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Teaching critical appraisal and research methodology to dental students and practitioners: A scoping review

Danchen Qin,[1,2,3] Xiaojin Wu,[1] Fangyu Li,[1] Xueqian Yu,[4] Fang Hua,[1,2,3,5,6*]

1. State Key Laboratory of Oral & Maxillofacial Reconstruction and Regeneration, Key Laboratory of Oral Biomedicine Ministry of Education, Hubei Key Laboratory of Stomatology, School & Hospital of Stomatology, Wuhan University, Wuhan, China.

2. Center for Evidence-Based Stomatology, School & Hospital of Stomatology, Wuhan University, Wuhan, China.

3. Hubei Provincial Clinical Research Centre for Dentofacial Deformities in Children, School & Hospital of Stomatology, Wuhan University, Wuhan, China

4. Library, School & Hospital of Stomatology, Wuhan University, Wuhan, China.

5. Center for Orthodontics and Pediatric Dentistry at Optics Valley Branch, School & Hospital of Stomatology, Wuhan University, Wuhan, China.

6. Division of Dentistry, School of Medical Sciences, Faculty of Biology, Medicine and Health, The University of Manchester, Manchester, United Kingdom.

* **Corresponding author:**
Fang Hua,
Centre for Evidence-Based Stomatology, School & Hospital of Stomatology, Wuhan University, Luoyu Road 237, Wuhan 430079, China.
E-mail: huafang@whu.edu.cn

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Abstract

Objective: Critical appraisal (CA) and research methodology (RM) are essential skills for evidence-based dentistry (EBD). This scoping review aims to summarize the existing evidence and experience regarding the teaching of CA and RM to dental students and practitioners.

Data sources: A systematic search was conducted in PubMed, Embase, Web of Science, and ERIC, supplemented with manual and citation searches.

Study selection: Two researchers performed article selection and data extraction independently.

Data analysis: Data were analysed using frequency tabulation and thematic content analysis.

Results: A total of 53 articles were identified and included, among which a majority (39/53, 73.6%) were research studies, while the rest (14/53, 26.4%) were narrative articles. Most of the research studies (33/39, 84.6%) were observational, while only 1 used a randomized controlled design. About three-fifths (31/53, 58.5%) focused on broad teaching of EBD, incorporating CA or RM as part of teaching content. Professional degree education (DDS, DMD, BDS, etc.) was described most frequently (38/53, 71.7%), followed by postgraduate/resident education (12/53, 22.6%), faculty development (6/53, 11.3%), and continuing education (4/53, 7.5%). The teaching outcomes of CA or RM were rarely assessed independently, and the majority assessed comprehensive EBD skills in the short term. Only 26.4% (14/53) mentioned teaching evaluation, primarily about teaching content and based on student feedback.

Conclusions: Research on CA or RM education in dentistry is predominantly observational, which typically adopted before-and-after self-comparison designs or uncontrolled designs. There remains a lack of evidence regarding the long-term effects of CA and RM teaching activities and their influence on clinical practice.

Clinical Significance: Teaching CA and RM equips dental practitioners with essential skills to implement evidence-based practice and improve the quality of dental care. Our findings indicate that current evidence on CA and RM teaching in dentistry is limited. This review provides insights to inform dental curriculum innovation and continuing education enhancement, ultimately facilitating the advancement of evidence-based dental practice.

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Introduction

Evidence-based dentistry (EBD) provides a systematic framework integrating the best available scientific evidence with clinical expertise and patient values to guide treatment decisions [1, 2]. This approach has significantly enhanced dental care quality and changed the way of dental practice and education [3-6]. Research indicates that students trained in evidence-based practice (EBP) exhibit superior critical thinking, clinical reasoning, problem-solving, and superior application of research evidence compared to traditionally educated students [7-9]. Therefore, incorporating EBD principles into dental education is essential for preparing students for sustained professional development.

Critical appraisal (CA) is an indispensable competency in EBP [2]. As scientific evidence expands exponentially, dental practitioners need to continuously update their knowledge to deliver optimal healthcare. However, extensive research has found significant methodological and reporting deficiencies in dental clinical studies, suggesting potential bias in research outcomes [10-12]. Therefore, clinicians need to develop skills to critically appraise literature and identify high-quality evidence. CA provides a structured approach to assess evidence, which includes three steps: assessment of validity, significance of results, and clinical applicability [2]. Developing CA skills also requires solid understanding of research design and statistical analysis, enabling dental professionals to make evidence-based decisions based on the best available evidence.

