

## A Systematic Literature Review Approach for Use in Engineering and the Classroom

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**Abstract**— In order to formulate research questions and justify the need of more study in a certain area, it is important to conduct a literature review of the relevant scientific works. Those just beginning out in the field of scientific research have a tough time with this since they don't know which comprehensive databases are crucial for their work and don't have the skills to search and filter materials properly. To help the researcher get from "my" to "the" current state of the problem, we propose a tweak to the method employed by Kitchenham and Bacca. Their technique divides the process into three phases: preparation, execution, and reporting of results. The research problem technique is used in the pre-analysis phase to create three to five research questions and a "mentefacto conceptual"; the latter brings creativity to the process and facilitates the building of a thesaurus for searches and inclusion/exclusion criteria. Conducting a basic systematic investigation at the outset of a research project is essential for discovering prior work in the subject, reviewing relevant literature, and, if any results are found, verifying whether they address our research concerns. As part of developing the search strategy, we established broad and narrow inclusion and exclusion criteria along with supplemental elements. If all goes according to plan, the researcher will have a comprehensive list of influential publications in the subject and detailed information on each subset of those articles. The findings support the theory, and each stage of the procedure has been laid out in a study case for simple exposure. Technical Approach Engineering for education Comprehensive literature survey

### INTRODUCTION

A thorough literature review is an important first step in developing research topics and establishing a foundation for future research in any area [1]. When doing research for a PhD, particularly as a first-year student, it is important to follow a

systematic approach. This will help you learn about previous work in your field, the methods used (population, sample, statistics), the results, and the authors' proposals. It is also helpful to identify the leading authors in your field and the databases and publications they use to present their work. This will ensure that you have permanent and up-to-date information about the results published. Also, not enough people know about scientific publications and other places where researchers work together to share their findings, methodologies, databases, networks, etc. in areas where there is a need for study. Whether a researcher is venturing into uncharted territory or just looking to bolster their current area of expertise, it may be difficult to figure out what thesaurus phrases to use and how to filter the results. In [2], a taxonomy is laid out in a table with various subcategories and topics that help to understand the field's scope. They also suggest a taxonomy that is a result of merging four main categories and dividing it up in two diagrams, with a horizontal tree with two sets of entries (rows and columns), a plethora of keywords, and so on. From such a comprehensive list, however, the search technique becomes murky. Although De Zubira's [4] "mentefacto conceptual" was first designed to help with reading comprehension, we think it would be a great fit for the needs indicated before because to its distinctive features and aesthetically pleasing design. In [5], the authors do rudimentary filtering by searching Scopus for the single variable "main topic; and, as discriminators, the date of publication." publishing, after which each reader thoroughly reviews the collected articles. Despite the researcher's satisfaction with the findings, this study does not meet the requirements for a systematic review as the search keywords were biased and no criteria were set up to include or exclude studies. There are a number of methods that thoroughly

describe the whole systematic process of building a state-of-the-art, which allows one to circumvent the limitations and empirical practices discussed before. This author's work in engineering literature reviews [7] and subsequent updates by Bacca et al. [8] and thousands of other researchers have provided a framework for researchers to follow in recent years, building on the work of Kitchenham et al. [6]. They divide it into three parts: planning, carrying out, and reviewing. Drawing on previous work [6,7], the Kitchenham group at Keele University [9] creates the Guidelines for conducting Systematic Literature Reviews in Software Engineering, adapting them to the specific requirements of the field while ensuring their generalizability. To make good use of these methodologies, the researcher has to have deep understanding of the selected scientific subject and a wealth of relevant experience. The results demonstrate that when the methodology of Kitchenham et al. [6, 7, 9] is used, the results provide conclusions that are based on the study subject, research questions, inclusion/exclusion criteria, and related analysis. All of these advantages and possibilities for great impact are inherent to this strategy, which combines a systematic search procedure with elements of conceptual thinking to make the researcher's job easier. We propose this method as an improvement to the Kitchenham methodology for the first step of systematic reviews. The new researcher will have the opportunity to publish their discoveries, network with seasoned researchers, and keep up with the field's current advancements via the construction of a list of high-impact journals. In the end, the document gives a high-level summary of the method's implementation in a real-world scenario, including the following: the mentefacto framework, a thesaurus for search words, database search scripts, research questions, criteria for inclusion and exclusion, reviews of related literature, analysis features of the research question, lists of related journals, systematic review

