into an executable educational RPG campaign.

The process begins with the definition of the knowledge base, where instructors organize RE concepts into topics and subtopics containing explanations, examples, and supporting material. This repository constitutes the educational knowledge used by the RAG module. During gameplay, the runtime retrieves the appropriate knowledge according to the current mission, learning objective, and

dialogue context, allowing the LLM to generate responses grounded in instructor-defined educational content.

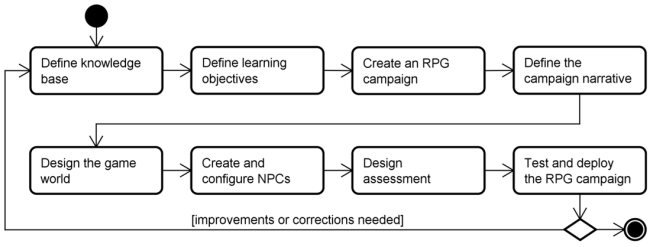

Figure 3: Pedagogical workflow for creating an RPG campaign for RE learning.

After defining the educational content, instructors specify learning objectives based on Bloom's Revised Taxonomy [2]. These objectives define the competencies expected during gameplay and constitute the pedagogical foundation of the RPG. Beyond supporting assessment, learning objectives guide the organization of adventures, missions, challenges, and the expected evidence of learning throughout the game.

The next steps involve creating the RPG campaign and organizing its narrative. Educational content is distributed across adventures, which represent complete learning modules connected by a common storyline. Each adventure is composed of one or more missions representing learning situations in which students perform RE activities. Missions are further decomposed into challenges corresponding to concrete tasks such as interviewing stakeholders, identifying functional and non-functional requirements, writing use cases, or creating UML diagrams. Every mission and challenge is explicitly associated with one or more learning objectives.

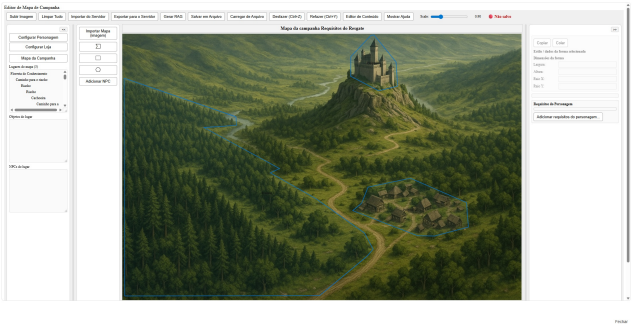

Figure 4: Campaign Map Editor.

Once the narrative has been defined, instructors use the campaign map editor (Figure 4) to create maps, locations, and interactive objects. Subsequently, NPCs are configured to support gameplay. The platform currently supports four types of NPCs: *Information NPCs*, responsible for presenting contextual information; *Tutor NPCs*, which explain RE concepts and assist students during learning activities; *Stakeholder NPCs*, representing clients and domain experts whose needs must be elicited, analyzed, and documented; and *Evaluator NPCs*, responsible for assessing student performance and providing formative feedback. Each NPC contributes different contextual information to the dialogue engine, ensuring that AI-generated interactions remain consistent with the pedagogical role defined during authoring.

Finally, instructors specify the assessment strategy by defining evaluation criteria, expected evidence of learning, progression rules, and feedback policies. These specifications are interpreted during gameplay by the assessment engine, which evaluates player responses and produced artifacts according to the learning objectives established during authoring. The authoring process is iterative, allowing instructors to continuously refine educational content, narrative elements, and assessment strategies.

4.2 Runtime Architecture

After an RPG has been authored, the *Runtime Environment* automatically instantiates the configured pedagogical and narrative elements by integrating the Game Engine, Dialogue Engine, Quest Manager, Assessment Engine, and RAG infrastructure into a unified execution environment.

Players interact with NPCs using natural language throughout gameplay. For each interaction, the dialogue engine constructs a prompt by combining NPC characteristics, narrative context, player interaction history, current mission, associated learning objectives, and educational knowledge retrieved through RAG. The resulting prompt is submitted to the LLM, enabling NPCs to generate adaptive responses that remain both context-aware and pedagogically grounded.

Game progression is coordinated by the *Quest Manager*, which controls the execution of adventures, missions, and challenges according to the progression rules established during authoring. Student actions continuously update the game state, ensuring that subsequent interactions and narrative events remain synchronized with the learner's educational progression.

The *Assessment Engine* continuously evaluates player responses and produced artifacts according to the learning objectives associated with each challenge. Rather than relying exclusively on scores or mission completion, the engine analyzes the expected evidence of learning defined by the instructor and generates formative feedback before determining progression to subsequent activities.

