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Trends in the development of Fink's taxonomy: a systematic literature review

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ABSTRACT

Fink's taxonomy is a learning model of six interrelated elements that can be used for the development of learning goals and create significant learning. However, there has been limited discussion about the development trend of Fink's taxonomy systematically. This study aims to identify trends in previous research that employed Fink's taxonomy based on countries and current years, as well as the diversity of definitions of Fink's taxonomy. This systematic review follows systematic reviews and meta-analyses (PRISMA) criteria and utilizes three main databases: Scopus, Web of Science, and ERIC. A total of 16 articles met the given criteria, and empirical results report that most studies on Fink's taxonomy were conducted in the United States, with the highest number of articles published in 2020. Furthermore, the diversity of definitions of Fink's taxonomy identified three themes which are producing significant learning, an approach that creates permanent changes in students, and focusing on the affective domain. The findings have significant implications through the introduction and understanding of Fink's taxonomy. This trend can serve as a reference for the ministry of education and other stakeholders in the empowerment of Fink's taxonomy in education. The study can be expanded by introducing new constructs for Fink's taxonomy in the local context.

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1. INTRODUCTION

The educational landscape in a country is constantly evolving and changing in tandem with the modernization of the contemporary world. Such changes necessitate teachers to remain vigilant and employ effective teaching strategies to foster deep and meaningful learning experiences for students. The Fink's taxonomy, developed by L. Dee Fink in 2003, is a cyclical learning model comprising six interrelated elements: foundational knowledge, application, integration, human dimension, caring, and learning how to learn. The need for Fink's taxonomy in the education system is evident in its integrated and student-centered approach, emphasizing the importance of focusing on student development. This approach can assist teachers in creating learning experiences that result in significant learning [1]. Significant learning is considered when there is a lasting change in students' selves through the delivery of knowledge and skills by teachers [2].

Moreover, Fink taxonomy stands out as an alternative to existing taxonomies like Bloom's taxonomy, offering value to teachers due to its emphasis on affective and metacognitive aspects [3]. The cultivation of affective behavior in students can be observed when they demonstrate motivation, interest, and value in learning. Furthermore, understanding Fink taxonomy and incorporating its principles into teaching practices enables teachers to create a learning environment that fosters inquiry, critical thinking, and sustained understanding of concepts [4]. Literature indicates numerous studies conducted on Fink taxonomy from various countries, particularly the United States, the home country of its founder, L. Dee Fink. However, there is still a limited number of studies on Fink taxonomy conducted in Asian countries, including Malaysia [5]. To gain a deeper understanding of Fink taxonomy's development, it is essential for everyone to comprehend trends in past Fink taxonomy studies, such as the frequency of studies by country and year.

Additionally, Fink taxonomy has various definitions, some of which are interrelated, while others are entirely unrelated. This systematic discussion is crucial because the diverse definitions of Fink taxonomy in various research articles can be categorized into several themes based on their similarities. Thus, there is a need to examine the development and diversity of Fink taxonomy definitions systematically by past researchers in studies related to Fink taxonomy. Therefore, this study investigated the trends in the development of research on Fink's taxonomy by country and year, as well as the diversity of definitions of Fink's taxonomy through a systematic literature review. While earlier studies have explored research on Fink's taxonomy, there remains a lack of studies that critically analyze and synthesize the latest development trends on Fink's taxonomy systematically. Therefore, the following objectives led to the conduct of this systematic literature review: i) identifying trends in past research on the application of Fink taxonomy based on the country and study years and ii) identifying the diversity of definitions of Fink taxonomy in previous studies.

2. METHOD

The present investigation utilizes the systematic review of literature (SLR) approach, which is based on document analysis. Research studies that have already been conducted can be systematically gathered, located, and critically analyzed using the SLR approach [6]. Characteristics of the systematic literature review technique by thoroughness, transparency, reprocessing, and a systematic process, with high discipline and focus in presenting reviews that are clear and easily understandable [7]. Fink [8] adds that a systematic review of the literature is a clear, thorough approach to finding, assessing, and compiling previously published research that has been recorded and created by other scholars.