results, and brief conclusions. Simplifying the process of conducting systematic reviews, this case study shows how the technique works in reality. METHOD We planned, conducted, and reported the review in accordance with the three-step process for a systematic assessment of the literature outlined by Kitchenham [6, 7, 9] and Bacca [8]. Incorporating a conceptual mind (De Zubira, [4]) or a graphical model (analysis and understanding of a particular field of study) into the research process is a new step that stems from an early approach to the overall research problem. This conceptual analysis is then carried out according to the proposed methodology. This reference will serve as a roadmap for organizing the search and sorting through inclusion and exclusion criteria. The following procedures make up the systematic review process after the aforementioned modifications: Making Plans Recognizing the need for a review (1.1)

The Existing Body of Knowledge About the Issue (1.1.1).

Questions for Study (1.1.2)

1.1.3 "Mentefacto Conceptual"

1.1.4 Systematic Reviews That Are Similar

Creating a Review Protocol 1.2.

Criteria for inclusion and exclusion are defined in Section 1.2.1.

Data Extraction Form Preparation 1.2.2  
Journal Selection 1.2.3

Reviewing the Process

2.1. Finding relevant research 2.2.  
Choosing main studies

Evaluation of Research Quality 2.3

Extraction and tracking of data 2.5  
Synthesis and tracking of data

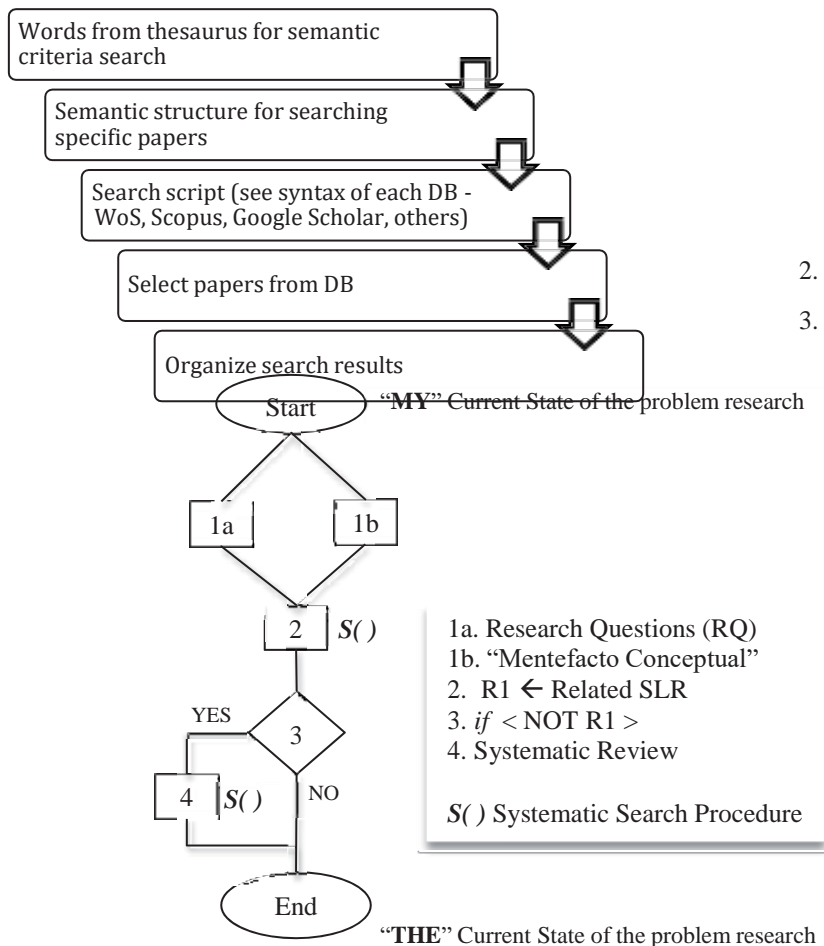
3. Summarizing the findings

Fig. 1 Generalized Methodology Procedure

Figure 1 shows that initially, the researcher has a "personal/individual" grasp of the subject (labelled "'MY' Current State of the problem"), but by the time the study is complete, they have a more thorough grasp (labelled "'THE' Current State of the problem"). In addition to having some background knowledge on the subject and area of expertise, the researcher doing the literature study should be able to formulate research questions and sketch out the mentefacto conception. Using this data as a starting point, the first systematic search S() is run to find any relevant systematic reviews. Should a systematic review exist, the research issues will be addressed by doing a systematic review if one does not already exist. Steps outlined by the Systematic Search Procedure S() explain a portion of the second macroprocess. After extracting search terms from the mentefacto conceptual and scientific thesauri, a script is customized for each database, a distinct procedure is employed to choose studies, and the end result is a list with the search results as a variable (refer to Fig. 2).

