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Student Self-Assessment in Islamic Religious Education: A Scopus-Based Bibliometric Review of Trends, Themes, and Research Gaps

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Abstract

The central problem addressed in this study is the fragmented nature of existing research on student self-assessment within the context of Islamic Religious Education (IRE). This fragmentation hampers the identification of developmental trends, dominant themes, and comprehensive research trajectories in the field. Although self-assessment, as a reflective evaluative strategy, holds significant potential for enhancing metacognitive awareness, learner autonomy, and the cultivation of students' religious character, its implementation has not been supported by systematic scientific mapping. Accordingly, this study aims to analyze publication trends, collaboration patterns, and the thematic evolution of research on student self-assessment in IRE using a bibliometric approach. The study employed a bibliometric design with data sourced from the Scopus database covering the period 1990–2025. A total of 169 relevant documents were analysed using Bibliometric (RStudio) and VOSviewer to map citation patterns, author collaborations, and keyword and thematic clusters. The analytical techniques included co-citation analysis, co-authorship analysis, bibliographic coupling, and keyword co-occurrence mapping. The results indicate that research on self-assessment has experienced moderate growth, with an annual development rate of 5.25%. The dominant themes identified include formative assessment, self-regulated learning, and professional development, with recent trends increasingly reflecting the integration of digital technology and artificial intelligence in reflective assessment practices. Nevertheless, international collaboration remains relatively limited, and studies specifically situated within the IRE context are still scarce. Based on these findings, future research is encouraged to develop self-assessment models grounded in Islamic values and supported by digital technologies, as well as to strengthen cross-country collaborations to enrich reflective evaluation practices in Islamic education.

Keywords: Assessment Epistemology, Bibliometric Analysis, Islamic Religious Education, Scopus Database, Student Self-Assessment.

1. Introduction

Student self-assessment has increasingly gained prominence as an evaluative approach within contemporary educational discourse [1]. In the context of Islamic Religious Education (IRE), the issue of self-assessment is becoming particularly salient, as it embodies evaluative practices that emphasise reflection, autonomous learning, and students' ability to evaluate their own competency achievements. Through self-assessment, learners engage in reflective processes that enable them to recognise their strengths and weaknesses and formulate appropriate improvement strategies [2]. However, research on self-assessment within the domain of IRE remains fragmented and insufficiently mapped, thereby limiting educators' and researchers' understanding of thematic developments, research orientations, and accumulated scientific contributions.

Existing studies further indicate that assessment practices in IRE, including authentic assessment of cognitive domains, continue to face significant challenges, largely due to teachers' limited mastery of valid and reliable evaluation techniques (Achmad Prastowo, 2022). Self-assessment, however, extends beyond a mere evaluative tool; it is a pedagogical strategy that fosters reflective and independent learners capable of managing their learning in a sustained manner [3]. These conditions underscore the urgent need for systematic studies on assessment—particularly self-assessment—to enhance the literature base and strengthen evaluation practices in IRE. As a self-evaluation strategy, self-assessment plays a critical role in developing metacognitive awareness, learning independence, and students' responsibility for their own learning trajectories. The primary challenge, however, lies in the fragmented nature of existing research, which is dispersed across multiple educational subfields without clear conceptual integration.

A number of bibliometric studies have been conducted in Islamic education, addressing areas such as the modernisation of Islamic education [4], distance learning [5], gender equality in Islamic education, and the professionalism of PAI teachers (Aprisma Evendi, 2023). These studies demonstrate the usefulness of bibliometric methods for mapping scientific developments, identifying research trends, and analysing networks of authors and thematic clusters. Nevertheless, no existing bibliometric research has specifically focused on the development of self-assessment studies within the context of IRE, whether in terms of publication volume, thematic structures, or conceptual evolution. Thus, despite the expansion of bibliometric research in Islamic education, the specific domain of student self-assessment remains unexplored.

The success of self-assessment is highly dependent on students' perceptions and understanding of its benefits, as they are the primary agents in the evaluative process. Although interest in researching students' perceptions of self-assessment is increasing, systematic reviews remain scarce. Existing findings highlight the importance of designing contextually appropriate self-assessment strategies that align with learners' needs to ensure effective implementation [6].

Other studies indicate that the accuracy of self-assessment in cognitive learning processes is influenced by the types of cues students use to evaluate their understanding [7]. The implementation of clear assessment criteria has been shown to enhance self-assessment accuracy and student performance by providing objective reference points for self-evaluation. This alignment enables learners to evaluate themselves more critically and realistically, making self-assessment a more valid instrument for competency development and reflective learning [8]. In the context of formative or integrative learning, self-assessment promotes positive student attitudes, as the evaluative focus shifts from final outcomes to ongoing learning processes. Such an approach increases learners' active engagement and accuracy in self-evaluation, as they perceive themselves as active agents in continuous performance improvement. These findings indicate that the effectiveness of self-assessment is strongly mediated by its purpose and application context, with formative approaches being more conducive to reflective and participatory learning.

The significance of the present study lies in its contribution to providing a comprehensive overview of global dynamics in self-assessment research. Through bibliometric analysis, the study maps publication trends over time, authorship and institutional collaboration networks, and the most frequently examined themes. The findings are expected to help scholars better understand the trajectory of scientific development, identify understudied topics, and determine future research priorities.

The absence of bibliometric mapping on self-assessment within IRE constitutes a notable academic gap. Existing Islamic education literature has emphasised the importance of pedagogical transformation, curriculum modernisation, and technology integration in learning evaluation [4]. Previous studies have found that self-assessment (SA) and peer-assessment (PA) interventions have a significant positive impact on students' academic performance. Self-assessment (SA) and peer-assessment (PA) are also effective in improving academic achievement in various educational contexts, while opening up opportunities for further research on more optimal implementation strategies [6]. Other research further underscores the importance of supportive learning environments to ensure that students can comprehend and effectively apply self-assessment [1]. Additionally, self-assessment has been confirmed as instrumental in promoting autonomy and critical reflection among adult learners. However, its effectiveness is heavily influenced by learners' objectivity; challenges such as overconfidence and self-deception often result in discrepancies between perceived and actual performance. Consequently, self-assessment must be integrated with external feedback mechanisms to enhance reflective accuracy and support the development of critical thinking competencies [9].

