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# Music Composition Learning Using Digital Audio Workstations in Higher Education: A Scoping Review

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**Abstract**

This study aims to map research trends, pedagogical strategies, learning practices, outcomes, and challenges in music composition learning using Digital Audio Workstations (DAWs) in higher education. A scoping review approach was employed using the Population, Concept, and Context (PCC) framework and the PRISMA-ScR guidelines. Literature searches were conducted through Scopus, ERIC, DOAJ, Google Scholar, and supplementary manual searches for publications from 2015 to 2025. After the screening and eligibility process, 15 publications were included in the final analysis. The findings show that DAW-based composition learning in higher education is commonly implemented through practice-based, project/studio-based, self-directed, and hybrid learning models, including DAW-live coding practices. DAWs are positioned not only as production tools but also as creative learning environments that support ideation, exploration, revision, collaboration, and digital music production. Reported learning outcomes include increased learning independence, production competence, creative exploration, and awareness of the composition process. However, the review also identifies several challenges, particularly the limited use of systematic assessment indicators, uneven digital literacy, and institutional readiness related to facilities and learning resources. This study contributes to the literature by clarifying how DAWs function as pedagogical media in higher music education and by highlighting the need for more structured assessment rubrics and sustainable learning designs.

**Keywords:** Digital Audio Workstation, music composition learning, creative pedagogy, higher music education, scoping review

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## INTRODUCTION

In recent years, music composition education in higher education has shifted from being centered on score writing and notation toward digital production practices mediated by Digital Audio Workstations (DAWs) (Chen, 2025; Edwards, 2022). This shift is not limited to a change in tools, but also reflects a transformation in musical thinking, particularly in how students generate ideas, organize musical structures, choose timbres, develop grooves or beats, and finalize their works. A DAW can be understood as software that enables users to record, sequence, edit, arrange, mix, and produce audio and MIDI materials. In this sense, DAW functions as a studio-like environment in which composition and production are integrated into a single workflow. Consequently, DAW literacy has become an increasingly relevant competency for music students, especially when learning outcomes require

students to transform theoretical understanding into digital audio works that can be presented or evaluated (Becking et al., 2016; Kashina et al., 2020).

However, DAW-based learning cannot be treated as a uniform practice. DAWs differ in interface design, workflow orientation, track management, plugin integration, MIDI features, and mixing or mastering functions. Different types of DAWs offer different operational characteristics, which may influence students' learning experiences and creative processes (Yang, 2024). In higher music education, DAW implementation also varies according to course design, software availability, facility readiness, and student competence. For example, DAW learning in digital music lectures involves both notation and production software and depends strongly on institutional support (Hidayat & Syafwandi, 2022). This indicates that DAW-based composition learning needs to be understood not only as software training, but also as a pedagogical ecosystem shaped by infrastructure, workflow, and learning design.

The relevance of DAW in higher education is also related to the broader demand for digital competence in contemporary music practice. As music creation, production, and dissemination increasingly occur in digital environments, students are expected to connect musical knowledge, such as structure, harmony, rhythm, and form, with production skills, including editing, mixing, sound design, and media-based presentation. The need to strengthen digital technology competencies in higher music education has also been emphasized so that students can adapt to modern learning and professional demands (Suvorov et al., 2022). In this context, DAW can function as a strategic medium that bridges musical, technological, and creative competencies.

Previous studies have discussed DAW and digital music technology from various perspectives, including the effectiveness of DAW in supporting musical practice (Fajar & Sukmayadi, 2021), self-directed DAW learning through design-based research (Cipta, 2021), the influence of technology on composition pedagogy and creativity (Pierard & Lines, 2022), and the relationship between DAW preferences and students' aesthetic tendencies (Jaohari et al., 2025). Other studies have also highlighted collaborative digital composition and platform diversity in music didactics (Merchán-Sánchez-Jara & González-Gutiérrez, 2023). Nevertheless, these studies are often presented as individual cases, conceptual discussions, or context-specific implementations. As a result, a broader map is still needed to explain how DAW-based composition learning has been designed, implemented, and evaluated in higher education.