Consequently, the preferred reporting items for systematic reviews and meta-analyses (PRISMA) protocol technique has been adopted for obtaining information regarding Fink taxonomy in this work. In order to assist researchers in designing the essential components of SLR studies, Shaffril *et al.* [9] emphasize the significance of creating customized SLR study protocols or making use of certain guidelines. The PRISMA statement checklist can assist researchers in reporting systematic reviews and assessing their quality. The procedures in the PRISMA flowchart can also illustrate transparency and consistency in producing study reports [10]. The PRISMA flowchart method is well-regarded in reporting systematic literature review studies due to its meticulous and detailed processes, as seen in studies [9], [11]–[14]. The PRISMA flowchart has been utilized to report the four working phases [10], [15] involved as shown in Figure 1, which are: i) phase 1: identification of articles; ii) phase 2: screening of articles; iii) phase 3: determining article eligibility; and iv) phase 4: determining articles that meet final criteria.

2.1. Phase 1: identification of articles

In the first step, the chosen databases-Scopus, Web of Science (WoS), plus the educational resources information center (ERIC). The following databases were selected because scholars frequently use them to conduct systematic literature reviews because they are reputable, open databases that offer highly impactful articles [12]. Scopus and WoS databases can be accessed through off-campus student access facilities provided by the Tun Sri Lanang library, Universiti Kebangsaan Malaysia. According to Mengist *et al.* [11], Scopus is a global database including peer-reviewed articles from across the globe, gathering a wealth of relevant information. The ERIC database was selected for its focus on articles specifically related to education. Subsequently, article searches were conducted using various combinations of keywords, as shown in Table 1. The selection of accurate and relevant keywords is crucial to retrieve articles that align with the study's objectives. The selection of articles referred to several criteria as stated in the Table 2. The chosen articles are within the recent 10-year publication period, from 2014 to 2023. This selection ensures that the articles published in the most recent years reflect current developments and provide the most relevant research data [16]. Selected articles are also in English since most studies on Fink taxonomy are conducted in an international context.

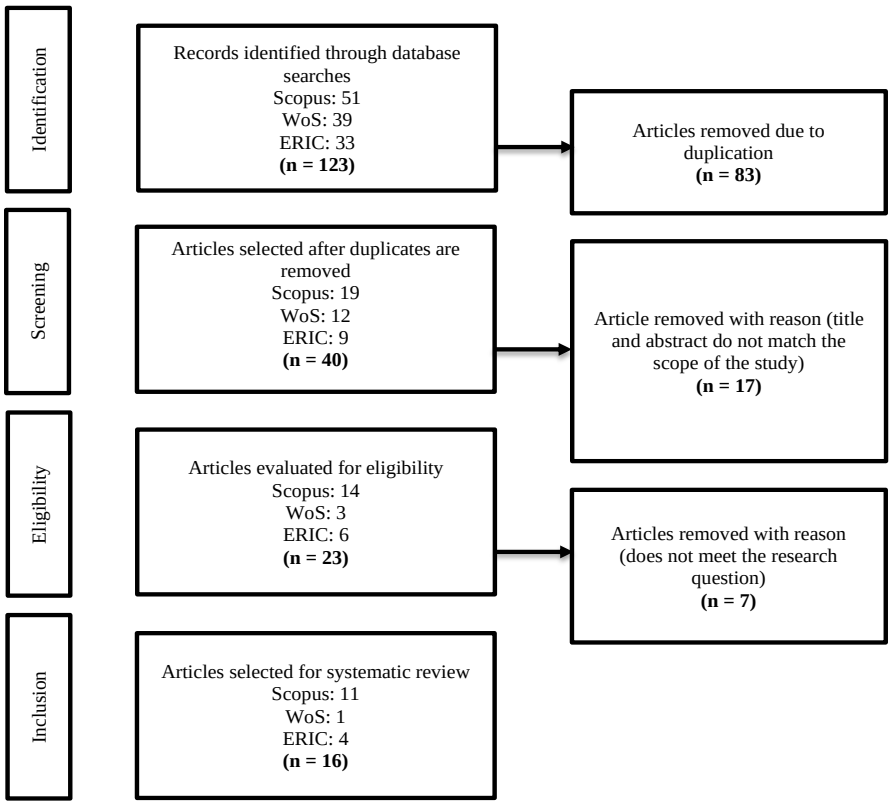

Figure 1. PRISMA flow chart of the article search process

Table 1. Search keywords used according to database

Database	Keywords
Scopus	TITLE-ABS-KEY("Fink's Taxonomy" OR "Taxonomy Fink" OR "Fink's Taxonomy of Significant Learning")
WoS	TS=("Fink's Taxonomy" OR "Taxonomy Fink" OR "Fink's Taxonomy of Significant Learning")
ERIC	Fink's Taxonomy, Fink's Taxonomy of Significant Learning