Fig. S(), the Systematic Search Method

1. A. A number of processes seem linear because they are really iterative and repeat indefinitely until all of the goals of each stage and sub-stage are met. Following the guidelines provided by the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) [1] during the "Development of a review protocol" stage and the last section of the report's presentation was essential. PRISMA is a 27-item evaluation checklist and specific flowchart that researchers can use to help them prepare systematic review reports [10]. The proposed approach requires a minimum of one iteration for each study subject. Approach 1) Thorough Evaluation of the Current Situation 1. C. Since the research subject is the starting point of the whole scientific process, it is where the systematic examination of literature starts. Following Anger-Egg's suggestion, one should not try to build a perfect formulation from the get-go; instead, one should think about the social and personal aspects, and do it with sociological ideology [11]. In order to tackle a research problem in this field, Hernández [12] offers some solutions. The end objective is study aids.
2. 2. queries for study.
3. Third, the study's justification: why and for what. from the research.



4. Study feasibility, number four.
5. Access to materials is the fourth category.
6. Limitations of the Research 4.2.
7. 8. The research's relevance and impact.
8. Disparities in understanding the issue
9. What we know today, section 9.1.
10. 9.2 Fresh viewpoints on the subject matter.
11. • The systematic review provides some of these thirteen items, but you can't go further until you get the first one. According to Ackoff [13], the researcher has to have a clear idea of the problem and be able to explain it in a way that anybody can understand. If the question is asked correctly, there should be higher chances to get a good response. The accuracy and clarity of the researcher's approach to the issue are crucial for the success of the remaining phases in the methodical process, which are inputs. Questions That Need More Research According to Hernández [12], research questions are a component of the problem statement. These first questions will guide the whole process since they combine the researcher's own interests with what is known about the state of the subject. Research questions should be clearly articulated and the reasons for their creation should be provided at the beginning of a study (Hienemann, 2014) since they dictate the research strategy and the expected findings. In this method, the research questions serve as a starting point for determining what needs to be investigated and how. You should be able to tell them apart from the original set of research questions because of the labels. The question's narrative proper comes last in the labeling syntax, which begins with the letter RQ and continues with the numbers. Concerning the first question, what is going on?
12. For RQ2, the second question, what is the response?
13. For the final question, what is the response?
14. It is possible to reduce the number of research questions posed at the outset if a search for systematic reviews turns up results that answer some of the original research questions. Partially answering the question might lead to keeping it but changing the categories utilized for analysis. Kitchenham recommends writing three to five research questions to find a happy medium between the depth and breadth of your investigation and the intricacy of your responses.
15. To aid in reading and learning, De Zubiria [4] developed the conceptual mentefacto. Conceptual pedagogy's mentefacto conceptual is a tool for representing concepts. The author calls it a "graphical sketch" because it uses representation to conceive a complex idea that is already there. The responses to these four questions are fundamental to this procedure. What class does it belong to? If there are other things that resemble you, how are you different? Are there several kinds of you? These inquiries form the basis of the concepts, leading to the emergence of four thought clusters:
16. As shown in Figure 3, the first four are omitted, followed by superordinate, infraordinated, and isoordinated. Isoordinados draw attention to essential parts, superordinados to the overall idea, excluded to the ideas that are most similar to the concept, and infraordinates to the many classes and subtypes that make up the concept.