This gap is important because the existing literature does not yet consistently show how pedagogical strategies, technological practices, creative outcomes, and implementation challenges are connected within DAW-based composition learning. Some studies emphasize the benefits of DAW use, while others focus on learning design, technology affordances, or student preferences. However, the indicators used to describe creativity, production competence, learning independence, or work quality are not always systematically explained. Therefore, a scoping review is appropriate because it is intended to map research characteristics, concepts, methods, and gaps across diverse studies rather than to measure the effectiveness of a single intervention.

Based on this background, this scoping review aims to map research trends, pedagogical strategies, production tools/practices, reported learning outcomes, and implementation challenges in DAW-based music composition learning in higher education. Specifically, this study aims to: (1) map publication trends and study characteristics; (2) identify pedagogical models or strategies, such as project-based, studio-based, self-directed, and hybrid learning; (3) examine dominant production tools and practices, including DAWs, MIDI integration, loop-based production, and live coding; and (4) summarize reported outcomes and challenges, including creativity, production competence, self-efficacy, learning independence, assessment, digital literacy, and facility readiness.

The research questions guiding this study are as follows: (RQ1) How are studies related to DAW-based composition learning in higher education distributed in terms of year, context, country, publication type, and study program setting? (RQ2) What pedagogical strategies are most frequently used and what forms of learning practices are employed? (RQ3) What production tools or practices are dominant and how are they positioned in the composition process? (RQ4) What learning outcomes are measured or reported and what indicators are most frequently used? and (RQ5) What implementation challenges arise most frequently, particularly in relation to digital literacy, facilities, curriculum, assessment, and lecturer readiness?

Theoretically, this study contributes to clarifying the relationship between technology and creativity in composition pedagogy by showing how DAW functions as both a production tool and a learning environment. Previous studies suggest that technology can shape the construction of composition pedagogy, while MIDI composition frameworks can help make digital composition learning more structured and measurable (Kashi, 2022; Pierard & Lines, 2022). Practically, the findings are expected to provide a reference for lecturers and curriculum developers in designing DAW-based composition learning that is more operational, project-oriented, and supported by clear assessment strategies. Thus, this review does not merely promote the use of DAW, but seeks to provide a clearer foundation for adaptive and sustainable digital composition pedagogy in higher education.

## METHODS

### Design and approach

This study employed a scoping review approach to map the evidence, characteristics, and research gaps related to music composition learning using Digital Audio Workstations (DAWs) in higher education. A scoping review was considered appropriate because studies on DAW-based music learning use diverse terms and contexts, such as “music composition,” “music production,” “digital composition,” “DAW pedagogy,” “MIDI composition,” and hybrid practices such as live coding. Therefore, this study did not aim to measure the effectiveness of a single intervention, but to identify research trends, pedagogical strategies, production tools/practices, reported learning outcomes, and implementation challenges across the selected literature.

**Determining focus using the PCC framework**

To clarify the scope of this study, the Population, Concept, and Context (PCC) framework was used. The population refers to students and lecturers in higher education music-related programs. The concept refers to music composition learning using Digital Audio Workstations (DAWs), including MIDI-based composition, DAW-based production, and hybrid digital practices such as live coding that are relevant to the composition or production process (Boon, 2023; Kashi, 2022). The context refers to higher education settings, including digital music courses, composition classes, production-oriented courses, campus studios, and workshop-based learning activities (Ban & Bin Md Noor, 2024; Hidayat & Syafwandi, 2022). The operational definition of each PCC component is presented in Table 1.

**Table 1.** PCC Framework

| Component | Operational description |
|---|---|
| Population (P) | Students or lecturers in higher education (music studies/music education/ music technology/ composition/ music production programs). |
| Concept (C) | Music composition learning using DAW, including supporting practices such as MIDI composition, DAW-based production, and hybrid practices (live coding) relevant to the music composition/creation process. |
| Context (C) | Higher education environment (composition classes, digital music classes, campus production/ composition studios, campus-based workshops). |

With this limitation, studies that only discussed audio technology without a clear connection to composition or production learning, or studies conducted outside higher education contexts, were not included in the core analysis.