Despite the substantial literature on student self-assessment, existing studies remain fragmented and predominantly practice-oriented. Moreover, bibliometric analyses in Islamic education have largely focused on themes such as modernization, gender, teacher professionalism, and digital learning, with limited attention to assessment-related epistemologies—particularly self-assessment as a reflective, value-laden pedagogical practice. As a result, systematic understanding of publication patterns, thematic evolution, and conceptual structures in self-assessment research—especially within IRE—remains underdeveloped. This gap highlights the need for comprehensive bibliometric mapping that situates self-assessment within broader debates on contemporary educational assessment and Islamic reflective traditions.

The novelty of this study lies in its position as the first bibliometric review specifically mapping student self-assessment research in Islamic Religious Education. Previous bibliometric studies in Islamic education have focused on other themes, including modernisation, digitalisation, gender issues, and teacher competence (MIER, 2025; [4]; Aprisma Evendi, 2022). The state of the art in this field shows that Islamic education is undergoing a phase of digital transformation, curriculum reform, and strengthening the quality of learning evaluation [5]. Thus, bibliometrics on self-assessment in Islamic Religious Education is an important contribution, not only to fill the literature gap but also to support the direction of evaluation reform in Islamic education. The research questions are 1) what are the global publication trends and collaboration patterns in student self-assessment research? 2) what dominant themes and thematic evolutions characterize this research field? 3) what research gaps and future directions emerge for Islamic Religious Education?

2. Methods

2.1 Research Design

This study employs a bibliometric method to analyze the development of scientific publications related to self-assessment in educational evaluation. The bibliometric approach was selected because it offers a quantitative and systematic overview of publication trends, leading authors, and patterns of scientific collaboration, thematic concentrations, and emerging research directions [10]. By providing an evidence-driven mapping of the literature, bibliometric analysis facilitates the identification

of influential studies, key scholars, prominent journals, and active institutions and countries over time.

In parallel with recent advancements in scientific and digital technologies, various bibliometric tools and analytical techniques have been developed to support researchers in conducting comprehensive and accurate literature analyses [11]. Bibliometric approaches are widely applied across scientific disciplines to uncover knowledge structures, map thematic developments, and trace research dynamics within a particular field.

Typically, bibliometric analysis is used to examine citation patterns and evaluate the performance, impact, and interconnectedness of scholarly publications. Citation-related indicators encompass the most frequently cited studies, authors, and journals; the most common research topics; patterns of collaboration across countries; bibliometric linkages; co-cited authors; and recurring keywords and conceptual terms associated with a given area of inquiry [12].

This study adopted a three-stage research design adapted from the bibliometric meta-literature approaches proposed by Paltrinieri *et al.* (2019) and [10]. The design comprised the following stages: (1) data identification and collection, (2) bibliometric analysis and network mapping, and (3) content analysis for an in-depth examination of research themes. These stages were implemented to ensure that the literature review process was systematic, valid, and comprehensive.

Methodological validity was strengthened through the integration of bibliometric techniques with systematic review procedures and the use of an internationally recognized academic database (Scopus). To further ensure dataset accuracy and relevance, manual screening procedures were conducted, consistent with established practices in contemporary bibliometric research. The bibliometric analysis in this study was performed using VOSviewer and Microsoft Excel. VOSviewer facilitated the analysis and visualization of large-scale bibliographic datasets through modularity-based clustering techniques, which are conceptually aligned with multidimensional scaling [13]. The literature retrieved from Scopus underwent a multi-step screening process:

1. Title and keyword screening to identify potentially relevant publications.
2. Abstract assessment to evaluate thematic relevance.
3. Manual screening to exclude studies that did not align with the research objectives

Through this systematic procedure, a final dataset comprising articles relevant to student self - assessment in educational contexts was obtained

2.2 Data Sources and Search Strategy

2.2.1 Scopus Search String

The data were retrieved from the Scopus database using the following exact search string: TITLE-ABS-KEY ("self-assessment" OR "student self-assessment") AND TITLE-ABS-KEY ("education" OR "religious education" OR "Islamic education" OR "Islamic Religious Education") The search was limited to peer-reviewed documents published between 1990 and 2025 and written in English.

2.2.2 Inclusion and Exclusion Criteria

The inclusion criteria for this study consist of peer-reviewed journal articles, conference proceedings, and book chapters indexed in the Scopus database. Selected studies must explicitly address student self-assessment within educational contexts. In addition, only publications written in English and published between 1990 and 2025 are included to ensure comprehensive coverage and relevance to the development of research in this field. The exclusion criteria comprise studies that are not related to education, as well as non-scholarly documents such as editorials, notes, and other

non-academic publications. Studies focusing exclusively on teacher assessment without incorporating elements of student self-assessment are also excluded. Furthermore, duplicate records identified during the screening process are removed to maintain the accuracy and reliability of the review.

Research data was obtained from the Scopus database, which was selected because it is a reputable scientific publication database widely used in bibliometric research. Data collection was conducted in November 2025, as presented in Table 1.

Table 1. Scientific Publication Data From Scopus On Self-Assessment

Description	Results
Main Information about the Data	
Time span	1990:2025
Sources (Journals, Books, etc)	111
Documents	169
Annual Growth Rate	
Average Document Age	9.07
Average citations per document	16.05
References	0
Document Contents	
Keywords Plus (ID)	526
Author's Keywords (DE)	511
Authors	
Authors	496
Authors of single-authored documents	28
Authors Collaboration	
Single-authored documents	29
Co-Authors per Document	3.02
Percentage of international co-authorships	12.43
Document Types	
Articles	150
books	1
book chapters	3
conference paper	13
reviews	2

The bibliometric analysis indicates that research on student self-assessment in educational contexts spans a substantial publication period, from 1990 to 2025, encompassing 169 documents published across 111 sources, including journals, books, and conference proceedings. These figures demonstrate that the topic of self-assessment has sustained scholarly attention for more than three decades, reflecting continuous and consistent development. The annual publication growth rate of 5.25% suggests a moderate upward trend, implying that the theme remains relevant and continues to evolve, particularly in relation to innovations in educational assessment and reflective learning practices.

The average document age of 9.07 years indicates that the literature in this area remains relatively current, despite foundational studies dating back to the early 1990s. This suggests that research on self-assessment has experienced notable advancement over the past decade, particularly in connection with the rise of formative assessment, self-regulated learning, and the integration of digital technologies in educational settings. Furthermore, the average of 16.05 citations per document reflects a relatively high level of scholarly impact, underscoring the influence of self-assessment research on the enhancement of reflection-based learning quality.

