MAPPING THE IMPACT OF MOBILE LEARNING AND SMART APPS CREATOR–BASED AUTHORING TOOLS IN VOCATIONAL FASHION DESIGN EDUCATION:
A SYSTEMATIC LITERATURE REVIEW

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Abstract. *This study examines research trends, implementation approaches, and learning impacts of mobile learning and Smart Apps Creator–based authoring tools in vocational fashion design education through a Systematic Literature Review (SLR). Literature searches were conducted across national and international academic databases, resulting in 24 peer-reviewed studies published between 2015 and 2024 that met the inclusion criteria. The review was guided by research questions addressing (1) trends in mobile learning research within vocational education, (2) forms of mobile learning implementation using no-code authoring tools, including Smart Apps Creator, and (3) their reported impacts on student learning outcomes. The findings reveal a steady increase in mobile learning research in vocational education over the past decade, with most studies emphasizing interactive multimedia, mobile applications, and visual-based digital learning media. Smart Apps Creator and similar no-code authoring tools are commonly positioned as practical solutions for developing flexible and interactive learning media, particularly suited to the visual and procedural nature of fashion design education. Across the reviewed studies, mobile learning implementations are consistently associated with positive effects on student engagement, learning motivation, visual understanding, practical skill development, and self-regulated learning. Nevertheless, this review also indicates that empirical studies explicitly focusing on Smart Apps Creator within vocational fashion design contexts remain limited and are generally conducted on a small scale. Future large-scale empirical research is therefore needed to strengthen the evidence base regarding the effectiveness of Smart Apps Creator–based mobile learning and to support its informed implementation in vocational fashion design education.*
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Keywords: *Fashion Design Education; Mobile learning; Smart Apps Creator; Systematic Literature Review; Vocational Education.*

1. INTRODUCTION

Vocational education aims to prepare graduates with competencies that align with the demands of the labor market through a balanced integration of theoretical knowledge and practical skills. Rather than focusing solely on cognitive understanding, vocational learning emphasizes the ability to apply knowledge effectively in authentic professional contexts. Previous studies consistently highlight that competency-based approaches are central to vocational and professional education, as they support employability and reduce skills mismatches in rapidly changing labor markets (Mulder, 2017; McGrath et al., 2019; OECD, 2019).

Within this broader context, fashion design education presents particularly complex learning demands. Students are expected to develop not only conceptual knowledge but also visual thinking, aesthetic sensitivity, proportional reasoning, and procedural skills that enable them to translate creative ideas into design sketches and tangible fashion products. Research in fashion and design education suggests that these competencies are most effectively developed through learning environments that integrate visual exploration, creative experimentation, and sustained practice (De La Haye & Ding, 2016; Armstrong et al., 2016; Burns & Bryant, 2019).

Despite these pedagogical requirements, learning practices in vocational fashion design programs often remain dominated by teacher-centered and text-based approaches. Instruction that relies heavily on lectures and printed materials tends to provide limited opportunities for visualization, interaction, and procedural learning. As a result, students may experience difficulties in understanding design processes, which can negatively affect their engagement, creative development, and overall learning outcomes (Sullivan, 2010; Kahu, 2013; Bond et al., 2021).

Recent advances in digital technology have gradually reshaped vocational learning environments, offering new possibilities for more flexible, interactive, and learner-centered learning experiences. One approach that has gained increasing attention is mobile learning, which enables learners to access learning resources across contexts and supports visual interaction, learner autonomy, and practice-oriented learning (Sung et al., 2016; Crompton & Burke, 2018). Empirical studies indicate that mobile learning can enhance student engagement, motivation, and skill development, particularly in vocational and skills-based education settings (Kearney et al., 2015; Nikou & Economides, 2018).

However, the effectiveness of mobile learning is closely related to the availability of development platforms that allow educators to design interactive learning media without requiring advanced programming skills. In response to this need, no-code authoring tools have emerged as practical solutions for developing mobile learning applications that integrate multimedia content with pedagogical structure. These tools enable educators to focus on instructional design rather than technical complexity (Nikou & Economides, 2018; Hwang et al., 2021). Smart Apps Creator (SAC) is one such no-code platform that has been increasingly used to develop Android-based learning media suitable for visual and procedural instruction.

In fashion design education, mobile learning media developed through no-code authoring tools offer particular advantages. Visual demonstrations, step-by-step procedural content, and project-based learning activities can be presented in ways that support independent learning and contextual understanding. Such approaches are consistent with the characteristics of vocational education, which emphasize authentic learning experiences and the development of practical competencies (Mayer, 2014; Guo et al., 2020; Pavlova, 2019). Nevertheless, existing research largely examines mobile learning in general or reports small-scale media development studies, with limited systematic attention to the role of specific authoring tools such as Smart Apps Creator in vocational fashion design contexts.