**Literature search strategy**

The literature search was conducted through databases and sources commonly used in education, music education, and technology studies, namely Scopus, ERIC, DOAJ, Google Scholar, and supplementary searches through ResearchGate and reference lists of relevant articles. The publication period was limited to 2015–2025, and only studies written in English or Indonesian were considered.

The search strategy combined keywords related to DAW, music composition/production, and higher education. The main search strings were adapted according to the search features of each database. The following search strings were used; Scopus: ("digital audio workstation" OR "DAW" OR "digital music production") AND ("music composition" OR "digital composition" OR "music production" OR "composition learning") AND ("higher education" OR "university" OR "college" OR "conservatory" OR "music students"); Eric: ("digital audio workstation" OR "DAW" OR "digital music production") AND ("music composition" OR "digital composition" OR "music production") AND ("higher education" OR "university" OR "college"); DOAJ: ("digital audio workstation" OR "DAW") AND ("music composition" OR "music production" OR "digital composition") ; Google Scholar: "digital audio workstation" "music composition"

"higher education" "DAW" "music production" "music education" "university" "MIDI composition" "music education" "DAW-based pedagogy" "music" "live coding" "music production" "higher education".

Supplementary manual searches were also conducted using backward and forward searching from the reference lists of selected articles. These searches were used to identify additional studies that were relevant to DAW-based composition or production learning but were not captured through the main database search.

**Inclusion and exclusion criteria**

Inclusion and exclusion criteria were established to ensure that the selected studies were relevant to DAW-based composition or production learning in higher education. Studies were included if they discussed DAW use in music composition/production learning, involved higher education students or lecturers, were published between 2015 and 2025, were written in English or Indonesian, provided full-text access, and contained a clear learning context such as assignments, course design, learning experience, classroom practice, or assessment. Studies were excluded if they were non-scientific publications, outside the publication period, unavailable in full text, focused on K–12 or non-campus training contexts, or only discussed technology/software without a clear connection to composition learning. For example, studies focusing on K–12 or summer camp contexts may be used as comparative references, but they were not included in the core analysis of higher education studies (Walzer et al., 2025). The criteria are summarized in Table 2.

**Table 2.** Inclusion and Exclusion Criteria

| Inclusion criteria | Exclusion criteria |
|---|---|
| Discussing the use of DAW in music composition/production learning | Non-scientific articles (blogs, opinions, news) |
| Subject of higher education research (university students/lecturers) | K-12/elementary-high school context, general community, or non-campus training (except only as a comparison) |
| Publication year 2015-2025 | Outside the year range |
| Indonesian/English Languages | other than Indonesian/English (if no translation is available) |
| Full text available | Full text not available |
| There is a learning context (assignments, class design, learning experiences, assessments, etc.). | Only discussing technology/software without the learning context of composition. |

Based on the criteria in Table 2, the selection process was carried out in stages, starting from screening abstract titles to evaluating full-text articles to ensure that each study truly discussed DAW-based composition/production learning in higher education.

**Study selection process**

The study selection process was carried out in four stages: identification, deduplication, title and abstract screening, and full-text eligibility assessment. In the identification stage, a total of 71 records were obtained from database searches

and supplementary searches. After removing 17 duplicate records, 54 records were screened based on titles and abstracts. From this stage, 29 records were excluded because they did not meet the topic, population, context, or publication criteria. A total of 25 full-text articles were then assessed for eligibility. After full-text assessment, 10 articles were excluded because they did not specifically address DAW-based composition/production learning in higher education or did not provide sufficient information for data extraction. Finally, 15 studies were included in the review and analyzed further.

The selection process was reported using a PRISMA-ScR flow diagram, as presented in Figure 1. To maintain consistency, each article was checked against the inclusion and exclusion criteria. Articles with unclear relevance were retained for full-text assessment before a final decision was made.

