

DESIGN OF AN APPSHEET-BASED CIVIC EDUGAME ARCHITECTURE TO SUPPORT STUDENTS' CIVIC DISPOSITIONS AND SUSTAINABLE DEVELOPMENT GOALS (SDGS)

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Abstract

The integration of digital technologies in education has accelerated the development of interactive learning applications; however, many civic education tools remain limited to content delivery and assessment, offering insufficient support for civic disposition development. This study presents the design of an AppSheet-based civic edugame, Civic Hero, aimed at supporting students' civic dispositions through structured, scenario-based digital learning. A design-based research approach was employed, consisting of needs analysis, instructional and system architecture design, application development using a no-code AppSheet platform, and formative evaluation. Civic disposition indicators were operationalized into missions, decision-making scenarios, automated feedback, and reflective learning tasks embedded within a modular workflow architecture. The results demonstrate that AppSheet's data-driven logic and conditional workflows can effectively support multi-stage experiential civic learning. The findings highlight that instructional and system architecture play a more critical role than technological sophistication in facilitating value-based learning. This study contributes a design-oriented framework for developing civic edugames using accessible no-code platforms, offering a scalable and teacher-driven solution for digital civic education in secondary school contexts. This study adds new information regarding sustainable development goals (SDGs).

Keywords: Civic disposition, Civic education, Education, Edugame, SDGs.

1. Introduction

The integration of digital technology in education has accelerated the development of educational games as interactive learning systems that promote student engagement and experiential learning [1-4]. Research shows that game-based learning can support cognitive, affective, and behavioural outcomes when instructional logic, feedback mechanisms, and learning progression are systematically embedded within the system design [5-8]. The emergence of no-code development platforms further enables educators to design functional learning applications without advanced programming skills, increasing the accessibility and scalability of educational technology innovation.

In civic education [9], developing students' civic dispositions (such as responsibility, respect for democratic values, and social participation) remains a key instructional goal. However, traditional civic instruction often relies on teacher-centred and text-based approaches, limiting students' opportunities for authentic decision making and reflection [10]. Studies indicate that students tend to show low civic engagement when learning environments lack interactive and contextual civic experiences [11]. Although digital civic learning tools and serious games have been introduced, many still emphasize content delivery and assessment rather than sustained civic disposition formation [12].

Existing studies on civic edugames largely focus on learning outcomes or immersive features, with limited attention to instructional and system architecture, particularly using accessible development platforms [13, 14]. Addressing this gap, this study proposes the design of an AppSheet-based civic edugame, Civic Hero, which integrates civic missions, scenario-based decision making, automated feedback, and reflective activities within a modular workflow architecture. This study demonstrates how a no-code platform can be systematically engineered as a scalable and teacher-driven civic learning system [15]. This study adds new information regarding sustainable development goals (SDGs).

2. Methodology

This study employed a design-based research (DBR) approach to develop an AppSheet-based civic edugame aimed at supporting students' civic dispositions. The DBR process consisted of four stages: needs analysis, instructional and system design, application development, and formative evaluation [16]. Civic disposition indicators were translated into civic missions, scenario-based decision-making tasks, automated feedback, and reflective activities embedded within a modular workflow architecture. The application was developed using the AppSheet no-code platform. Formative evaluation through expert review and limited user testing was conducted to refine system functionality and instructional alignment.

3. Results and Discussion

This study resulted in the development of an AppSheet-based civic edugame, Civic Hero, designed as a structured digital learning system to support students' civic dispositions. The edugame was implemented using a modular workflow architecture that integrates onboarding, civic missions, scenario-based decision making, automated feedback, reflective input, and learning evaluation. The overall

interaction flow and system logic are illustrated in Fig. 1, which shows how learning progression is governed by data-driven conditions and automated actions.

The results indicate that the AppSheet no-code platform can effectively support game-like learning structures through the configuration of data tables, conditional expressions, and workflow automation. Civic disposition indicators were operationalized into missions and decision-making scenarios, enabling students to engage with civic dilemmas and receive immediate feedback based on their choices. This approach allows adaptive learning paths, in which progression depends on decision outcomes rather than linear content delivery, supporting experiential learning cycles that combine action, feedback, and reflection.

From a system perspective, the edugame architecture consists of five core components: user interface, data management, logic and condition processing, feedback and reflection, and learning evaluation. The user interface manages navigation and mission presentation, while the data layer stores user responses, scores, and reflective inputs. Conditional logic controls feedback delivery and mission progression, reinforcing civic learning through immediate system responses. The implementation of this architecture in the AppSheet environment is presented in Fig. 2, which illustrates how the workflow-based design is translated into an accessible application interface. Figures 2(a)-(g) show the appearance of the Civic Hero Edugame AppSheet.