Therefore, this study conducts a Systematic Literature Review (SLR) to map research trends, forms of implementation, and learning impacts of mobile learning and Smart Apps Creator–based authoring tools in vocational fashion design education. By synthesizing findings from relevant empirical studies, this review seeks to contribute to a clearer understanding of technology-enhanced learning in vocational fashion design and to provide evidence-based insights for educators and instructional media developers.

Based on the research objectives and the SLR approach, this study addresses the following research questions:

1. What research trends have emerged over the past decade regarding the use of mobile learning and Smart Apps Creator–based authoring tools in vocational education?
2. How are mobile learning and Smart Apps Creator–based authoring tools implemented in fashion design education and related vocational fields?
3. What learning impacts are reported from the use of mobile learning and Smart Apps Creator–based authoring tools, particularly in terms of student engagement, learning motivation, visual understanding, practical skill development, and self-regulated learning within vocational education contexts?
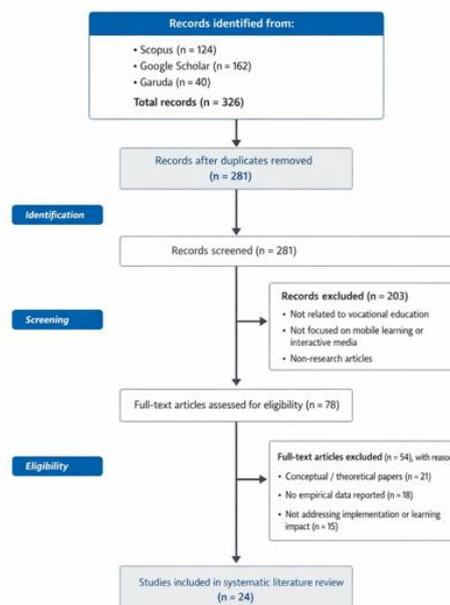
2. LITERATURE REVIEW

The article selection process was conducted in a systematic and sequential manner. During

the identification stage, literature searches were carried out using three major databases: **Scopus** (124 records), Google Scholar (162 records), and Garuda (40 records), resulting in a total of 326 records. Following the removal of duplicate entries, 281 unique articles remained for further screening.

In the screening stage, the remaining articles were reviewed based on their titles and abstracts. At this stage, 203 articles were excluded because they were not relevant to the vocational education context, did not focus on mobile learning or interactive digital media, or did not constitute empirical research. As a result, 78 articles were retained for full-text assessment.

The eligibility stage involved a comprehensive full-text review of the 78 selected articles to ensure their alignment with the inclusion criteria. A total of 54 articles were excluded at this stage, primarily because they were conceptual or theoretical in nature without empirical data, lacked clear research procedures or findings, or did not address the implementation or learning impacts of mobile learning.

Finally, in the inclusion stage, 24 articles met all eligibility criteria and were deemed suitable for in-depth analysis within this systematic literature review. These selected studies formed the basis for analyzing research trends, implementation approaches, and the learning impacts of mobile learning and digital media in vocational education.

Figure 1. PRISMA flow diagram of the study selection process

Following the PRISMA-based screening and selection process illustrated in Figure 1, a total of 24 studies were deemed eligible for inclusion in this Systematic Literature Review. These selected studies are summarized in Table X, which presents their key characteristics, research contexts, methodologies, media platforms, and main findings.

Table 1. Characteristics of studies included in the systematic literature review

No	Author(s) (Year)	Country	Educational Context	Research Method	Media/ Platform	Key Findings
1	Sung et al. (2016)	Taiwan	Vocational education	Meta-analysis	Mobile learning	Mobile learning improves student engagement and learning outcomes
2	Crompton &	USA	Vocational	Systematic	Mobile learning	Mobile