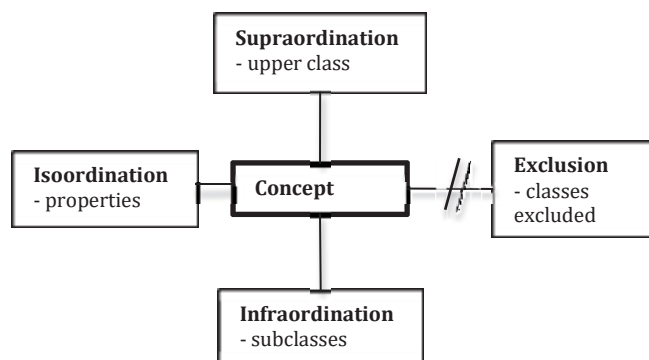


Fig. 3The "Mentefacto conceptual" [4]

You may figure out the search phrases by looking at the ideogram, which are usually on the left side (Isoordination). When choosing keywords, we also evaluate the subclasses (Infraordination) since any inquiry into a subset of the notion would also be within its purview. Data from exclusion and supra ordination are used for analyzing inclusion and rejection criteria.

Search Scripts for All Databases (Table I) 4)  
 Related Systematic Reviews

To begin building the mentefacto graph model's bibliography, we must first do a basic systematic search for reviews of the relevant literature and, if found, evaluate their results to see whether they address our research questions. The search phrases are input into the semantic framework of literature searches; these terms are in turn generated from the modelo conceptual and linked to the scientific domain thesaurus to establish words that denote synonymy and antonymy. Each database-specific script will be developed using the search structure provided in Table I. Three categories are ultimately established from the articles that passed the researcher's subjective standards: valid, referents, and answers. In order to support our research proposal, this part highlights if the selected literature reviews allow us to address the research questions we have set in our problem. Otherwise, in order to facilitate a methodical continuation of the first bibliographic investigation, the unresolved research themes will be identified and organized. Evaluate the development of guidelines

It is necessary to establish inclusion and exclusion criteria initially.

This and the next steps in the review process's development are constrained by the paucity of systematic reviews that deal with the study's aims

and the types of analysis they use. In this stage, research subjects are taken into account using general, special, and supplemental criteria, as described by Bacca et al. [8]. It is necessary to take into account not just the groupings that are included, but also

For every part, we construct adjustable variables based on theoretical studies, global standards, and research methods. • (keyword\_m\* OR synonym\_m)

The following filters work in tandem: (year > (current year -5 years))

Review, Topic 1 OR Synonymous Topic 2;  
 Topic 3 OR Synonymous Topic 4; Topic 5 OR  
 Synonymous Topic 6; Topic 7 OR Conversely  
 Keyword 8

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 Topic 3 OR Synonymous Topic 4; Topic 5 OR  
 Synonymous Topic 6; Topic 7 OR Conversely  
 Keyword 8

difference between n\_2 and n\_m

Consider the following options: keyword\_1, synonym\_1, keyword\_2, synonym\_n, synonymous\_n\_1, synonym\_n\_2, OR review, study

- 1) Making a form to collect information
- 2) In order to properly categorize the data that has been acquired, the researcher must first establish the necessary systems. Areas for storing tools and showing results need to be defined and set up, including mutually exclusive
- Thirdly, the main filters are the year, abstract, keywords, and title of the article. (5 years less than this one)
- the combination of (keyword\_1 OR interchangeable\_term\_1)
- 5)) as electronic databases and citation managers.
- 6) Mendeley or another bibliography management program may help you arrange and

classify academic literature search results.

7). The eye

Cloud storage is a good option for collaborative projects and last-minute preparations, and papers and other documents that come up during the search are also necessary. Magazines Selected

see columns for the Journal Citation Reports (Impact Factor, Quartile in Category, and Category), the Science Citation Reports (h-index), and the Web of Science (WoS). The sorting filter produces the output known as