In terms of content, the analysis identified 526 Keywords Plus and 511 Author Keywords, indicating the extensive breadth and thematic diversity within the existing literature. The large number of keyword variations demonstrates that research on student self-assessment is approached from

multiple perspectives—pedagogical, psychological, and technological—and applied across different educational levels, ranging from secondary to higher education.

With respect to authorship, a total of 496 researchers contributed to the publications included in the analysis. Of these, 29 documents were single-authored, while the remainder resulted from collaborative work. The average of 3.02 collaborators per document suggests that research in this area is predominantly collaborative, involving cross-institutional and cross-disciplinary partnerships. However, the level of international collaboration, at 12.43%, remains relatively low to moderate, indicating that most studies are conducted within national or institutional boundaries. This condition highlights significant opportunities to strengthen international research networks focusing on self-assessment across diverse educational and cultural contexts.

In terms of publication types, the majority of works analyzed were journal articles (150 documents), followed by conference proceedings (13 documents), book chapters (3 documents), and a small number of literature reviews (2 documents). This distribution suggests that research on self-assessment is primarily disseminated through peer-reviewed journals, reflecting the field's maturity and recognition within the academic community. The predominance of journal articles further indicates a high degree of methodological and empirical development, particularly in research focused on the implementation of self-assessment practices across various educational settings.

The search keywords were identified through a brainstorming process and preliminary screening of relevant literature, and these keywords are presented in Figure 2.

Overall, these results illustrate that research on student self-assessment shows consistent growth, active international collaboration, and strong scientific contributions. This topic has evolved from a mere academic evaluation instrument to a holistic approach in 21st-century education that supports learning autonomy, metacognition, and technology integration in the learning process.

2.3 Data Analysis Techniques

Bibliometric analysis has emerged as a crucial tool for measuring the scientific output of various scientific items (e.g., papers, authors, keywords, journals, institutions, and countries) in any field of research and examining how the intellectual, social, and conceptual structure of the relevant field has developed over time based on the relationships and interactions between these items [14]. The analysis was conducted in two stages:

It involves processing metadata to identify: Annual publication trends, Most productive authors, Countries and institutions with the largest contributions, Leading journals/publication outlets, Most cited articles, Patterns of author and country collaboration, Most dominant keywords in research. This analysis was performed using the following software: RStudio (bibliometrix package) for bibliometric statistics and visualizations, VOSviewer for network mapping and clustering, and Microsoft Excel for additional data processing and visualizations. VOSviewer (version 1.6.19) serves as robust software that facilitates the creation of bibliometric maps derived from network data. This software offers visualizations and exploration capabilities for these maps [15]. The mapping techniques used include: co-citation analysis, co-authorship analysis, bibliographic coupling, and keyword co-occurrence mapping. To avoid bias due to the large number of authors in a single article, the fractional counting approach was used.

This stage aims to explore the focus of the research theme, the direction of previous research, and opportunities for future studies through in-depth reading of articles in the main research cluster. Content analysis is carried out on *core documents* that have a high citation frequency and occupy key clusters of keyword mapping results.

3. Results and Discussion

3.1 Results

The results of the Co-citation analysis, Co-authorship analysis, Bibliographic coupling, and Keyword co-occurrence mapping can be seen in Figure 1.

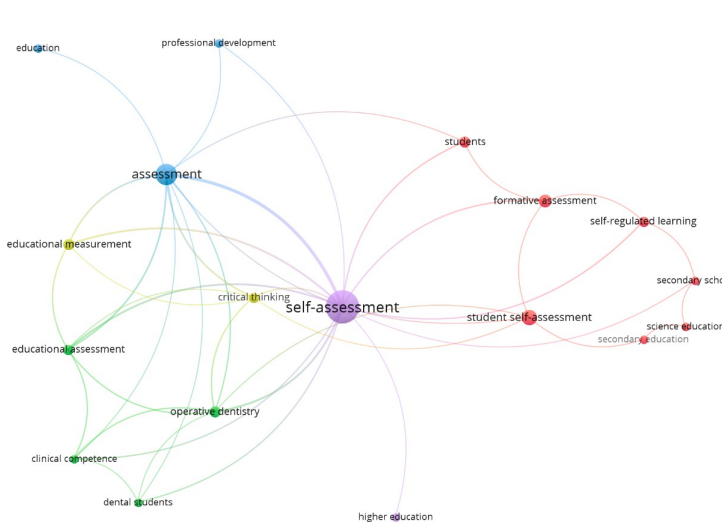


Figure 1. Keyword network visualization (co-occurrence network)

The keyword network visualizations (co-occurrence network) shows that the term "*self-assessment*" occupies a central position with extensive connections to a number of important topics in the field of education, indicating that this concept is central to research related to student self-evaluation. The large node for *self-assessment* indicates the high frequency of occurrence of this keyword, while also reflecting its role as the main connecting node between various fields of research focusing on the development of student learning evaluation and competence.

The network is divided into five thematic clusters with different colors, each reflecting intersecting research sub-themes. The red cluster focuses on *student self-assessment*, *formative assessment*, *self-regulated learning*, *science education*, *secondary education*, and *secondary schools*. This cluster illustrates the research focus linking self-assessment with reflective learning processes at the secondary education level, particularly in the context of *science education*. The strong link between *formative assessment* and *self-regulated learning* shows that *self-assessment* is considered a learning strategy that supports learning independence, self-awareness, and student responsibility for their learning process.

The green cluster includes keywords such as *educational assessment*, *educational measurement*, *clinical competence*, *operative dentistry*, and *dental students*. This indicates that some research is still dominated by the field of professional education, particularly medicine and dentistry, with a focus on developing valid assessment instruments to measure clinical competence. This theme reinforces the position of *self-assessment* as a reflective and formative tool in professional competency-based education.

The blue cluster connects *assessment*, *education*, and *professional development*, indicating a research direction that highlights the relationship between self-assessment and the professional development

of teachers or educators. This theme emphasises that *self-assessment* is not only relevant to learners but also to educators in the context of reflecting on teaching practices and improving professionalism.

Furthermore, the yellow cluster focuses on *critical thinking* and *educational measurement*, indicating researchers' attention to measuring critical thinking skills that can be improved through *self-assessment* practices. This confirms that self-evaluation not only plays a role in monitoring learning outcomes but also as a means of fostering students' reflective and analytical thinking skills.

The purple cluster links *self-assessment* with *higher education*, indicating that most research is still rooted in the context of higher education, both for students and prospective professionals. However, the connection between the red and purple clusters shows a shift in research interest towards the context of secondary education, where the concept of *student self-assessment* is beginning to be integrated into competency-based curricula and formative assessment.