Table 2. Acceptance and rejection criteria for article selection

Criteria	Inclusion	Exclusion
Year	2014-2023	<2014
Type of reference material	Journal articles (research articles with empirical data)	Proceedings, book, dissertations or theses, review articles, and concept papers
Language	English, Malay	Languages other than English and Malay

Furthermore, the chosen articles are of the research type or journal articles, excluding proceedings, books, dissertations or theses, review articles, and concept papers, as journal articles offer up-to-date information and articulate discussions clearly. Additional criteria considered are articles that have undergone peer review and are available in full text. A combined total of 123 articles were found in the databases that were used; these included 33 papers from the ERIC database, and 39 research papers from the WoS database, plus 51 articles from the database maintained by Scopus.

2.2. Phase 2: screening of articles

The second phase involves the screening process by accepting or excluding articles based on the predefined criteria. Carrera-Rivera *et al.* [6] emphasize that establishing acceptance and rejection criteria before conducting the review is essential to avoid bias. The screening process begins by eliminating duplicate articles across the three selected databases. A total of 83 articles out of the initial 123 were excluded after the first screening process. The screening process continues by downloading 40 articles for further examination and analysis through reading the titles and abstracts to gain an overall understanding of the articles, ensuring they align with the study's scope on Fink taxonomy. Subsequently, 17 articles were excluded in this phase as their titles and abstracts did not match the study's scope, leaving 23 eligible articles for the next phase.

2.3. Phase 3: determining article eligibility

The third phase involves determining the eligibility of articles for selection. In this phase, the content of each of the 23 articles is scrutinized in greater detail. A total of 7 articles were excluded as they did not address the research questions.

2.4. Phase 4: determining articles that meet final criteria

Articles that satisfy the final requirements are identified in the inclusion phase, which is the fourth stage. Total of 16 articles that match the selection criteria are included in this last round and used as the sample for the systematic literature review in this study. Each article was downloaded and managed using Mendeley Reference Manager v2.94.0. Relevant article information, such as title, researcher names, journal names, and publication years, was cross-checked to ensure accuracy. Microsoft 365 Excel software was used to organize and store detailed information about each study, including researcher names, years, countries, titles, definition terms, issues, study findings, and implications.

3. RESULT AND DISCUSSION

The findings from the trend analysis report that research on Fink's taxonomy is predominantly conducted in the United States, with the highest number of articles published in 2020. Furthermore, the diversity of definitions of Fink's taxonomy has identified three themes: i) producing significant learning; ii) an approach that forms lasting changes in students; and iii) focusing on the affective domain.

3.1. Tendency trends of previous studies that conducted Fink's taxonomy by country

Table 3 and Figure 2 present the countries that conducted studies on Fink taxonomy based on the 16 selected articles. Among the countries that have researched Fink taxonomy are the United States, Colombia, Iran, Ireland, Australia, Thailand, the United Kingdom, and Canada. The systematic review indicates that the United States dominates this research with seven publications, accounting for 43.75%, followed by Colombia and Canada, each publishing two articles on the topic of Fink taxonomy. Other countries such as Iran, Ireland, Australia, Thailand, and the United Kingdom each published only one study on the research topic.