The discussion highlights that instructional and system architecture play a more decisive role than technological sophistication in facilitating value-based learning. Consistent with prior research on serious games and educational system design, learning effectiveness is strongly influenced by structured interaction flow and pedagogical alignment rather than graphical complexity [14, 17, 18]. Furthermore, the use of a no-code platform lowers technical barriers for educators, enabling teacher-driven innovation while maintaining system functionality and instructional coherence. Consequently, the proposed design offers a scalable and feasible model for implementing digital civic education in secondary school contexts. This study adds new information regarding game as reported elsewhere [19-22].

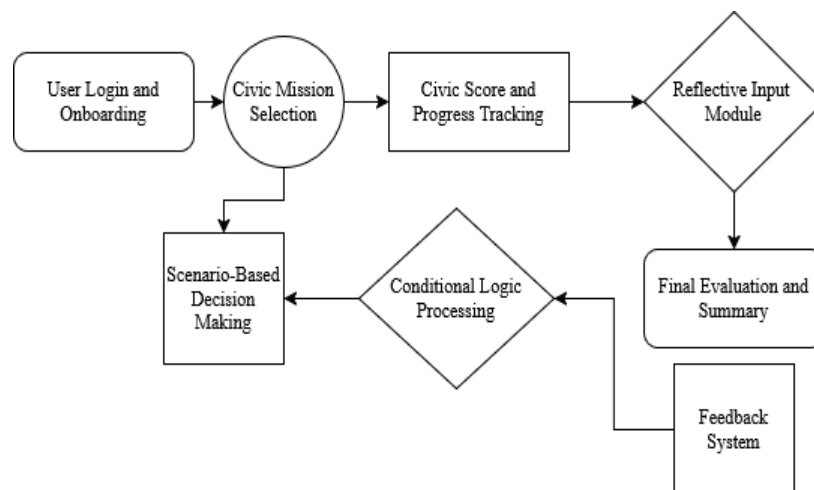


Fig. 1. AppSheet civic hero edugame flowchart diagram.



(a)



(b)



(c)



(d)



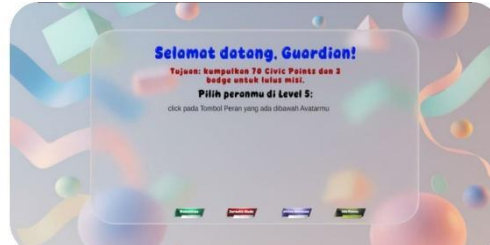
(d)



(e)



(f)



(g)

Fig. 2. User interface and gameplay scenes of the Civic Hero AppSheet-based edugame: (a) Main menu and game entry screen; (b) Character selection and representation; (c) Introductory narrative presenting civic learning context; (d) Level 1 interface focusing on the introduction of core civic values; (e) Level 2 and Level 3 mission screens addressing rights, obligations, and national values; (f) Advanced gameplay interface illustrating social interaction scenarios; (g) Feedback and reward screen displaying level completion and civic points.

In addition, the proposed AppSheet-based civic edugame demonstrates alignment with the United Nations SDGs, particularly SDG 4 (Quality Education) and SDG 16 (Peace, Justice, and Strong Institutions). This is in line with previous studies relating to SDGs [23-28], especially in education [29-34]. By embedding civic missions, scenario-based decision making, and reflective activities within a structured digital system, the edugame supports inclusive and equitable quality education through accessible learning technology. The focus on civic dispositions such as responsibility, respect for rules, and social participation contributes to the development of active citizenship and democratic awareness, which are core targets of SDG 16. From a system perspective, the use of a no-code platform enables scalable implementation and teacher-driven adaptation, supporting sustainable digital education practices without requiring high technical resources. This alignment indicates that well-designed educational technologies can function not only as instructional tools but also as practical instruments for advancing global education and governance-related development goals.

4. Conclusion

This study demonstrates that no-code platforms can be systematically utilized to design educational games that support civic disposition development when guided by coherent instructional and system architecture. The AppSheet-based civic edugame, Civic Hero, was designed using a modular workflow that integrates civic missions, scenario-based decision making, automated feedback, reflective activities, and learning evaluation within a single digital system. The findings indicate that effective value-based learning depends more on structured interaction flow and pedagogical alignment than on technological complexity. This research contributes a scalable and teacher-driven design framework, offering a feasible approach for implementing digital civic education in secondary school contexts. This study adds new information regarding SDGs.

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