Overall, the network structure demonstrates that research on self-assessment has evolved into a multidisciplinary field encompassing pedagogical, psychological, and professional dimensions. Recent trends indicate a broadening of research contexts from higher education to secondary education, alongside the increasing integration of self-regulated learning and formative assessment as key theoretical foundations. These developments open promising avenues for future research, particularly in designing digital and artificial intelligence (AI)-based self-assessment models that can be implemented across educational levels—including primary and secondary schools—to support adaptive and reflective learning in the digital era.

In general, the findings of this descriptive analysis show that research on student self-assessment in education continues to grow positively, with a strong concentration in higher education while exhibiting significant potential for broader adoption in primary and secondary contexts. The relatively limited level of international collaboration offers a strategic opportunity to enhance global academic impact and enrich cross-cultural perspectives on student self-assessment, especially amid ongoing digital transformation and the expansion of technology-supported independent learning.

3.1.1 What are the most dominant themes and keywords, and how have they evolved thematically?

The results of the Thematic Map are visualizations in bibliometric analysis used to identify and group the main themes (topics/themes) in a field of research based on relevance (centrality) and level of development (density), as shown in Figure 2.

The *thematic map* illustrates the conceptual structure of research on *student self-assessment* with reference to two main dimensions: *centrality* (the level of relevance of the theme to the overall field) and *density* (the level of development or depth of research on the theme). Based on the position of the theme in the four main quadrants, the direction and maturity of research can be identified for each theme group.

In the lower right quadrant (*Basic Themes*), it can be seen that themes such as *self-assessment*, *assessment*, *student self-assessment*, *science education*, *secondary education*, and *dental education* are the main foundations of research in this field. These themes have a high level of relevance, but their level of development is still moderate. This indicates that research on *self-assessment* plays a central role as the basis for further research, especially in the context of secondary education and health professions. The dominance of the keywords *science education* and *secondary education* also indicates that the application of *student self-assessment* is beginning to spread to the context of public schools, no longer limited to higher education, as in the field of *dental education*, which was previously the most studied.

Furthermore, the upper right quadrant (*Motor Themes*) displays the most dynamic and develop-

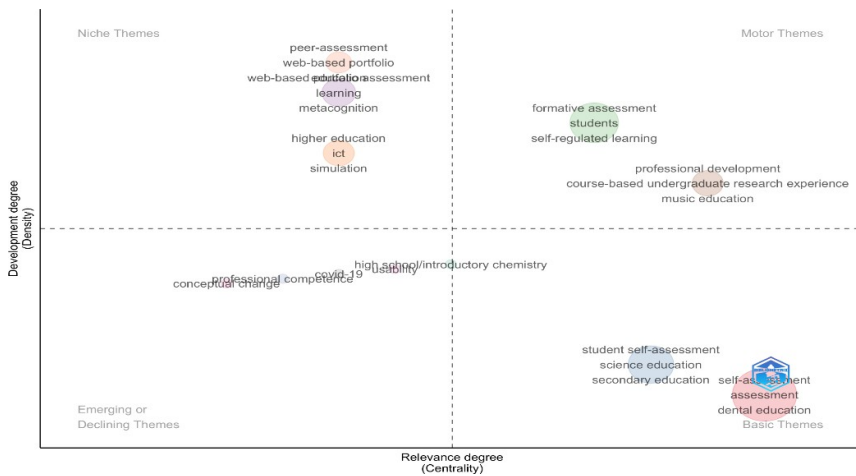


Figure 2. Thematic Map on self-assessment

ing themes, such as *formative assessment*, *self-regulated learning*, *students*, *professional development*, *course-based undergraduate research experience*, and *music education*. These themes have a high level of relevance and density, indicating that they are the main focus of contemporary research that is undergoing theoretical and practical expansion. The link between *formative assessment* and *self-regulated learning* reinforces the role of *self-assessment* as a reflective learning strategy that encourages student independence in learning. Meanwhile, the emergence of *professional development* and *music education* indicates an increasingly diverse direction of research, covering teacher professional development and the application of *self-assessment* in the arts and non-STEM education.

In the upper left quadrant (*Niche Themes*), themes such as *peer assessment*, *web-based portfolios*, *educational assessment*, *learning*, *metacognition*, *higher education*, *ICT*, and *simulation* were found. These themes have a high level of development but narrower relevance, meaning that research in these areas tends to be specialized and in-depth among certain circles. The focus on *peer assessment* and *web-based portfolios* indicates a growing research interest in digital and collaborative assessment, in line with developments in learning technology. In addition, the link to *metacognition* and *ICT* indicates that research in this field is beginning to integrate digital approaches to enhance *learning awareness* and self-reflection skills through online media.

The lower left quadrant (*Emerging or Declining Themes*) includes themes such as *conceptual change*, *professional competence*, *COVID-19*, and *high school/introductory chemistry*. These themes have low relevance and development levels, indicating that studies in this area are still in their early stages or beginning to decline in attention. However, the presence of *COVID-19* shows the emergence of a new context in the use of *self-assessment* during online learning, especially during the pandemic, which could be a starting point for further research exploration on post-pandemic digital assessment.

Overall, the *thematic map* indicates that research on *student self-assessment* is entering a phase of diversification and innovation. Foundational themes such as *self-assessment* and *science education* continue to serve as essential conceptual bases, while areas including *formative assessment*, *self-regulated learning*, and *professional development* function as key drivers of emerging research directions. Current trends also reveal a shift toward interdisciplinary domains—such as *educational technology*, *metacognition*, and *web-based learning*—which highlight the increasingly central role of digital tools in expanding the implementation of *self-assessment* across different educational levels.

These developments open substantial opportunities for future research, particularly in integrating

AI-based assessment systems, enhancing *metacognitive feedback mechanisms*, and applying *reflective assessment approaches* in primary and secondary education. Such advancements have the potential to strengthen *independent learning practices* and improve *assessment literacy* within the digital era. The themes of this evolution are presented in Figure 3.