Table 3. Research country trends

Country	No. of article	Research
United States	7	[4], [17]–[22]
Colombia	2	[23], [24]
Canada	2	[25], [26]
Iran	1	[27]
Ireland	1	[28]
Australia	1	[29]
Thailand	1	[30]
United Kingdom	1	[31]

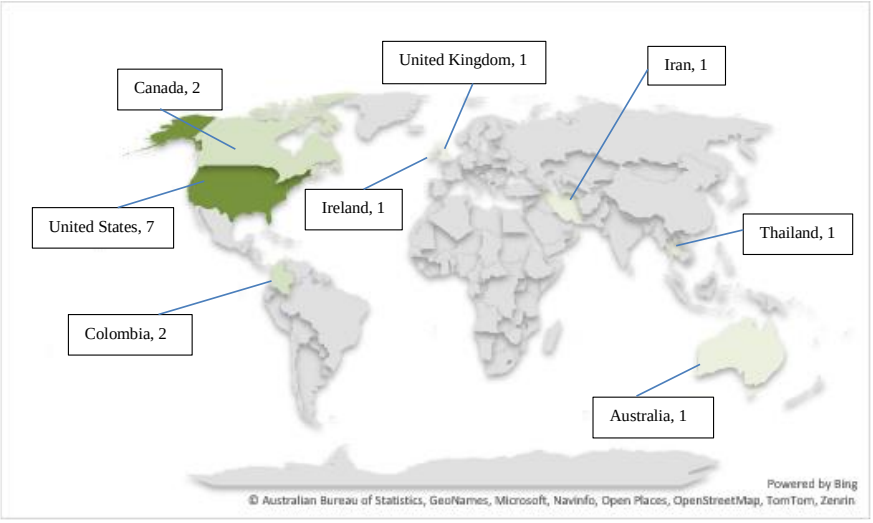

Figure 2. Total number of articles published by country (2014-2023)

3.2. Tendency trends of previous studies conducting Fink's taxonomy based on year of publication

Table 4 and Figure 3 display the number of articles published based on the publication years related to Fink taxonomy. This systematic literature review has limited the articles to those published from 2014 to 2023. The findings reveal that four articles were published in the peak year 2020, three articles each in 2018 and 2021, and two articles each in 2016, 2019, and 2023. A slight decrease occurred in 2021, with only three article publications, and only two article publications were recorded in the database throughout 2023.

Table 4. Past research trends based on year of publication

Year	Number	Research
2016	2	[4], [17]
2018	3	[18], [23], [27]
2019	2	[19], [28]
2020	4	[20], [21], [24], [29]
2021	3	[25], [30], [31]
2023	2	[22], [26]

Figure 3. The total number of article published between 2014-2023

3.3. The diversity of definitions of Fink's taxonomy in previous studies

Table 5 and Figure 4 present the classification of articles based on these three themes. Table 6 illustrates the diversity of Fink taxonomy definitions in the 16 selected articles. Based on the definitions of Fink taxonomy in these 16 articles, the literature review identified three themes in studies conducted on Fink taxonomy: i) producing significant learning; ii) approaches shaping lasting changes in students; and iii) focusing on the affective domain.

Table 5. Classification of articles by theme

No.	Article	Produce significant learning	Approach to parmanent change	Focus on the affective domain
1	[17]			x
2	[4]	x		
3	[18]		x	
4	[23]	x		
5	[27]		x	
6	[19]	x		
7	[28]	x		
8	[24]	x		
9	[20]	x		
10	[29]			x
11	[21]			x
12	[30]		x	
13	[31]		x	
14	[25]	x		
15	[22]			x
16	[26]	x		