The integration of the Dialogue Engine, Quest Manager, Assessment Engine, and RAG infrastructure enables the platform to combine AI-assisted dialogue, adaptive learning, reusable game services, and continuous formative assessment within a single execution environment.

Figure 5 illustrates the interaction and assessment cycle during gameplay. Players interact with NPCs to obtain information, ask questions, and solve RE challenges. Throughout the game they acquire knowledge by consulting books and produce artifacts such as requirements lists, use cases, use case diagrams, and class diagrams. These interactions and artifacts are analyzed by the assessment engine using the LLM together with the educational knowledge retrieved through RAG. Based on the demonstrated achievement of the associated learning objectives, the platform provides formative feedback and determines progression to subsequent missions.

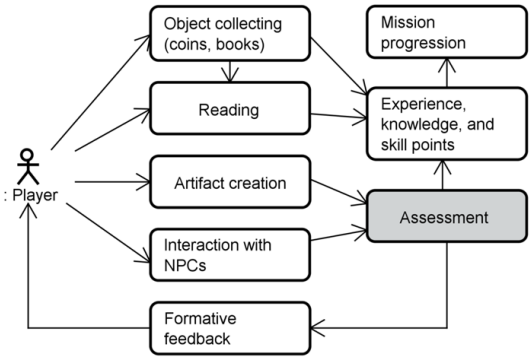

Figure 5: Interaction and assessment cycle integrating AI-assisted dialogue, artifact production, and formative assessment.

5 Platform Demonstration

To demonstrate the feasibility of the proposed authoring platform, an educational RPG entitled *Reinos e Software* (Kingdoms and Software) and a campaign named *Os Requisitos do Resgate* (Requirements for the Rescue) were configured using the authoring environment. Rather than evaluating learning outcomes, this demonstration illustrates how pedagogical configurations are transformed into an executable educational RPG campaign.

The authoring process began with the configuration of the educational knowledge base. RE concepts based on the SWEBOK Guide Version 4.0 [26] were organized into topics and subtopics covering requirements elicitation, analysis, specification, validation, and management. This repository provides the domain knowledge retrieved by the RAG module during gameplay.

Next, learning objectives were defined according to Bloom's Revised Taxonomy [2]. These objectives cover the cognitive processes of Remember, Understand, Apply, Analyze, Evaluate, and Create.

The RPG campaign was organized into three adventures representing successive stages of learning. *O Aprendiz* (The Apprentice) introduces fundamental RE concepts through *Tutor NPCs* and exploratory activities. *Tornando-se um Mestre* (Becoming a Master) emphasizes practical RE activities, including requirements elicitation, analysis, specification, and artifact construction through interactions with *Stakeholder NPCs*. Throughout these activities, *Evaluator NPCs* provide AI-assisted formative feedback. Finally, *O Resgate dos Programadores* (The Rescue of the Programmers) requires students to solve RE problems with progressively reduced instructional support, allowing the assessment engine to verify whether the expected learning objectives have been achieved. Each adventure was organized into educational missions and tasks associated with one or more learning objectives.

Figure 6 presents the initial gameplay scene, while Figure 7 illustrates one of the AI-assisted interaction interfaces generated by the platform. The interface combines narrative descriptions, visual elements, campaign maps, RE artifact editors, and natural-language interactions with NPCs. Unlike traditional educational games based on predefined dialogue trees, NPC responses are dynamically generated by the LLM using contextual information composed of NPC characteristics, narrative context, learning objectives, and educational knowledge retrieved through RAG.

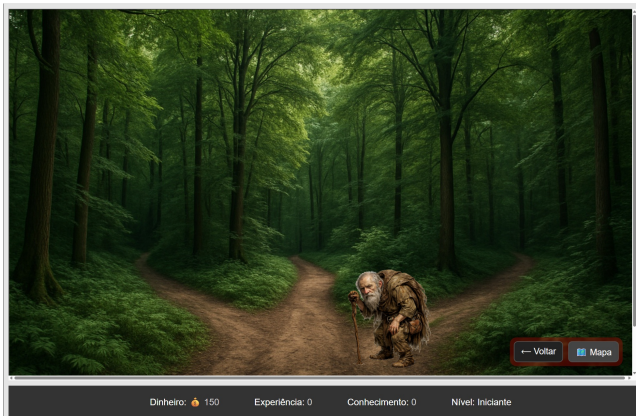

Figure 6: Initial gameplay scene.

During gameplay, every interaction and produced artifact is evaluated according to the learning objectives associated with the current challenge. Based on this analysis, *Evaluator NPCs* generate formative feedback, recommend additional learning activities when necessary, and update the player's progression. The Quest Manager uses these results to synchronize narrative progression with the learner's demonstrated competencies.