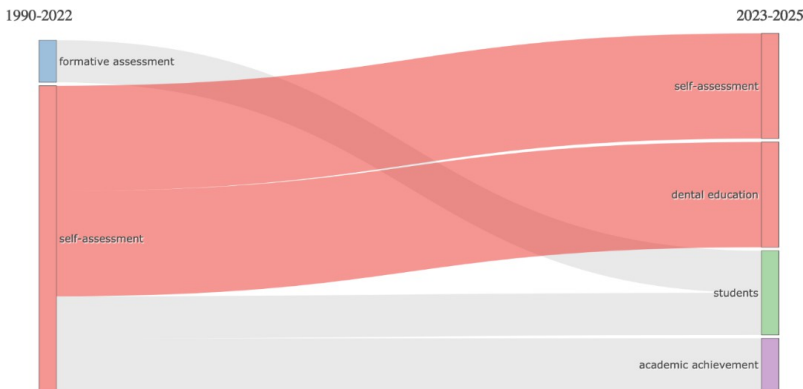


Figure 3. Thematic Evolution Map of Self-Assessment

The *Thematic Evolution Map* illustrates the development and transformation of research themes on *self-assessment* between 1990 and 2025, showing a shift in focus from conceptual contexts towards practical application in education. In the early period (1990–2022), the dominant themes were *self-assessment* and *formative assessment*. This theme indicates that research in the early phase focused more on developing the concept of self-evaluation as part of formative assessment, with a theoretical orientation towards increasing learners' learning awareness and self-reflection. *Formative assessment* plays an important role in shaping the rationale that assessment is not merely a tool for measuring learning outcomes, but also a means of strengthening the process of *independent learning* and reflective decision-making by students.

Entering the 2023–2025 period, the literature shows a noticeable diversification and consolidation of more specialized themes. The theme of *self-assessment* continues to serve as the primary focus, demonstrating the sustained consistency and high relevance of this topic within global scholarship. However, several new themes have emerged—such as *dental education*, *students*, and *academic achievement*—reflecting an expansion of research contexts into professional education and empirical applications in higher education.

The prominence of *dental education* further suggests that a significant portion of recent studies continues to originate from health-related fields, particularly dentistry and medicine, where self-assessment is widely employed to evaluate students' clinical skills and *professional competencies*.

The themes of *students* and *academic achievement* that emerged in the latest phase signify a shift in the focus of research towards the general context of student learning. This shows that researchers are beginning to link *self-assessment* practices with learning outcomes, *learning independence*, and *metacognitive skills* at both school and higher education levels. This evolution points to a new direction in research towards *evidence-based learning assessment*, where *self-assessment* is positioned as an important factor in improving academic achievement through reflection and *self-feedback*.

Thus, this thematic evolution structure illustrates three important layers of development. First, the *conceptual phase* (1990–2010) emphasized *formative assessment* as a basic theory. Second, the *implementative phase* (2011–2020) focused on the application of *self-assessment* in professional fields such as medicine and higher education. Third, the *integrative phase* (2021–2025) indicates a new direction for research towards *reflection-based learning*, *academic achievement*, and *21st-century skills* that prioritise *student agency* and *self-regulated learning*.

Overall, these results confirm that *self-assessment* research has evolved from the concept of *formative evaluation* to more contextual and outcome-based practical applications. Recent trends show great potential for further research in general education, particularly in the development of artificial intelligence (AI)-based *digital self-assessment systems* to support reflective assessment and personalised learning in the era of digital transformation in education.

Thematic trend analysis shows that research on *student self-assessment* has undergone significant evolution in the last five years (2020–2025), moving from the conceptual realm towards technology-based application and improved learning outcomes. During this period, there were three major interrelated themes of development: strengthening the theoretical foundation, diversifying the context of application, and integrating with technology and academic achievement.

First, the trends of *formative assessment* and *self-regulated learning* have become the main theoretical foundations that continue to develop. This theme emphasizes that *self-assessment* not only functions as a tool for self-evaluation, but also as a reflective learning strategy that strengthens *self-regulation*, *metacognitive awareness*, and student responsibility for the learning process. This shift reflects a paradigm shift from *assessment of learning* to *assessment for learning* and *assessment as learning*, where students actively play a role as evaluators in their own learning process.

Second, the current phase (2023–2025) shows a strong integration between *self-assessment* and the themes of *academic achievement* and *digital education*. The emergence of a link between self-assessment and academic achievement indicates a shift in research direction from mere exploration of concepts to *evidence-based implementation*. Researchers have begun to explore how *self-assessment* practices contribute tangibly to improvements in student learning outcomes, motivation, and *self-efficacy*. On the other hand, an increase in research on *ICT*, *web-based assessment*, and *AI literacy* indicates the integration of digital technology in the self-assessment process, which is in line with the development of *learning analytics* and AI-based learning systems.

Overall, the trend in *student self-assessment* research during 2020–2025 is moving towards a more integrative, reflective, and digital direction. This topic has transformed from a mere evaluation technique into an adaptive learning strategy that utilizes technology to improve students' *metacognitive competencies* and achievements. Going forward, there are vast research opportunities in the development of *AI-assisted self-assessment models*, the integration of *self-assessment* with *learning management systems (LMS)*, and the application of self-assessment in primary and secondary education to strengthen students' *reflective literacy* and independent learning in the digital age. The conceptual structure of self-assessment can be seen in Figure 4 below:

The *conceptual structure map* provides an overview of the interrelationships between concepts and keywords in research on *student self-assessment* in education. This analysis was conducted using the *Multiple Correspondence Analysis (MCA)* method, which grouped the keywords based on their thematic proximity and frequency of occurrence in the literature. This map shows that *self-assessment* research is divided into two main dimensions (Dim 1 = 70.2%, Dim 2 = 16.7%), which together explain more than 86% of the conceptual variation in this field of research — indicating a strong and interconnected thematic structure.

In Dimension 1, research themes move from pedagogical and reflective contexts on the left to pro-