	Burke (2018)		education	review		learning is effective for practice-based learning
3	Kearney et al. (2015)	Australia	Vocational education	Mixed methods	Mobile-based learning	Supports self-directed and reflective learning
4	Nikou & Economides (2018)	Greece	Vocational education	Quasi-experimental	Mobile learning application	Enhances learning motivation and self-regulation
5	Bond et al. (2021)	Multi-country	Professional education	Systematic review	Digital learning media	Interactive media increase student engagement
6	Hwang & Fu (2019)	Taiwan	Skills-based education	Experimental	Mobile multimedia	Improves procedural understanding
7	Sonjaya & Munir (2025)	Indonesia	Design education	Experimental	Interactive multimedia	Enhances visual thinking and creativity
8	Guo et al. (2020)	China	Vocational education	Systematic review	Digital Project-Based Learning	Supports contextual and authentic learning
9	Obzhorin (2025)	Rusia	Design education	Quasi-experimental	Digital media	Improves visual and aesthetic skills
10	Pavlova (2019)	International	TVET	Empirical study	Learning technologies	Technology enhances relevance to workforce competencies
11	Mayer (2014)	USA	Multimedia-based education	Theoretical–empirical	Multimedia learning	Visualization enhances conceptual understanding
12	Kahu (2013)	UK	Vocational higher education	Review	Digital media	Interactive media increase student engagement
13	Hattie (2017)	International	Skills education	Meta-analysis	Instructional media	Active learning has a significant impact on achievement
14	Redecker (2017)	Europe	Digital education	Empirical report	Digital competence frameworks	Teachers' digital competence is crucial
15	Armstrong et al. (2016)	USA	Fashion design education	Empirical study	Visual learning media	Visual learning supports creative design processes
16	Burns & Bryant (2019)	USA	Fashion education	Empirical study	Visual-based learning	Visualization enhances design development
17	Sullivan (2010)	UK	Design education	Qualitative study	Studio-based learning	Visual practice enhances professional competence
18	McRobbie (2016)	UK	Creative education	Qualitative study	Creative media	Idea exploration is essential in design learning

19	Spöttl & Windelband (2021)	Germany	Vocational education	Review	Digital learning	Digital transformation reshapes TVET
20	Hillmayr et al. (2020)	Germany	Skills education	Meta-analysis	Digital technology	Digital technology positively impacts learning outcomes
21	Hamzah et al. (2025)	Belanda	Skills education	Empirical study	Interactive multimedia	Videos and simulations are effective learning tools
22	Alrasheedi et al. (2015)	Saudi Arabia	Vocational education	Experimental	Mobile learning	Mobile learning increases learning flexibility
23	Hwang et al. (2021)	Taiwan	Vocational education	Experimental	Authoring tools (no-code)	No-code authoring tools effectively support media development
24	Kuhlmann et al. (2024)	International	Design education	Empirical study	Visual media	Supports procedural understanding

3. RESEARCH METHODS

Inclusion and Exclusion Criteria

The inclusion criteria for this review comprised empirical research articles and research and development (R&D) studies that examined the use of digital learning media. Studies were included if they explicitly addressed mobile learning, interactive digital learning media, or Smart Apps Creator as a platform or no-code authoring tool for developing learning media. In addition, only studies conducted within vocational education, skills-based education, or closely related fields—such as vocational fashion design education—were considered eligible for inclusion.

The exclusion criteria included non-scholarly publications, such as opinion articles, popular reports, or conference proceedings that did not undergo a peer-review process. Duplicate publications or earlier versions of the same study were also excluded. Furthermore, studies that did not present empirical data, lacked clear research procedures, or failed to report analyzable findings relevant to the objectives of this review were excluded from the analysis.

Data Analysis Technique

The articles that met the inclusion criteria were analyzed using a descriptive qualitative approach combined with thematic synthesis techniques. The analysis involved systematically categorizing the research findings based on educational context, research design and methods, forms of implementation of Smart Apps Creator and similar mobile learning media, as well as their reported impacts on students' learning processes and outcomes.

Through this thematic synthesis, the review aimed to identify recurring patterns, emerging research trends, and variations in the implementation and effectiveness of Smart Apps Creator–based and mobile learning media within vocational education settings. This analytical approach enabled the development of a comprehensive mapping of how mobile learning contributes to effective, interactive, and competency-oriented vocational learning.

This study employed a Systematic Literature Review (SLR) to identify, evaluate, and synthesize relevant research findings related to the use of Smart Apps Creator and mobile learning innovations in vocational fashion design education. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which were adapted to suit the objectives of this study. The SLR procedure involved several key

stages, including the formulation of research questions, the development of a structured literature search strategy across reputable academic databases, the selection of studies based on predefined inclusion and exclusion criteria, data analysis, and thematic synthesis of the findings.
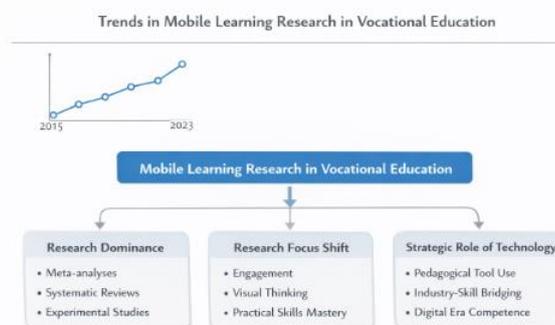.