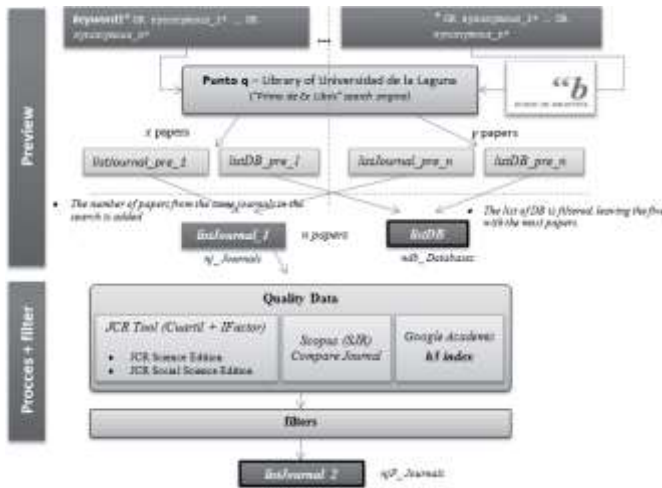


Fig. 4. Flow chart for selecting relevant journals

A. For the purpose of selecting suitable journals, a process flow diagram has been created. For this first curation, the platform's search engine "Punto q" is used, along with "Primo de Ex Libris" (which is licensed to the library at the Universidad de La Laguna).1. The platform automatically generates lists for journals and databases, ranging from listJournal\_pre\_1 to listJournal\_pre\_n and listDB\_pre\_1 to listDB\_pre\_n, according to the amount of searches. Similar to previous scientific inquiries, this study uses a wide range of disciplines to form its results. Currently, we are in the process of identifying which journals have the most effect. We propose the systematic search as a means to achieve this goal; it involves organizing a search according to a semantic sentence2, which connects the many fields of study by use of terms found in a scientific thesaurus, and then employing keywords to find relevant research. By using this filter, we are able to find just the articles and websites that are pertinent to our research. In the first journal list (listJournal\_1), you can

listJournal\_2. You may use these selection criteria: Find the value of sortingOrd by multiplying the number of research papers by 25%. (IF JCR). SJR reports. (5th h-index) To ensure that this variable is consistent with the other three factors, we have set it to 25%, which is the quantitative proportion of articles acquired in the journals.

- B. • The list must be purged of any and all periodicals that aren't directly related to the field of study. A few examples:
- C. o The JCR takes into account the following areas: Science of Computing, Computer Science: Interactive Applications
- D. - Information Science and Related Fields; Pedagogy, Psychological Studies, and Related Areas; Special Education; and Rehabilitation.
- E. o "Education Technology," "Education," "Human Computer Interaction," and "Engineering & Computer Science (general)" are all categories in the h5 index.
- F. As a last criterion, the "Aims and Scope" portion of each journal's online home must be reviewed.
- G. • Discard any periodicals that aren't

included in the JCR or SJR indexes.

H. Following the earlier-provided Ord formula, just the top twelve journals on the list need be retained.

I. The journals must be separated into two piles—JCR Science Edition and JCR Social Science Edition—according to their categorization in JCR 2016.

*Review Methodology (M): Execution* As described by Kitchenham [7], the review itself may begin after the technique has been settled upon. Step one's inclusion/exclusion criteria and journal list are required for this one to work. (*listJournal\_2*). Some of the procedures to follow here are detailed in Fig. 2. *Systematic Search Procedure S( )*, which were also applied in the planning phase, in Related SLR. This stage includes 5 sub-stages that are detailed in Kitchenham's [7] proposal, with the adaptations of the new method.

All the sub-stages that involve the review are iterative and incremental, so the process will follow as many times as the researcher considers necessary until the research questions are answered.

#### 1) *Identification of research*

The procedure revealed in the previous phase is supplemented in some manner by this initial sub-stage. Search documentation, bibliography management, document retrieval, publishing bias, and strategy development are all part of this process. The first three steps of the Systematic Search Procedure S() are applicable as search strategies: Thesaurus words for use in a search based on semantic criteria; 2) A search based on semantic structure Structured query languages (SQL) allow users to access databases using semantic sentences. 3) Search script for certain documents. Here, the databases that were chosen are searched thoroughly; it is recommended that this be done in Filtering the list of received journals may be done using WoS, Scopus, and Google Scholar.

A method called "Knowledge Discovery in Databases" (KDD) is suggested for searching all journals continuously and sorting the results according to the structure

of the variables from research questions [15]. Semantically organizing searches is done using structured search ideas; successful filtering is aided by logical gates such as AND, OR, NOT, SAME, and others. Here we have an example of using AND to combine search parameters, OR to get a list of synonyms from the thesaurus that was established before, and NO to omit items that we don't want to be considered.

It is advised that the researcher makes use of a bibliography management tool, such Mendeley3, Zotero4, Endnote5, or any other that they may think of, to arrange the search results from academic databases. To manage the large number of citations that may arise from reviewing the literature, bibliographic software is an excellent resource.