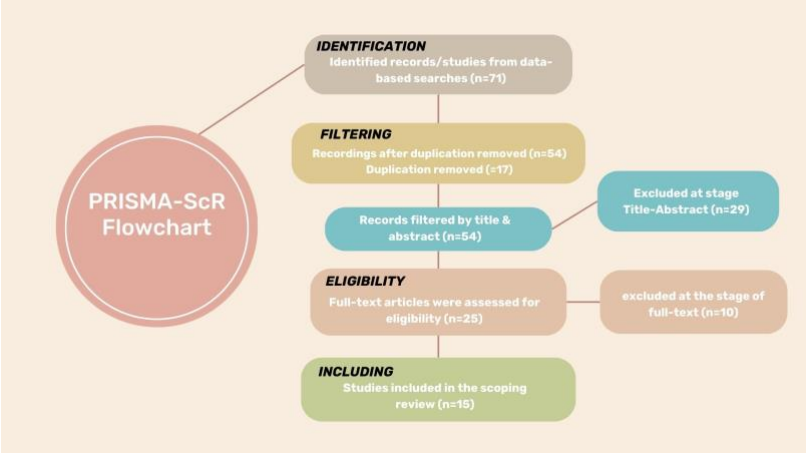


**Figure 1.** Study selection flow diagram (PRISMA-ScR)

Based on the flowchart in Figure 1, the studies that passed the full-text eligibility stage were designated as the final articles and then entered the data extraction or charting stage. This stage was conducted to record the core information from each study consistently, so that the selected studies could be compared and mapped according to the research questions.

**Data extraction**

The 15 studies that met the eligibility criteria were extracted using a charting table. The extraction process focused on information that was relevant to the research questions. The extracted data included: (1) study identity, including author, year, country, and type of publication or study design; (2) learning context, including course, classroom, studio, workshop, level, or participants; (3) pedagogical strategy, including project-based learning, studio-based learning, self-directed learning, design-based research, workshop, or hybrid learning; (4) technology or tools, including DAW type, MIDI integration, audio editing, digital production, and live coding; (5) reported outcomes, including creativity, production skills, self-efficacy, learning independence, composition quality, or reflective awareness; and (6) implementation challenges, including digital literacy, facility readiness, assessment, lecturer workload, and technical barriers. The results of this extraction are summarized in Table 3.

**Table 3.** Study Extraction

| Author | Study Design | Learning Setting | DAW/ Tools | Pedagogical Focus | Key Finding | Gap |
|---|---|---|---|---|---|---|
| (Kashi, 2022) | (Framework) development | Digital composition learning (music education) | MIDI composition | MIDI integration for composition learning | The framework helps make composition learning more structured (ideation-revision-product). | Cross-class/institutional trials and more measurable outcome evaluations are needed. |
| (Boon, 2023) | Qualitative study | Digital music composition/ production practice | Live coding + digital production | Hybrid practice (composition-production-performance) | Hybrid practices open up space for creative exploration and improvisation | Learning achievement assessments have not been clearly formulated. |
| (Pierard & Lines, 2022) | Analytical/descriptive study | Education in digital music composition | DAW (variety) | Technology and creativity in composition pedagogy | Technology influences musical thinking and composition learning design | Still predominantly conceptual; intervention-based classroom studies are needed |
| (Yang, 2024) | Description/mapping | Learning music technology | Various DAWs | Introduction to DAW types and workflow characteristics | Helping to understand the differences between DAW types and the implications for learning | Not focusing on the specific design of composition learning |
| (Hidayat & Syafwandi, 2022) | Descriptive qualitative | Digital music classes in higher education | DAW + music software | Implementation of DAW in lectures | DAW supports the process of music practice/production in the classroom. | Has not specified the pedagogical model and composition assessment rubric |
| (Ban & Bin Md Noor, 2024) | Case study | Production-oriented course (popular music/vocals) | Audio/DAW technology | The use of audio technology for performative achievements | Audio technology helps improve production skills and understanding | The focus of the composition is not central; generalization is limited. |
| (Cipta, 2021) | Design-Based Research | Self-directed learning DAW | DAW (production practice) | Self-directed learning design | DBR helps design more adaptive and contextual learning | Requires replication in a larger population and long-term evaluation |