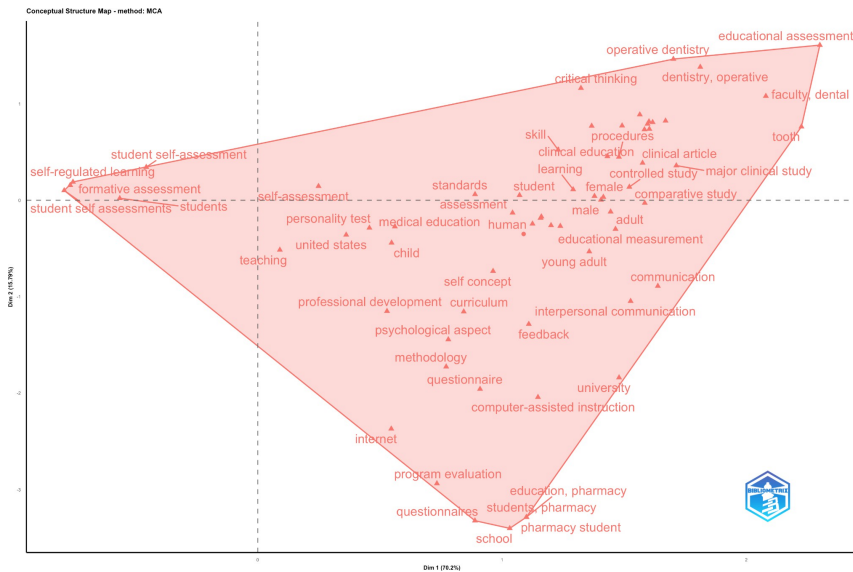


Figure 4. Conceptual structure map of self-assessment

professional and clinical contexts on the right. On the left, there are keywords such as *student self-assessment*, *self-regulated learning*, *formative assessment*, and *students*, which represent a research focus on reflective, metacognitive, and participatory learning. This group describes a new educational paradigm that places students as active participants in evaluating their learning processes and outcomes. This approach is often associated with the development of *21st-century skills*, such as *critical thinking*, *self-awareness*, and *learning responsibility*.

Meanwhile, on the right side of the map, themes such as *educational assessment*, *operative dentistry*, *dental education*, *clinical education*, *educational measurement*, and *critical thinking* show the dominance of research in the context of professional and health education. The main focus is on the application of *self-assessment* to measure *clinical skills*, the validity of *evaluation instruments*, and the improvement of the performance and professionalism of medical and pharmacy students. Themes such as *faculty dental*, *comparative study*, and *clinical competence* reinforce the position of *self-assessment* as part of practice-based *competency assessment* and clinical simulation.

In Dimension 2, the vertical axis illustrates the distinction between research that emphasizes methodological and psychological approaches (lower area) and research that focuses on reflective learning and technology-based assessment (upper area). The lower portion contains keywords such as methodology, questionnaire, psychological aspect, program evaluation, education pharmacy, and internet. This cluster reflects studies oriented toward the development of measurement instruments, questionnaire validation, and the exploration of affective and metacognitive dimensions of self-assessment. The presence of computer-assisted instruction further indicates the integration of digital technologies as tools to support self-assessment processes.

Conversely, the upper section of the map features keywords such as peer assessment, feedback, communication, and interpersonal communication, representing collaborative and reflective learning approaches. This configuration suggests that self-assessment is frequently combined with peer feedback and interpersonal interaction to reinforce the social components of reflective learning.

Overall, the MCA map demonstrates that research on student self-assessment in education possesses

a multidimensional conceptual structure connecting pedagogical, psychological, professional, and technological aspects. Current trends indicate a shift toward integrating self-assessment with digital technology and reflection-based learning. Given the growing attention to formative assessment and AI-assisted learning, future research has substantial potential to examine how self-assessment can be integrated with learning analytics systems and Learning Management Systems (LMS) to support autonomous and adaptive learning.

3.2 Discussion

3.2.1 Trends in research development regarding self-assessment

Visualizing the relationship between keywords, authors, and research themes—particularly in the context of professional education and dentistry—is an important aspect of understanding the dynamics of academic discourse in this field. The dominance of themes such as clinical competence, formative assessment, and self-reflection confirms the increasing emphasis on pedagogical strategies that are able to adapt to the needs of learners in a dynamic environment. Recent trends show the integration of technology and artificial intelligence (AI) in educational practice, supporting a more personalized approach to enhance the learning experience. The use of three-field plots is important for illustrating the interconnection between keywords, main authors, and research themes. Similar visualisations have been applied in various research fields. For example, although [16] focused on 3D printing technology, their research emphasised how such visual techniques can facilitate understanding of the relationship between authors, countries, and research areas, which is relevant in the context of educational research. This methodological approach allows researchers to visually capture research output trends and thematic developments in specific fields such as dentistry and education. In addition, the integration of technology in educational practice, particularly through AI, is evident in recent literature. [17] present a bibliometric method for identifying research trends related to specific fields, including the application of technology in education. However, existing references have not specifically verified the direct application of AI in educational strategies. [18] also explore how strategic educational planning evolves with technological advances, although their research is not directly related to the use of AI in dentistry. Furthermore, self-assessment plays an important role in professional education, particularly in encouraging reflective practice among dental practitioners.

The role of formative assessment supports continuous self-evaluation and competency improvement. Although [19] discuss the flipped learning method in engineering education, their bibliometric analysis may reflect general trends in self-reflection practices and assessment methods, which are essential for clinical training in various disciplines. In conclusion, the synthesis of various bibliometric analyses confirms the complex relationship between keywords, authors, and research themes in the context of professional education. Research trends in education, particularly in dentistry, show a shift towards adaptive learning strategies that leverage advances in AI to improve pedagogical effectiveness and self-assessment practices. Looking ahead, particularly in the period 2023–2025, the integration of AI technology in self-assessment practices is a major trend. Research indicates that AI can significantly improve the self-assessment process by providing real-time feedback and personalised learning experiences tailored to individual weaknesses [20] [21]. Thus, AI not only helps assess clinical skills, but also fosters self-regulated learning habits—an important skill for long-term success in the health professions [22].

This potential of AI is reinforced by the availability of digital tools that support self-monitoring, thereby shaping a learning culture that emphasizes competence and continuous improvement. Furthermore, the relationship between self-assessment practices, academic achievement, and self-regulation is also confirmed in various studies, which show that students who engage in reflective self-assessment tend to excel academically and develop a strong professional identity [23] [24]. The

integration of reflective practices into the dental curriculum can result in a better alignment between self-perception and actual performance, thereby bridging the often-reported gap between student and instructor assessments [25] [26]. The thematic shift depicted in this discourse underscores the urgency for dental educators to adopt innovative methodologies that integrate AI-based tools for effective self-assessment practices, thereby ensuring students possess the competencies necessary to succeed in an ever-evolving digital landscape [20] [21]. By creating an environment that supports self-regulation and reflective practice, future dental practitioners will not only refine their clinical skills but also contribute to improving the overall quality of healthcare services.

In the context of research on self-assessment in education, the Adaptive Conceptual Model (ACM) concept map illustrates that two primary dimensions shape the field: the pedagogical–reflective dimension and the professional–clinical dimension. Methodological and psychological themes are positioned beneath these core dimensions, while reflective and collaborative themes are situated above them. This structure indicates a layered conceptual framework, in which foundational methodological and psychological aspects support higher-order reflective and collaborative learning processes.