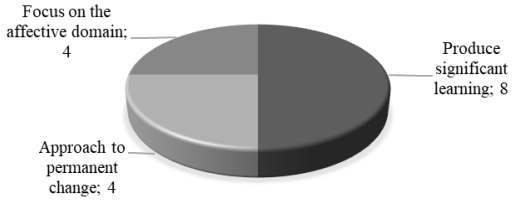

Figure 4. Total frequency of articles by theme

Table 6. Diversity of definitions of Fink's taxonomy in 16 selected articles

No.	Author/year	Country	Content	Definition
1	[26]	Canada	Work-integrated learning and Fink's taxonomy: an "audit" of the success strategies employed by accounting recruits	Conceptual model of learning focusing on high-quality teaching and learning and used to categorize strategies.
2	[22]	United States	Continuing education and developing technologies: a framework for professional development and training in artificial intelligence	A framework of six cyclic principles leading to the development of continuous learning that focuses on both cognitive and affective learning.
3	[25]	Canada	Advancing an instructional approach in teacher education that aims to teach assessment in a gradual and thorough way	Pedagogy of learning that employs six essential types of learning experiences interacting positively to encourage deep learning.
4	[31]	United Kingdom	The development of critical thinking skills amongst undergraduates studying pharmacy in preparation for the evolving pharmacy field	A non-hierarchical, non-linear framework encompassing six critical learning types and a nature of learning that can transcend various types simultaneously and be used in the analysis process.
6	[21]	United States	Teaching empathy to kids through a framework of meaningful education	A learning cycle model containing six important learning principles connecting students to a deep emotional level and leading them to become self-directed learners.
7	[29]	Australia	Analyzing staff practices and opinions about assessment methods in an introductory teacher education program at an Australian University	A model that emphasizes fundamental knowledge elements, application, integration, human dimensions, caring, and learning how to learn, considering the development of learning goals and assessment.
8	[20]	United States	The evaluation of an electronic book assignment by undergrad dental hygiene students using Fink's taxonomy of meaningful learning	Design using the backward design concept for complex learning activities utilizing six interactive domains to achieve significant learning outcomes.
9	[24]	Colombia	The outcomes of a "basics of dental anatomy" courses that uses Fink's integrative taxonomy and course design	An integrated approach that harmonizes six fundamental domains: basic knowledge, application, integration, caring, human dimension, and learning how to learn towards more meaningful learning.
10	[28]	Ireland	Perspectives from pharmacy students during an immersion understanding visit to a mental health facility	Fink's significant learning taxonomy explains an integrated approach where each type of learning can stimulate other types. This taxonomy is explained in the domains of basic knowledge, application, integration, human dimensions, caring, and learning how to learn.
11	[19]	United States	Leveraging the taxonomies of meaningful knowledge in medical education to go beyond and besides competent	A learning taxonomy that helps create meaningful learning with six main domains: (a) learning how to learn, (b) basic knowledge, (c) application, (d) integration, (e) human dimension, and (f) caring, emphasizing active learning and meaningful connections between teaching content and assessment.
12	[27]	Iran	Creating valuable learning opportunities for literary translation: a guide for course redesign	A taxonomy with six interrelated and interactively connected learning types that show relationships, resulting in learning that focuses on changes within the learner.
13	[23]	Colombia	A method for providing significant and practical learning in architectural education through the use of real projects	An integrated taxonomy connecting experiential learning and student-centered teaching by unifying six types of learning: basic knowledge, application learning, integration, human dimension learning, caring, and learning how to learn.
14	[18]	United States	Including financial capabilities and asset building topics in a communities organizing training	Course design encouraging active student engagement and creating significant learning experiences that can bring about lasting change.
15	[4]	United States	Volunteering perspectives analyzed using Fink's taxonomy	A taxonomy that encompasses six categories: basic knowledge, application, integration, human dimension, caring, and learning how to learn; a non-hierarchical and interconnected and interactive taxonomy contributing to the synergy of learning.
16	[17]	United States	AdvoCaring is an extracurricular activity that aids as well as representation to Baltimore's underprivileged. It serves as an illustration of both evaluation and designing instruction	A learning model applying basic knowledge and skills while integrating learning interests, human dimensions, and caring within students.

This study found that research on Fink's taxonomy is still lacking in Asian countries, including Malaysia. The trend of previous research on Fink's taxonomy was higher in 2020, during the pandemic era, indicating a sudden shift towards online research. This study also discussed three themes obtained through a systematic review based on the diversity of definitions of Fink's taxonomy.

3.4. Tendency trends of previous studies that conducted Fink's taxonomy by country

Through the reviewed articles, it is evident that researchers predominantly conducting studies on Fink taxonomy hail from the United States [4], [17]–[22]. L. Dee Fink, the founder who introduced Fink taxonomy in 2003, is from the United States, where rapid exposure and introduction to Fink taxonomy have occurred. The United States boasts a top-tier higher education system with numerous prestigious universities and research institutions actively engaged in educational research. The United States holds a global position in research and innovation across various academic disciplines [32]. This environment fosters research, development, and dissemination of frameworks like Fink taxonomy to enhance teaching and learning. Researchers investigating Fink taxonomy are not limited to any specific country but comprise scholars from around the world, including Colombia, Canada, Ireland, the United Kingdom, Australia, Iran, and Thailand [23]–[31].