| | | | | | | |
|---|---|---|---|---|---|---|
| (Fajar & Sukmayadi, 2021) | Descriptive qualitative | Practical music/production learning | DAW | Task-based composition/production | DAW simplifies the process of practicing and composing works. | Creativity/composition indicators have not been explained in detail. |
| (Mygdanis, 2025) | Design-Based Research | Technology-based music education | Digital music production | Development of music technology learning models | Demonstrating the importance of iterative design and reflection in production practices | Limited sample/context; need for outcome evaluation reinforcement |
| (Suvorov et al., 2022) | Survey/observation | Higher music education | Digital technology (including DAW) | Digital competence in music education | Emphasizing the urgency of digital competence and technology integration | Not specifically focused on DAW-based composition |
| (Jaohari et al., 2025) | Descriptive survey | Music technology students | Various DAWs | DAW preferences & aesthetic style | DAW preferences relate to the aesthetic tendencies of the work. | Has not yet reviewed pedagogical strategies and task design in depth |
| (Walzer, 2016) | Qualitative/reflective practice | Music & audio education | Digital storytelling + teknologi audio | Reflection on the creative process and learning | Technology-based reflection helps shape process awareness | Impact assessment on composition results is necessary |
| (Bombardieri, 2024) | Qualitative | Composition/composer education | DAW (digital audio workstation) | Composer identity and creative process | Affirming DAW as a creative and reflective space | Not yet assessed instructional effectiveness |
| (Gaines, 2018) | Case study | Higher education in music/production | Digital production | The relationship between production techniques and aesthetic decisions | Technical practices influence artistic decisions in works | Need for intervention design and process assessment rubrics |
| (Asplund, 2022) | Ethnography/qualitative | Digital music composition | DAW + digital tools | The relationship between tools and the formation of ideas | Digital tools influence how musical ideas emerge and develop | Further elaboration is required on the instructional design and the indicators used to assess learning outcomes. |

In addition to the 15 included studies, several references were used as contextual or comparative sources to support the discussion of music technology education. However, these references were not counted as included studies in the PRISMA-ScR flow because they did not fully meet the eligibility criteria or could not be extracted into the charting format. For example, studies on music technology in K–12 or summer camp contexts were used as comparative references, while broader discussions of music technology in education were used as contextual sources (Eiksund et al., 2020; Walzer et al., 2025).

**Data analysis**

The extracted data were analyzed using descriptive and thematic analysis. Descriptive analysis was used to map the general characteristics of the selected studies, including year of publication, type of publication, educational context, research design, and technology used. Thematic analysis was then used to group the findings into major themes related to DAW-based composition learning in higher education. These themes included DAW as a digital composition environment, pedagogical models and learning strategies, MIDI and production workflow, reported learning outcomes, and implementation challenges. The results of these analyses are presented in the Results and Discussion section to provide a structured map of DAW-based music composition learning in higher education.

## RESULTS & DISCUSSION

**Study characteristics**

Based on the PRISMA-ScR selection process, 15 studies were included in the final analysis. These studies were mapped according to publication year, publication type, educational context, pedagogical focus, technology used, reported outcomes, and research gaps. In general, the selected studies show that research on DAW-based composition and production learning in higher education has increased in the 2020–2025 period. Earlier studies mainly provide the foundation for understanding DAW as part of music technology education, while more recent studies increasingly discuss DAW in relation to creativity, digital competence, project-based learning, and production-oriented learning.

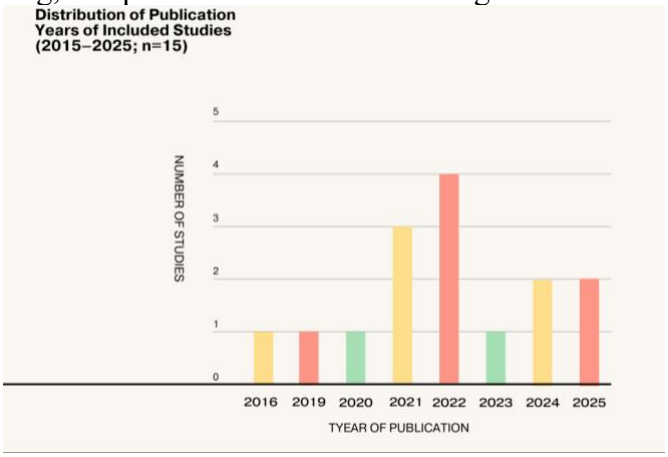


**Figure 2.** Distribution of publication years of included studies (n=15)

The graph shows an increase in publications during the period 2021–2025, with the highest number in 2022. This indicates growing research interest in DAW-based composition and production learning in higher education.