4. RESULTS AND DISCUSSION

RQ1. Research Trends in Mobile Learning within Vocational Education

The findings of the Systematic Literature Review, based on 24 selected studies, indicate a substantial growth in research on mobile learning and digital learning media in vocational education since 2015. This trend is reflected in the increasing number of meta-analyses, systematic reviews, and experimental studies that examine the effectiveness of digital technologies in enhancing skills-based learning (Sung et al., 2016; Bond et al., 2021; Hillmayr et al., 2020). These findings suggest a growing scholarly recognition of technology as a strategic component in the development of vocational education.

Over time, the focus of research has shifted from viewing technology primarily as a means of accessing learning materials to recognizing its role as a pedagogical tool that supports student engagement, visual thinking, and the development of practical skills (Kahu, 2013; Pavlova, 2019). Rather than functioning merely as a supplementary resource, mobile learning is increasingly positioned as an instructional approach that actively shapes learning processes in vocational contexts.

Furthermore, several studies emphasize that the integration of mobile learning is considered a key strategy for addressing the gap between graduates' competencies and the evolving demands of industry in the digital era (Redecker, 2017; Spöttl & Windelband, 2021). Taken together, these findings demonstrate that mobile learning has evolved into a strategic and relevant pedagogical approach in contemporary vocational education, supporting both skills development and workforce readiness.

Figure 2. Research Trends in Mobile Learning within Vocational Education

This figure illustrates research trends in mobile learning and digital learning media within vocational education based on the findings of the Systematic Literature Review. The trend shows a noticeable increase in the number of studies since 2015, characterized by the growing prevalence of meta-analyses, systematic reviews, and experimental research.

Beyond the increase in research volume, the figure also reflects a shift in scholarly focus from the use of technology merely as a means of accessing learning materials toward its role as a strategic pedagogical tool. Research attention has increasingly centered on enhancing student engagement, visual thinking skills, and practical skill development. Overall, the trend highlights mobile learning as a key strategy for bridging the gap between vocational graduates' competencies and the evolving demands of the digital-era workforce.

RQ2. Forms of Implementation of Smart Apps Creator and Similar Mobile Learning Media

From an implementation perspective, the SLR findings indicate that most studies adopt

mobile learning in the form of learning applications, interactive multimedia, and visual-based digital media developed using authoring tools. These learning media are generally designed to support flexible, self-directed, and practice-oriented learning, which aligns closely with the core characteristics of vocational education (Kearney et al., 2015; Crompton & Burke, 2018).

In the context of design education and visually oriented skill development, several studies report that the use of interactive multimedia and digital visual media significantly supports the development of visual thinking, creativity, and procedural understanding among learners (Sonjaya & Munir, 2025; Chi, 2020; Obzhorin, 2025). These findings underscore the importance of visually rich and interactive learning environments for vocational fields that emphasize hands-on skills and design processes.

Furthermore, research by Hwang et al. (2021) highlights that the use of no-code authoring tools enables educators to efficiently develop interactive learning media without requiring advanced programming skills. This finding is particularly relevant to Smart Apps Creator, which is characterized as a user-friendly and adaptable platform for mobile learning development, making it well suited to the needs and constraints of vocational education contexts.

In addition, several studies associate mobile learning implementation with project-based learning and contextual learning approaches. The integration of digital technologies within Project-Based Learning has been shown to enhance the relevance of learning to real-world work situations and to promote authentic learning experiences (Guo et al., 2020; Pavlova, 2019). These findings suggest that Smart Apps Creator and similar platforms function not only as content delivery tools, but also as enablers of innovative, experience-oriented learning that supports practical competence development.
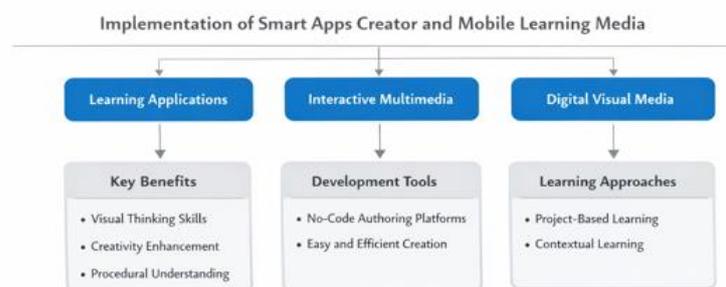

Figure 3. Forms of Implementation of Smart Apps Creator
and Similar Mobile Learning Media

This figure illustrates the forms of implementation of Smart Apps Creator and similar mobile learning media as identified through the Systematic Literature Review (RQ2). The implementations are represented in three main forms: learning applications, interactive multimedia, and visual-based digital media developed using authoring tools.