However, research on Fink taxonomy has not received significant attention in Asian countries in general and in Malaysia specifically. There is still lacking research conducted on Fink taxonomy in Malaysia. This is due to the limited exposure and awareness of Fink taxonomy among teachers, school administrators, and researchers. Various initiatives for introducing and promoting Fink taxonomy can be implemented in Malaysia. Researchers can initiate studies related to Fink taxonomy in Malaysia by reviewing and exploring existing studies, especially those conducted in the United States.

3.5. Tendency trends of previous studies conducting Fink's taxonomy based on year of publication

The research chosen for the comprehensive review of literature included the most recent 10-year period, between 2014 to 2023. In 2020, there was a considerable rise in research into Fink taxonomy when compared with previous years. This major spike happened during the start of the COVID-19 pandemic, resulting in significant changes in the global schooling system. The abrupt move to online and remote learning approaches has had a significant impact on the environment of education, research, and instruction. The abrupt transition to online and remote learning methods redirected educational research toward effective teaching and learning strategies. Fink taxonomy offers a comprehensive approach to shaping teaching strategies that encourage significant and meaningful learning [25], [33], [34], leading to an increase in research on Fink taxonomy. Amid the pandemic crisis, the need to adapt current teaching and learning practices and conduct real-time research during movement control phases became urgent. With the closure of all academic institutions and the implementation of movement restrictions and social distancing measures, researchers explored online methodologies that could be conducted and managed remotely. Researchers also turned to virtual methods for data collection, such as online polls, simulated interviews, and internet-based focus sessions.

Online research has allowed researchers to gather data from diverse and global participant groups. Significant geographical barriers have been overcome, enabling researchers to access a broader range of study participants without requiring physical presence. For instance, in ethnographic research, traditionally involving face-to-face meetings between researchers and study participants, there has been a shift toward digital ethnography [35]. Researchers explore study participants online through video call platforms, conducting virtual interview sessions without disruptions from external factors. Furthermore, the efficiency and accuracy of online research can also be enhanced through computational thinking. In the next five to ten years, these unique challenges are expected to generate increased interest, space, and greater opportunities in online research among researchers.

3.6. The diversity of definitions of Fink's taxonomy in previous studies

Based on the findings of the comprehensive examination of chosen literature, the research discovered three themes in the literature on Fink taxonomy: i) generating significant learning, ii) approaching lasting change in students, and iii) focusing on the affective domain. In general, seven articles share a commonality in the first theme, emphasizing that Fink taxonomy is an integrative methodology which assists educators construct lessons that lead to substantial outcomes, meaningful, and profound learning [28], [25].

Fink taxonomy is a cyclical learning model with each dimension interacting, allowing teachers to create learning experiences, approaching lasting change in students and focusing on the affective domain to generate significant learning [21]. Teachers design learning objectives and content based on Fink taxonomy's six interconnected dimensions: foundational knowledge, application, integration, human dimension, caring, and learning how to learn [36]

Educators connect education goals and material with Fink taxonomy's six pillars, guaranteeing that student achievement entails more than just acquiring information but also the growth of profound comprehension, abilities, mindsets, and values about the subject. Fink taxonomy additionally stresses more

advanced thinking abilities including analysis, synthesis, assessment, and creativity. Educators can improve knowledge by developing difficult activities that actively include pupils throughout the process of instruction and learning [37]. Active student involvement can stimulate critical thinking, encourage the application of knowledge in real-world scenarios, fostering the International Baccalaureate-Middle Years Programme (IB-MYP) approach [38], and foster student-centered learning, ultimately resulting in significant learning.

The second topic emphasizes Fink taxonomy's ability to instill long-term transformation in students. This assertion is consistent with Fink's claim that successful learning happens when students experience a distinct and persistent change. The Fink taxonomy, as an organizing principle, emphasizes fostering a deep and perpetual curiosity in a subject [39]. This curiosity strengthens students' dispositions and broadens their comprehension of the material. Acquisition is thought to have happened when there is an evolution in the learner, and if the alteration is long-term, it indicates considerable learning

In addition, Cognitive Theory, an educational theory, complements Fink taxonomy by focusing on the educator's attention on student mental processes, which allows for acquiring knowledge, memory enhancement, motivation, and solving issues [40]. This means that whenever a student goes through the process of learning and instruction, every bit of information and insight they get is preserved in their long- and short-term memories. Behavior changes mirror the processes that take place in a student's thinking. If a long-term shift happens, it demonstrates that successful learning has occurred, which is defined as an obvious and permanent transformation among pupils.