In terms of publication type, the reviewed studies include journal articles, proceedings, case studies, design-based research, dissertations, and broader conceptual works on music technology education. This variation shows that DAW-based composition learning is not only discussed in music education, but also intersects with digital creativity, music technology, production studies, and contemporary composition pedagogy.

In terms of program context, the reviewed studies are mostly situated in digital music courses, music technology classes, digital composition settings, music production courses, and production-oriented courses. For example, DAW learning has been discussed in digital music lectures, while audio technology has also been highlighted in production-oriented learning (Ban & Bin Md Noor, 2024; Hidayat & Syafwandi, 2022).

**Pedagogical models in DAW-based composition learning**

The reviewed studies indicate that DAW-based composition learning in higher education is commonly implemented through practice-based, project-based, studio-based, self-directed, and hybrid learning models. In practice-based and project-based settings, students learn by creating, revising, and finalizing musical works through DAW workflows. This approach is relevant because DAWs allow students to immediately listen to their ideas, revise musical materials, adjust timbre, arrange structures, and evaluate their production decisions during the composition process.

Several studies show that DAW can support musical practice and composition activities, particularly because students are able to experiment with sound, repeat the process, and refine their works more flexibly (Fajar & Sukmayadi, 2021; Hidayat & Syafwandi, 2022). However, the implementation of DAW-based learning is also shaped by facility readiness, software access, lecturer guidance, and students' digital literacy. This means that DAW-based learning should not be understood merely as software use, but as a learning model that requires structured task design, workflow guidance, and appropriate assessment strategies.

Self-directed and design-based learning models also appear in the reviewed studies. DAW self-learning can be designed through a more adaptive learning process, while iterative design and reflection are also important in music technology learning (Cipta, 2021; Mygdanis, 2025). These findings suggest that DAW learning benefits from a cycle of exploration, feedback, revision, and reflection. In composition education, such a cycle is important because students are not only expected to operate software, but also to make musical and production decisions consciously.

**DAW, technology, and creative processes**

DAW-based composition learning shows that technology plays an active role in shaping the creative process. In digital composition, musical decisions and production decisions often occur at the same time. Students may develop melodic,

rhythmic, harmonic, or structural ideas while also making decisions about sound design, layering, editing, mixing, and timbre. Therefore, DAW functions not only as a technical tool, but also as a creative environment where composition and production are integrated.

This finding is in line with studies that position technology as part of composition pedagogy. DAW can influence how composition pedagogy is constructed, while digital tools may also affect how musical ideas emerge and develop (Asplund, 2022; Pierard & Lines, 2022). In this sense, students' creativity is not only seen from the final product, but also from how they explore ideas, make revisions, negotiate sound choices, and organize musical materials within the DAW environment. However, the reviewed studies also show that creativity is often discussed descriptively and has not always been measured using clear indicators or assessment rubrics.

**Production tools, MIDI integration, and hybrid practices**

The dominant practices found in the reviewed studies include sequencing, MIDI programming, audio editing, track arrangement, loop-based production, sound selection, mixing, and live coding. These practices show that DAW-based composition learning involves both musical understanding and technical production competence. Different types of DAWs also have different workflow characteristics, which may influence how students compose, arrange, and produce music (Yang, 2024). Therefore, the choice of DAW and its features can affect students' learning experiences and aesthetic tendencies.

MIDI integration is one of the important components in DAW-based composition learning. A MIDI composition framework can help structure the learning process from ideation, development, revision, to product finalization (Kashi, 2022). This framework is relevant because many DAW-based courses are highly practical, but not all of them provide explicit stages for connecting musical ideas with production workflows. In addition, hybrid practices such as live coding expand the meaning of composition by combining production, performance, and improvisation in digital environments (Boon, 2023). These practices indicate that DAW-based learning can support both structured composition and experimental exploration.