Furthermore, the figure highlights that the implementation of mobile learning media extends beyond content delivery and actively supports the development of visual thinking skills, creativity, and procedural understanding among learners. From a pedagogical perspective, the use of Smart Apps Creator and comparable platforms is commonly integrated with project-based learning and contextual learning approaches, making it highly relevant to vocational education, which emphasizes practical, authentic, and experience-oriented learning.
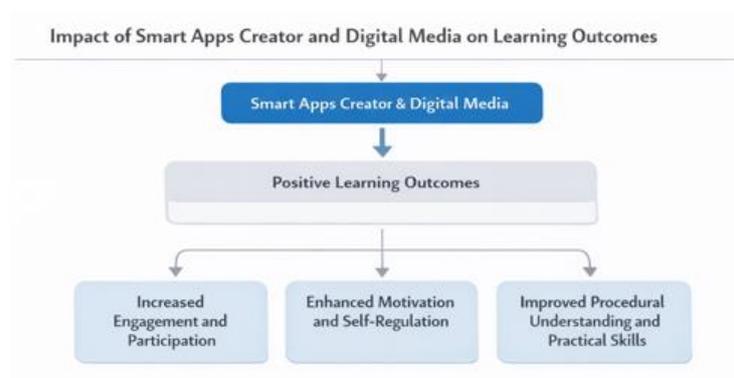
RQ3. Learning Impacts of Smart Apps Creator and Digital Learning Media

In terms of learning impacts, nearly all studies reviewed in this SLR report positive effects of mobile learning and digital learning media on students' learning outcomes. The most consistently reported impacts include increased student engagement and active participation (Kahu, 2013; Bond et al., 2021), enhanced learning motivation and self-regulation (Nikou &

Economides, 2018), as well as improvements in procedural understanding and practical skill development (Hwang & Fu, 2019; Chi, 2020).

Within design education and fashion design contexts, visual-based media and interactive multimedia have been shown to be particularly effective in enhancing visual thinking skills, creativity, and the quality of students' creative outputs (Armstrong et al., 2016; Burns & Bryant, 2019; Sonjaya & Munir, 2025). These findings are consistent with Mayer's Multimedia Learning Theory (Mayer, 2014), which emphasizes that the well-designed integration of text, images, and animations can facilitate deeper cognitive processing and improve understanding of complex and procedural concepts.

Nevertheless, several studies also highlight that the effectiveness of mobile learning implementation is strongly influenced by educators' digital competence and the pedagogical quality of instructional design (Redecker, 2017; Spöttl & Windelband, 2021). Therefore, while Smart Apps Creator demonstrates considerable potential as an innovative learning medium, its impact on learning outcomes ultimately depends on the extent to which it is embedded within contextualized, pedagogically grounded, and competency-oriented instructional designs.

Figure 4. Learning Impacts of Smart Apps Creator and Digital Media
on Learning Outcomes

This figure presents a synthesis of findings from the Systematic Literature Review regarding the learning impacts of Smart Apps Creator and mobile learning–based digital media on students' learning outcomes. The synthesized results indicate that the use of these digital media consistently contributes to positive learning outcomes.

More specifically, the most prominent impacts include increased student engagement and active participation, enhanced learning motivation and self-regulation, as well as improved procedural understanding and practical skill development. In addition, the figure highlights that the effectiveness of Smart Apps Creator and digital media does not operate in isolation, but is influenced by the quality of pedagogical design and the digital competence of educators in implementing these learning media.

CONCLUSION

This Systematic Literature Review demonstrates that research on mobile learning in vocational education has increased substantially over the past decade, with Smart Apps Creator emerging as a promising authoring tool. The implementation of Smart Apps Creator and similar platforms is predominantly realized through interactive, visual, and project-based learning media, which align closely with the characteristics of vocational education, particularly in the context of fashion design education.

The findings further confirm that the use of Smart Apps Creator–based media has positive effects on students' learning motivation, visual conceptual understanding, and practical skill development. These results highlight the potential of Smart Apps Creator as an innovative learning medium in vocational fashion design education. At the same time, the review indicates

a need for large-scale empirical studies to provide more robust evidence regarding its effectiveness and to support informed and sustainable implementation in vocational education settings.

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