Recent research trends show that the integration of digital technology, feedback mechanisms, and artificial intelligence (AI) in adaptive and self-directed learning is becoming an increasingly prominent focus. The incorporation of technology—particularly AI—into the self-assessment process has been demonstrated to significantly influence students' learning strategies. AI enhances learners' self-awareness by providing personalized feedback, thereby enabling students to reflect more deeply on their learning processes [27] [28]. For example, AI can provide real-time feedback that encourages students to evaluate their progress and identify areas for improvement, which is important in the development of metacognitive awareness [29] [30]. This is in line with findings showing that the use of technology-based feedback supports students' metacognitive strategies, improving self-regulation skills in the learning process [28] [31].

Technology-supported self-assessment can also be conducted through more innovative evaluation tools, such as AI-based question systems designed to enhance user experience in the context of digital learning [21]. These systems not only automate assessment but also provide in-depth feedback, which can help students understand their mistakes and develop better learning strategies [32]. Thus, the presence of technology in self-assessment not only increases the efficiency of the learning process but also supports students in achieving learning independence. Furthermore, feedback from AI can enhance students' reflective experiences in a broader educational context, including medical and other professional contexts. Research shows that students involved in simulations and debriefings using AI technology show an increase in the accuracy of their self-assessments as they gain experience (Braund *et al.*, 2024). This indicates that experiences gained through technology-based learning can improve students' ability to effectively assess and reflect on their clinical practices [33]. In conclusion, developments in the use of digital technology, feedback, and AI in education are expected to bridge the two main dimensions of self-assessment, namely pedagogical-reflective and professional-clinical. Through efficient technology integration, students can more easily achieve adaptive and independent learning, which adds value to their overall learning process.

3.2.2 What are the most dominant themes and keywords, and how have they evolved thematically?

Keyword co-occurrence networks are an important tool for assessing the interrelationships between concepts and themes in a particular field of research. In the domain of education, the term "self-assessment" emerges as a central node, indicating its significant connection to various other educational topics. This centrality confirms the role of self-assessment in promoting pedagogical strategies, learner engagement, and competency-based frameworks in the context of education. Several studies reinforce the dominance of self-assessment in educational research. For example, [34] emphasise the use of competency-based evaluation in teacher professional development, highlighting

the importance of self-assessment as a core competency for educators.

The integration of self-assessment encourages reflective practices among teachers, thereby improving teaching effectiveness and their ability to adapt based on self-evaluation results. Furthermore, a bibliometric analysis conducted by [35] reveals the link between self-assessment and technological pedagogical content knowledge (TPACK), making it an important element in digital learning environments. In addition to its relationship with teacher efficacy, keyword co-occurrence analysis also provides insights into the collaborative nature of educational practices related to self-assessment. Findings from research led by [36] show how self-assessment practices are used by students in clinical training, forming a feedback mechanism that improves learning outcomes.

This study presents a co-occurrence network that visually depicts the evolution of the theme of self-assessment. Furthermore, the bibliometric framework across various studies confirms the growing attention to self-assessment in educational discourse. For example, an analysis by [37] highlights sustainable digital pedagogy, where self-assessment plays a crucial role in shaping learning autonomy and skill acquisition. These findings align with the higher education context, particularly as self-assessment methodologies evolve alongside technological advances in learning environments. Finally, the thematic evolution related to self-assessment reflects broader academic efforts to understand its transformative potential in educational practice. [38] explore the factors that influence the success of online learning, identifying self-assessment as a key component closely related to digital learning techniques and reflective practices. This complex network of relationships shows that self-assessment is not merely a stand-alone concept, but a central feature that influences various dimensions of education, from competency frameworks to technology integration.

Conclusion Keyword co-occurrence network analysis shows that "self-assessment" is an important concept connected to various themes in education, including pedagogy, technology integration, and reflective practices. The comprehensiveness of existing research confirms the role of self-assessment as an integral part of educational success and transformation.

In recent years, research on self-assessment has shown significant growth in various fields, reflecting its increasing importance in both clinical practice and educational settings. This analysis synthesizes trends, patterns of collaboration, and dominant themes related to self-assessment, utilizing bibliometric insights and thematic analysis. Global Publication Trends Data from various studies show a significant increase in publications related to self-assessment, especially after 2018, in line with broader trends in the fields of health and education. For example, a study by [39] used tools such as Scopus Analyzer and VOSviewer to reveal a peak in publication volume in 2020, coinciding with the COVID-19 pandemic. This surge can be attributed to an increased focus on self-management in healthcare services, as seen in a systematic review by [40], which highlights how self-tracking technology encourages collaboration between patients and healthcare providers. The methodology of self-assessment is now more widely documented, as seen in the increasing number of publications recommending the use of self-assessment tools in various sectors, particularly in personal health management. Collaboration Patterns International collaboration has become a hallmark of research on self-assessment. Bibliometric studies show that global joint efforts are increasingly important for advancing knowledge in this field. For example, [41] note that collaborative results often correlate with higher citation rates, indicating increased visibility and impact of research.

Furthermore, a bibliometric landscape exploration by [42] discovered a citation practice network that indicates reciprocal influence and knowledge exchange between countries, thereby improving the quality of research on walk-in healthcare services. These patterns of collaboration are important for bridging knowledge gaps and improving the effectiveness of self-assessment in various contexts, ranging from clinical settings to education. **Dominant Themes in Research** The thematic landscape related to self-assessment shows a multifaceted approach, covering both qualitative and quantita-

tive research dimensions. For example, [43] identifies the integration of natural language processing (NLP) in analyzing medical students' self-assessments, highlighting the need to process narrative data efficiently to improve educational outcomes. This focus on reflective practice is crucial as it promotes self-awareness and strengthens learning accountability among students. Beyond education, the implications of self-assessment in healthcare management are profound. Research by [44] proposes a self-assessment tool aimed at improving primary care services, promoting self-assessment as a strategy for enhancing clinical practice.

The development of this tool emphasizes the importance of creating a framework that can be adapted to various professional contexts, while reinforcing the importance of empirical evidence in shaping effective assessment models. Additionally, another emerging theme involves the role of psychological empowerment in self-assessment, particularly in nursing, as documented by [45], which highlights the relationship between psychological factors and self-evaluation in the health profession. Conclusion Overall, the growing body of research on self-assessment reflects its important role in improving healthcare practice and education. Trends indicate growing interest, particularly due to global collaboration that drives the development of self-assessment methodologies and frameworks across various fields.