**Reported learning outcomes**

The reported outcomes of DAW-based composition learning include production competence, composition skills, learning independence, reflective awareness, creative exploration, and aesthetic decision-making. Studies on DAW implementation report that students can benefit from direct practice, repeated listening, revision, and production-based assignments (Fajar & Sukmayadi, 2021; Hidayat & Syafwandi, 2022). In design-based and self-directed learning contexts, the outcomes are more related to learning independence, process awareness, and the ability to adapt to digital workflows (Cipta, 2021; Mygdanis, 2025).

Other studies show that DAW use can be connected to broader musical and aesthetic outcomes, including production-oriented learning, students' aesthetic tendencies, and reflective practice in music and audio education (Ban & Bin Md Noor, 2024; Jaohari et al., 2025; Walzer, 2016). These findings suggest that DAW-

based composition learning should not be assessed only from the final audio product, but also from the process of idea development, revision, reflection, and production decision-making.

Nevertheless, the reviewed studies show that the measurement of learning outcomes remains inconsistent. Some studies discuss creativity, independence, or production skills, but do not always explain the indicators used to assess these outcomes. Therefore, one important gap in DAW-based composition learning is the need for clearer assessment rubrics that balance musical aspects, production aspects, and creative process indicators.

**Implementation challenges**

The implementation of DAW-based composition learning in higher education faces several recurring challenges. The first challenge is digital literacy. Students and lecturers need sufficient competence not only to operate DAW software, but also to use it meaningfully for composition, production, and reflection Digital technology competence is important in higher music education (Suvorov et al., 2022). Without adequate digital literacy, DAW learning may become too focused on technical operation and fail to support deeper musical understanding.

The second challenge is facility and institutional readiness. DAW-based learning requires access to appropriate devices, software, audio interfaces, headphones, MIDI controllers, and studio or laboratory facilities. Institutional support influences the implementation of DAW learning in digital music lectures (Hidayat & Syafwandi, 2022). This indicates that DAW-based composition learning cannot rely only on lecturer initiative or students' personal equipment. It requires a more stable learning ecosystem supported by infrastructure, learning resources, and curriculum design.

The third challenge is assessment. The reviewed studies frequently mention creativity, production competence, or composition quality, but fewer studies provide systematic assessment instruments. This creates a gap between the learning process and the evaluation process. If assessment is not clearly designed, lecturers may find it difficult to evaluate whether students' works demonstrate musical understanding, production skill, originality, coherence, or reflective growth.

**Synthesis of findings**

Overall, the reviewed studies show that DAW-based composition learning in higher education can be understood as a pedagogical practice that integrates musical creativity, digital production, and technology-based learning. DAW is not only used as a production tool, but also as a space where students explore ideas, organize sounds, revise materials, collaborate, and produce musical works. This finding is supported by broader discussions on music technology education, which emphasize that digital tools can expand learning possibilities while also requiring critical pedagogical planning (Eiksund et al., 2020; Ford et al., 2021).

The findings also show that DAW-based learning is closely related to project-oriented and studio-based approaches. This is consistent with the development of music technology learning, where students are encouraged to learn through making, experimenting, revising, and presenting works. Studies on digital tools and project-based learning further support the idea that DAW learning should be connected to

creativity, collaboration, and product-oriented assignments (Cuenca-Rodríguez et al., 2025; Yu, 2024). However, these opportunities also require structured learning resources and clear assessment criteria.

In relation to tools and practices, DAW-based composition learning involves not only conventional production workflows, but also more experimental and computational practices. Live coding, algorithmic composition, and computational approaches show that digital composition can expand beyond linear production into performative and interactive forms (Boon, 2023; Dimitrov, 2015; Manaris et al., 2018; McCall et al., 2024). However, these practices need to be adapted to students' readiness and course objectives. For introductory or undergraduate contexts, accessible DAW platforms and structured learning scenarios, such as GarageBand-based learning, may help bridge facility limitations and students' technical readiness (Fritsche, 2022).

Based on the synthesis, the main strength of existing studies lies in describing the potential of DAW for practice-based and production-oriented learning. However, the main limitation lies in the lack of consistent assessment indicators. Creativity, production competence, and composition quality are often mentioned as outcomes, but they are not always connected to measurable criteria. Therefore, future studies need to develop and test assessment frameworks that can evaluate both musical and production aspects in DAW-based composition learning.