One thing to keep in mind when talking about publication bias is that the researcher's personal view could often determine whether results are good or negative [7]. While it's true that Google Scholar searches can help mitigate bias to a certain degree, it's also important to remember that cutting-edge research of the highest quality relies on studies backed by respected scholars, such as those who work as editors or reviewers for high-impact journals that rank in the top quartiles of the JCR and SJR indexes.

#### Step Two: Selecting Primary Sources

Full articles may be accessed when the bibliographies are finished. In order for the research team to access the administration and decide on which articles to use collectively, they need individual logins to the bibliography management system. An important part of the study selection criteria [7] is identifying the primary papers that address the research question. A systematic review differs from a more traditional one in that it employs specific selection criteria to reduce the likelihood of bias. These criteria are defined at the protocol design phase and act as a guide throughout the remainder of the process. Reading all of the texts thoroughly is necessary before deciding which ones to include and which ones to leave out.

It is necessary to label, download, and store all documents in a single repository. Syntax that is very recommended

for cataloging digital files is as follows:

- 2) Research into gestural environments, such as RQ2\_01\_SSE3\_2013\_Torres\_Usability, where:
- 3) Question No. 2 in the Study
- 4) First chosen paper; referred to here as "01."
- 5) Journal ID from the Social Sciences E3 List.
- 6) Also, the citations should be saved to your computer and added to your bibliography software. Tags: (RQ1, SSE1, SLR), and then add the necessary information to the Notes section of the application, as shown in the previous example. In addition, the chosen document has to be tabulated in the electronic record sheet so that it may be used in statistical analysis.
- 7) 2) Evaluating the Standard of Studies
- 8) This section builds upon the one before it. Assessing the "quality" of source publications is typically regarded as significant, in addition to conventional inclusion exclusion criteria [7]. The inclusion and exclusion criteria provide further support for these factors by including measures of quality such as the significance of the study, the reliability of the cited references, the expertise of the authors, and the renown of the journal in which the research was published. Guidelines from the Australian National Health and Medical Research Council and the Cochrane Collaboration are cited in [7] for suggesting that study design is considered during assessment of evidence rather than during the appraisal and

selection of studies.

- 9) You may easily determine an article's significance with the use of databases and search engines like Scopus, WoS, Elsevier's ScienceDirect, and GoogleScholar. Sites like Scimago (SJR) and Journal Citation Reports, index h5 of Google Scholar, have a bibliometric detail of all journals indexed in its database; variables like: h index, impact factor, and dating trend, will greatly assist in establishing the quality of the journal and thus its ranking. Having completed a thorough assessment and cataloguing of journals in advance, as part of the methodology's approach, the needs of this stage are addressed in significant part.

*Eleven) Collecting and keeping tabs on data Information gleaned from primary studies must be recorded carefully, therefore researchers must draft data extraction forms with fields for things like review name, date of data extraction, title, authors, journal, publishing description, and any other remarks they may want to include [7]. If utilized properly, the current bibliographic management software (discussed in section B1) should be sufficient to complete this substage, even if working from a group of researchers. How they occurred, how they interacted, and how they were identified*

data registration, will make the procedure more productive and efficient. Documents should be marked as part of the literature review and the related research topic in the keywords area, and related comments should be documented in the notes section. Find the sources that are relevant to your research issue and use them as a starting point for your literature review Synthesis of Data and Continuous Tracking

The systematic review's quality is established in this last phase. The synthesis may be descriptive (non-quantitative) in nature, or it may serve as a quantitative summary to supplement a descriptive synthesis (in which case it is a meta-analysis) [7]. Kitchenham also details,

depending on whether the analysis is qualitative or quantitative, what features it should include.

#### Review Summary (M)

All findings must be shared with the scientific community for assessment and comment. When it comes to arranging research findings across time and between disciplines, the outcomes of a systematic review are highly anticipated. It is always included with a PhD thesis and may be presented at a conference or published in a scholarly publication [7].

- I. Kitchenhand [7] recommends include the following information in the systematic review report:
- II. 1. Title.
- III. 2. Authorship.
- IV. 3. Context, Objectives, Methods, Results, and Conclusions, often known as an Executive Summary or Structural Abstract.
- V. 4. Background.
- VI. There has to be a detailed description of each review question.
- VII. 6: Review Techniques: Information Gathering, Search Strategies, Selecting Studies, Evaluating Quality, Extracting Data, and Synthesizing Results.
- VIII. 7 Studies that met the inclusion criteria and those that did not, as well as a list

of the latter with an explanation of why they were not included.