Exploration of self-assessment in the context of education shows its vital role as a research theme, particularly in the areas of formative assessment, self-regulated learning (SRL), and professional development. Self-assessment helps learners recognize their strengths and weaknesses, enabling them to actively engage in their learning process—a crucial aspect of effective formative assessment practices [46] [47]. The continuous interaction between self-assessment and formative assessment creates adaptive feedback that enhances learning experiences and outcomes. [46] note that guided self-assessment in competency-based medical education reflects effective formative assessment management and emphasizes the need for training in self-assessment strategies. Furthermore, self-regulated learning (SRL) is closely related to self-assessment, functioning as a catalyst that encourages learners to take control of their learning process. Research shows that students equipped with self-assessment tools demonstrate better self-monitoring and self-regulation skills, which are essential for achieving deeper learning outcomes [48]. For example, [48] showed that immersive learning environments that integrate formative assessment can improve students' metacognitive and self-reflective skills.

These findings are in line with current trends that encourage the integration of digital technology in assessment, thereby supporting self-regulatory behavior in learners [49]. Emerging themes in this discourse include the use of digital tools such as web-based portfolios, which have been shown to support self-assessment, although they also present challenges related to student stress and the need for guidance [50]. Although digital portfolios can enhance learning and professional development, careful implementation and ongoing support from educators are necessary to optimize their benefits, particularly in managing students' expectations and emotional responses to their assessment process [50]. Furthermore, significant advances in artificial intelligence (AI) in education present new opportunities, particularly in improving assessment strategies [30] [51].

Research shows that AI tools can strengthen formative assessment practices through real-time feedback and the development of students' metacognition, thereby potentially transforming traditional educational paradigms [52]. However, challenges such as over-reliance on technology and the need for educators to engage critically with AI-based assessment must still be carefully anticipated [1]. This discussion emphasizes the importance of continuous professional development for educators to adapt effectively in an AI-integrated educational landscape. In conclusion, the synthesis between self-assessment, formative assessment, self-regulated learning, and technology integration points to a dynamic and evolving educational landscape. The interconnection between these themes indicates that the implementation of appropriate assessment strategies, reinforced by technological advances

and reflective processes, can significantly improve learners' experiences and outcomes in various educational contexts.

The evolution of thematic trajectories in self-assessment research reveals a significant shift from early conceptual frameworks grounded in formative assessment toward more practice-oriented applications, particularly within professional education such as dentistry. This development is characterized by a growing connection between self-assessment, academic performance, self-regulated learning, and digital technology, accompanied by an increasing emphasis on the integration of artificial intelligence (AI) as a transformative element in contemporary learning environments.

Recent studies have examined self-assessment more deeply in relation to its effectiveness for evaluating student performance in dental education. Findings indicate that dental students frequently struggle to assess their abilities accurately, often demonstrating a tendency to overestimate their performance, which may present risks to their clinical competence [53] [54]. Therefore, the need for structured self-assessment training is crucial, as it plays a role in promoting self-directed learning among future professionals [55]. Furthermore, an educational environment that encourages reflection on personal performance, including peer evaluation and self-assessment, has been shown to correlate with increased understanding and skill development [56].

The emergence of AI and its application in education, particularly in self-assessment, is a highly promising area for developing countries to explore. By adopting technology-based educational tools, researchers and educators in Indonesia can increase collaborative opportunities and leverage international partnerships that ultimately enrich the local educational environment [57]. This trend is reflected in recent studies exploring how educators in Indonesia utilise AI technology to improve student learning outcomes and self-regulation practices [58]. Furthermore, a bibliometric analysis of scientific publications confirms that although high-income countries remain dominant in producing educational research, there has been a shift in participation from other parts of the world. This indicates a growing global concern for inclusivity and methodological diversity in education [59]. This evolving research environment calls for stronger cooperation across geographical boundaries, particularly in the ASEAN region, to build a solid community capable of comprehensively addressing educational challenges [60]. In conclusion, the evolution of self-assessment research shows an important intersection of opportunities for countries such as Indonesia to strengthen their contribution through technology integration and broader collaboration networks. By utilising the resources and best practices of developed countries, Indonesia can pave the way towards more effective and inclusive educational practices, especially in the field of self-assessment and beyond.

4. Conclusion

Based on the first research objective—analyzing trends in student self-assessment research—the findings indicate that studies on self-assessment have shown consistent growth from 1990 to 2025, with a notable increase over the past decade. The concept of self-assessment has progressed from a basic evaluative mechanism to a reflective pedagogical strategy that contributes to the enhancement of self-regulated learning, metacognition, and student autonomy. However, within the context of Islamic Religious Education (IRE), research on self-assessment remains relatively limited and has not yet emerged as a central focus. Consequently, evaluation practices in IRE continue to be dominated by conventional, results-oriented models rather than reflective, process-based approaches.

Regarding the second objective—identifying dominant themes and thematic evolution—the study reveals that self-assessment is strongly associated with formative assessment, critical thinking, professional development, and the integration of digital technology and artificial intelligence (AI). The thematic evolution also highlights a shift from conceptual discussions to technologically supported adaptive learning. Nonetheless, spiritual dimensions and Islamic values such as *muhasabah*, *tazkiyah*,

atun nafs, and moral *internalisation* have not been explicitly incorporated into the contemporary self-assessment models currently being developed. This gap presents significant implications for Islamic Religious Education, as self-assessment holds substantial potential to serve as a strategic instrument for cultivating Islamic reflective values, strengthening spiritual awareness, and shaping students' religious character through an evaluative process that measures not only academic outcomes but also attitudes, behavior, and the quality of faith.

The study contributes theoretically by positioning self-assessment within the epistemological framework of assessment in Islamic Religious Education. Methodologically, it provides the first Scopus-based bibliometric mapping of self-assessment research relevant to the IRE context. Practically, it establishes a foundation for the development of reflective and value-based assessment models that align with Islamic educational principles.

This study is limited to Scopus-indexed and English-language publications, which may exclude relevant regional works on Islamic Religious Education. Moreover, bibliometric analysis cannot fully capture the depth of pedagogical insights commonly explored in qualitative research.

Future research should focus on developing empirical self-assessment models grounded in Islamic reflective traditions, such as *muhasabah* and *tazkiyatun nafs*. Further studies are also needed to explore AI-assisted self-assessment tools that integrate spiritual, moral, and cognitive dimensions in Islamic education. Expanding international collaboration, particularly among Muslim-majority contexts, is highly recommended to deepen and diversify the scholarly discourse in this field.

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