The third theme emphasizes that Fink taxonomy places a greater emphasis on the affective aspect, which is its uniqueness and advantage compared to other taxonomies. The need to emphasize the affective aspect is to produce individuals who not only possess cognitive intelligence but also fulfill affective development [41]. For example, in the modern workplace, post-modern employers are more discerning in selecting skilled and full-potential workers from both cognitive and affective aspects. Therefore, the education curriculum needs to change and be adapted by prioritizing the affective and psychomotor aspects such as adversity quotient (AQ) [42] which has a relationship with intellectual quotient (IQ), emotional quotient (EQ), and spiritual quotient (SQ) [43] as students' preparation for the future job market requires the cultivation of affective values starting from school.

Moreover, Fink taxonomy integrates social and emotional aspects into learning. The elements of the human dimension and caring within Fink Taxonomy emphasize the affective aspect, encouraging students to explore values in learning, fostering personal growth and empathy [21], and cultivating wisdom, moral ethics, and happiness [30]. The emphasis on the affective aspect through the caring element in Fink taxonomy demonstrates its uniqueness compared to other taxonomies. Teachers use teaching methods that create classroom environments that build interest, care, and concern for the subject being studied.

4. CONCLUSION

In summary, this comprehensive review of the literature intends to identify trends in previous studies connected to Fink taxonomy concerning countries, study years, and the diversity of definitions. Based on the findings from the 16 selected articles, our findings provide conclusive evidence that it can be inferred that the United States is the country that has conducted the most research on Fink taxonomy. The highest publication of Fink taxonomy articles was recorded in 2020 during the global pandemic era. The systematic literature review of the selected 16 articles has identified three thematic classifications for Fink taxonomy definitions, namely generating significant learning, an approach shaping lasting change in students, and focusing on the affective domain. This research also has several implications, such as knowledge implications, value implications, and practical implications. The knowledge implications in this systematic literature review study include enhancing the understanding of the meaning or definition of Fink taxonomy according to researchers from various countries and indirectly providing a better overview of the Fink taxonomy body of knowledge.

The results of the investigation help to shape future studies on Fink taxonomy, particularly in Malaysia. Value implications refer to the relationship between disciplines shown through the integration of various dimensions of Fink taxonomy and the cognitive and affective learning domains. The systematic literature review has explored how Fink taxonomy is used across different disciplines and fosters relationships between disciplines in the education system in Malaysia. Practical implications indicate that the information gathered about Fink taxonomy can serve as a reference for the Ministry of Education (KPM), stakeholders, schools, and teachers in empowering Fink taxonomy to diversify meaningful and significant learning experiences for students. This study has systematically explored the trends in previous research related to Fink's taxonomy. However, further and in-depth research is needed to gain new knowledge, strengthen the findings of initial research, and overcome the limitations of the initial research. Further research can be conducted by comparing Fink taxonomy with other educational taxonomies and models, such as Bloom's taxonomy and others. The comparison can be made by examining aspects of effectiveness, advantages and disadvantages,

limitations, and unique contributions in promoting significant learning, with a focus on the Malaysian context. Moreover, additional research can be carried out by developing and validating assessment instruments and measures tailored to the dimensions of Fink taxonomy in the Malaysian context. These measurement tools can assist teachers in assessing the extent to which teaching strategies align with Fink taxonomy principles, facilitating the evaluation of significant learning outcomes. Additionally, these measurement tools can assess affective aspects in students, such as empathy, motivation, lifelong learning interest, and self-directedness.

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AUTHOR CONTRIBUTIONS STATEMENT

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication. Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research related to human use has been complied with all the relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration and has been approved by the institutional review board or equivalent committee from Ministry of Education of Malaysia with the reference letter number of KPM.600-3/2/3-eras (18154).

DATA AVAILABILITY

The authors confirm that the data supporting the findings of this study are available within the article [and/or its supplementary materials].

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