**Pedagogical implications for higher education**

The findings imply that DAW-based composition learning should be designed as a structured creative process rather than as software training. Lecturers can use project-based or studio-based learning by guiding students through stages such as ideation, sketching, arranging, MIDI or audio production, revision, mixing, and final presentation. This process is aligned with contemporary composition pedagogy, which emphasizes gradual development, exploration, and work-oriented learning (Edwards, 2022).

The integration of MIDI composition frameworks can also help lecturers provide clearer learning stages and connect musical concepts with production workflows (Kashi, 2022). In addition, hybrid practices such as DAW and live coding can be used as enrichment activities for more advanced classes, especially when the learning objective includes improvisation, digital performativity, or experimental composition (Boon, 2023). However, these approaches need to be supported by scaffolding, learning modules, and assessment rubrics so that students' creative process can be evaluated more fairly and systematically.

**Curriculum and institutional implications**

At the curriculum level, DAW-based composition learning requires clear learning outcomes that balance musical understanding and production competence. The curriculum should not only state that students are able to operate DAW, but also that they are able to compose, arrange, revise, and evaluate digital music works. This requires alignment between course objectives, learning activities, facilities, and assessment instruments.

Institutional support is also crucial. Campuses need to provide adequate infrastructure, legal software access or accessible alternatives, audio production

equipment, and standardized learning resources. Lecturer competence should also be strengthened through professional development, because DAW-based learning requires both musical and technological understanding. Technology-based learning in higher music education needs pedagogical support, not only technical access (Hamond et al., 2019). Therefore, DAW implementation should be positioned as part of curriculum development and institutional readiness.

**Research agenda**

Based on the reviewed literature, several research directions can be proposed. First, future studies need to connect DAW-based pedagogical strategies with operational indicators of creativity and composition quality. Many studies discuss creativity, but only a few explain how it is assessed in relation to musical structure, originality, timbre processing, rhythmic organization, or coherence of ideas.

Second, future research may compare different learning approaches, such as self-directed learning, project-based learning, studio-based learning, and hybrid learning, to examine how each approach influences students' creative process and final works. Third, design-based research can be used to develop and test learning tools, such as modules, project templates, and assessment rubrics, in iterative cycles (Cipta, 2021; Mygdanis, 2025). Fourth, assessment frameworks need to balance musical and production aspects so that DAW-based composition learning does not become too technical or too theoretical. Recent studies on digital tools and creativity in music education also support the need for learning frameworks that integrate technology, creativity, and constructivist learning principles (Aoonlamai & Kwangmuang, 2025; Chen, 2025).

**Limitations of the scoping review**

This scoping review has several limitations. First, the databases and search strategy used in this study may not have captured all relevant publications on DAW-based composition learning. Second, the language limitation to Indonesian and English may have excluded relevant studies published in other languages. Third, the publication period of 2015–2025 may have excluded earlier studies that also discuss music technology and composition learning. Fourth, because this study uses a scoping review approach, the analysis focuses on mapping the characteristics, themes, and gaps of the literature rather than evaluating the effectiveness of specific learning interventions. Therefore, the findings should be understood as a research map that can inform future empirical studies, curriculum development, and assessment design in DAW-based composition learning.

## CONCLUSION

This scoping review indicates that music composition learning using Digital Audio Workstations (DAWs) in higher education has developed as a creative, project-oriented, and collaborative pedagogical practice. The reviewed studies show that DAWs are not only used as production tools, but also function as learning environments that support ideation, exploration, revision, collaboration, and finalization of musical works. The dominant learning strategies include practice-

based learning, project/studio-based learning, self-directed learning, and hybrid models such as live coding. Reported learning outcomes include learning independence, production competence, creative exploration, reflective awareness, and digital music production skills. However, the review also identifies several limitations, particularly the lack of systematic assessment indicators and the need for stronger institutional readiness in terms of facilities, digital literacy, and learning resources. Therefore, future research needs to develop and test clearer assessment rubrics and sustainable learning designs so that DAW-based composition learning can be implemented more effectively in higher education.

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