Figure 7: AI-assisted interaction illustrating contextualized dialogue and formative assessment.

This demonstration shows how the proposed platform transforms pedagogical configurations—including educational knowledge, learning objectives, narrative structures, NPC behaviors, and assessment strategies—into an executable AI-enhanced educational RPG. Although only one campaign is presented, the same authoring workflow and runtime infrastructure can be reused to create educational RPGs for other RE topics or Software Engineering disciplines without modifying the underlying platform.

6 Discussion

The literature review showed that educational games effectively support RE education but predominantly provide standalone applications. Rather than proposing another educational RPG, this work introduces a reusable authoring platform that separates pedagogical design from game implementation. This architectural separation changes the unit of reuse. In previous work, the reusable artifact is typically the educational game itself. In the proposed approach, the reusable artifact becomes the authoring platform, while individual educational RPGs are created by configuring pedagogical elements rather than implementing software. Consequently, instructors can create different educational experiences while reusing the same runtime infrastructure.

A second contribution concerns the explicit integration between pedagogy and software architecture. Learning objectives are no longer treated as external instructional documentation; instead, they directly guide narrative organization, mission and challenge design, NPC behaviors, assessment criteria, and game progression. As a result, educational planning becomes an integral part of the authoring process, maintaining explicit traceability between intended learning outcomes and gameplay.

The proposed platform also extends the interaction model adopted by previous educational RPGs. While existing games generally rely on predefined dialogue trees and scripted interactions, the integration of LLMs and Retrieval-Augmented Generation (RAG) enables NPCs to generate contextualized responses grounded in instructor-defined educational knowledge. Combined with the configurable assessment engine, this approach supports AI-assisted formative feedback aligned with the learning objectives established during authoring.

Table 3: Comparison between existing educational games and the proposed authoring platform

Characteristic	Existing Educational Games	Proposed Authoring Platform
Primary software artifact	Standalone educational game	Educational RPG authoring platform
Educational content	Embedded in the game	Teacher-defined
Learning objectives	Game-specific	Teacher-defined (Bloom-based)
Narrative structure	Predefined	Configurable
NPC behaviors	Predefined	Configurable and AI-assisted
Dialogue generation	Scripted dialogues	LLM + RAG
Assessment strategy	Embedded in the game	Teacher-defined
Game progression	Fixed	Configurable
Creation of new educational RPGs	Requires software development	Supported through the authoring environment
Reuse across educational scenarios	Limited	High
Pedagogical model	Implicit	Explicit

Table 3 summarizes these conceptual differences. Unlike previous educational games, where educational content, assessment strategies, and progression rules are embedded in the application, the proposed platform externalizes these elements as configurable pedagogical artifacts. This design enhances reuse, facilitates the authoring of new educational RPGs, and enables instructors to adapt games to different educational contexts without modifying the underlying software.

Although the proposed platform increases flexibility and reuse, this work has some limitations. The current paper presents the design and demonstration of the platform rather than an empirical evaluation. Future studies involving instructors and undergraduate students will investigate usability, educational effectiveness, authoring effort, and the quality of AI-assisted formative assessment. Additional research should also explore collaborative multiplayer scenarios, learning analytics, and the application of the platform to other Software Engineering domains.

7 Conclusion

This paper presented a reusable authoring platform for AI-enhanced educational RPGs aimed at Requirements Engineering education. Rather than proposing another educational game, the proposed approach separates pedagogical authoring from game implementation, enabling instructors to create customized RPGs by configuring educational content, learning objectives, narrative structures, NPC behaviors, and assessment strategies within a common software infrastructure.

The platform integrates pedagogical planning with AI-supported runtime services by combining learning objectives, configurable assessment, LLM-based dialogue, and RAG to provide contextualized interactions, adaptive gameplay, and formative assessment aligned with the intended learning outcomes.

A conceptual demonstration illustrated the complete workflow from pedagogical configuration to RPG execution, demonstrating the feasibility of creating educational RPGs without modifying the underlying software. Although demonstrated for RE education, the proposed authoring model can be applied to other Software Engineering domains.

From a Software Engineering perspective, the primary contribution of this work is transforming educational RPG development from software implementation into a pedagogically driven authoring process. By externalizing educational content, learning objectives, assessment strategies, and narrative elements as configurable artifacts, the platform promotes software reuse while increasing the flexibility and adaptability of educational RPGs.

Future work includes empirical studies with instructors and students to evaluate usability, educational effectiveness, authoring effort, and AI-assisted formative assessment, as well as support for collaborative multiplayer RPGs, learning analytics, and additional Software Engineering domains.

Artifact Availability

No artifacts are provided.

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