- IX. Conclusions and findings are presented in Section 8.
- X. 9. An analysis of the key results, including their implications and limitations.
- XI. Ten. Final Thoughts and Suggestions.
- XII. 11. Acknowledgements.
- XIII. 12) Improper bias or interest.
- XIV. Thirteen: Bibliography/Appen dices.

#### The Case Study: XVI.

A high-level overview of how each phase and sub-phase fits into the research process is provided to both validate the approach and provide context for the researchers. The 2017 PhD thesis [16, 17] also includes an evaluation of the technique, which was found to be successful. The new parts are introduced to the Kitchenham approach by means of a synopsis of the revising effort. Children in Inclusive Classrooms Benefit from Gestural-Computer Interaction

been selected as a generic setting, a functional domain, in which to demonstrate the technique.

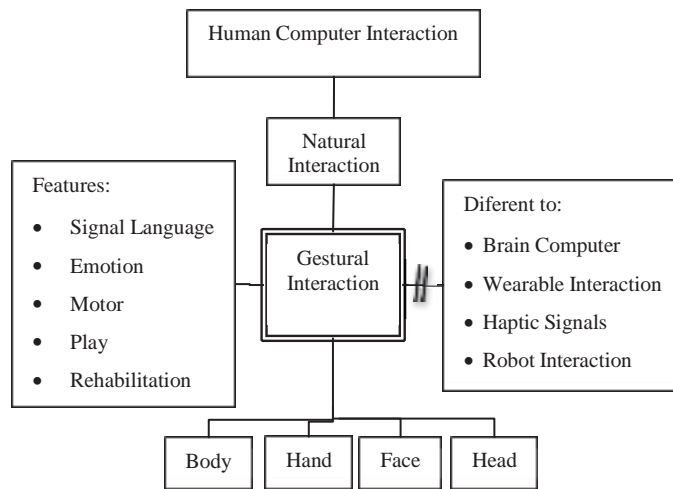
#### A. Planning 1) Research on the Existing State of the Problem

In Human-Computer Interaction (HCI), Computer Science, Gestural Interaction has been regarded a study topic; it is a subarea of the natural interaction (NI). As more and more individuals with disabilities need specialized hardware and sensors to use computers, studies in HCI are becoming more important to the technology industry as a whole. Using IN, the user is able to deliver instructions to the computer using natural and intuitive means, such as voice

commands, hand, finger, arm, and body motions, and even indirectly through biophysiological data recorded by wearable sensors [18]. Gesture interfaces, on the other hand, employ human body parts as input controllers for a computer, such as the limbs (arms, hands, fingers), the trunk (torso, neck, and face), and the extremities (legs, feet)[19]. Knowing and organizing the outcomes of research in this subject is important since digital teaching tactics derived from gestural interaction settings have been proven to significantly increase the learning of persons with cognitive

as a requirement for future research the following research questions have been proposed:

- RQ1: In what ways have strategies for gestural engagement in educational settings been implemented?
- How have the pedagogical materials for gestural communication been developed?
- Which technologies for gestural engagement have been implemented in schools?
- One) Conceptual Mentefacto



disorders [17], [20].

2 ) Investigative Queries

- From the exposition of the problem, and Gestural

L1 Computer Interaction

**CONCLUSIONS**

This article introduces a fresh approach to systematic review, including how to plan, execute, and report on such a study. Kitchenham's original technique, Bacca's modified version of it, and De Zubrá's ideogram for a conceptual mind map, mentefacto, all lend credence to this approach.

Particular attention is paid to how the mentefacto was modified. Learning

**A. Performing the analysis**

For each article in JournalList\_2, a search was conducted using the Expert Search capabilities on Elsevier's ScienceDirect platform, using the parameters specified in the following script. Based on the results of the first search, we further subdivided our areas of focus into five categories to help us identify the most relevant scientific publications. The indexing scheme may be used with the WoS system.

theoretical, serving as the cornerstone upon which to build the search terms, their

Fig. 5. Mentefacto Conceptual – Gestural Interaction

antonyms from the scientific thesaurus, the semantic framework for navigating through academic publications, and the database-specific search script.

A case study is used to illustrate each step of the process. The establishment of the search script in the databases has been delayed while we prioritized the application of the mentefacto conceptual framework.

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