Understanding of research methodology (RM) is fundamental both for practitioners who need to appraise and apply research findings, and for those who conduct clinical studies [13]. Comprehensive mastery of RM is integral to generating high-quality evidence, requiring a

thorough grasp of epidemiological principles, biostatistical concepts, and study designs. However, these knowledge and skills remain underappreciated among clinicians and researchers [14]. Teaching RM serves dual purposes in evidence appraisal and production: it equips dental students to apply EBD principles in clinical practice while simultaneously cultivating their potential as future producers of research evidence that will guide dental practice [15].

The Commission on Dental Accreditation (CODA) Standards for Dental Accreditation require that "Graduates must be competent in the use of critical thinking and problem-solving, including their use in the comprehensive care of patients, scientific inquiry and research methodology" [16]. Despite the importance of CA and RM, their situation of teaching in dental education was not fully investigated. A previous systematic review examining teaching CA to healthcare professionals suggested that even low-intensity teaching in CA could produce moderate improvements in practitioners' capabilities [17]. Following our recent scoping review on EBD education [18], we identified the need for a focused investigation of CA and RM education in dentistry. Therefore, this scoping review aims to: (1) explore the evidence and experiences related to the teaching of CA and RM to dental students and practitioners and pertinent faculty development; and (2) summarize the characteristics and teaching contents, processes, and outcomes reported in the identified literature.

Methods

The present scoping review was conducted according to the Joanna Briggs Institute (JBI) methodological guidance [19], and was written in accordance with the Preferred Reporting

Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [20]. The review protocol was registered prospectively at the Open Science Framework (osf.io/a4uvw).

Eligibility criteria

The inclusion criteria were educational articles regarding the teaching of CA or RM in dental education, which was specified according to the Population, Concept, and Context (PCC) framework [19]:

- Population: dental students, oral healthcare workers, or dental faculties;
- Concept: teaching of CA or RM;
- Context: any forms of teaching, including face-to-face or online teaching, and theoretical teaching or hands-on practice.

The exclusion criteria were as follows:

- Articles pertaining to other disciplines (e.g., general medicine or nursing);
- Articles broadly referred to EBD concepts or skills without specifying CA or RM education;
- Articles with no specific teaching methods or programs, such as tutorial papers of CA or RM, or cross-sectional surveys on participants' knowledge, attitudes, and perceptions of CA or RM;
- Literature reviews, systematic reviews, scoping reviews, case reports, and conference papers.

Literature search and article selection

We performed a systematic search on 4 electronic databases up to October 19, 2024: PubMed, Embase, Web of Science Core Collection, and Educational Resource Information Center (ERIC, via EBSCOhost). No restrictions on publication date or language were applied. The search strategies were drafted with the help of an experienced librarian (X.Y.) and refined through team discussion. The detailed search strategies for all databases are listed in **Appendix Table 1**.

Article selection was undertaken by 2 reviewers (X.W. and F.L.) according to the aforementioned eligibility criteria, independently and in duplicate. After the removal of duplicates, the reviewers screened the retrieved records through titles and abstracts. Then, the reviewers examined the full texts of potentially eligible articles. After electronic searches, a manual search was carried out by screening the reference lists of identified key articles. A forward citation search of these articles was also conducted using the Web of Science for additional eligible articles. Discrepancies were resolved by discussions with other reviewers (D.Q. and F.H.).

Data extraction

The following information was extracted from included articles through pre-piloted standardized forms: author, publication year, country, university or institution, participants, teaching forms, teaching content, teaching methods or strategies, teaching outcomes, and teaching evaluation. Before formal data extraction, a pilot study was conducted to calibrate the

authors (D.Q. and X.W.) on five randomly chosen articles. All disagreements were resolved through discussions with another reviewer (F.H.).

Data analysis

Descriptive statistics and frequency tabulation were used to summarize article characteristics, and thematic content analysis was conducted to synthesize findings. Categorical data was presented as numbers and percentages. We grouped the articles by the content and audience of teaching, and summarized the types of teaching forms, teaching methods, teaching outcomes, and teaching evaluation. The findings were presented in the form of graphs.

Results

A total of 2,620 records were identified through the electronic search. Thirty-one articles met the inclusion criteria and were included via databases. **Appendix Table 2** lists the excluded articles with reasons. Besides electronic search, 22 additional articles were identified through manual search or citation search. Finally, 53 articles were deemed eligible and included in this review (**Figure 1**).

Characteristics of included articles

The characteristics of included articles are listed in **Table 1**. The majority of the articles were from North America (34/53, 64.2%), followed by Asia (11/53, 20.8%) and Europe (6/53, 11.3%). Over half of the schools or organizations originated from the United States (30/53, 56.6%), followed by the United Kingdom (5/53, 9.4%) and Canada (4/53, 7.5%). The 53

included articles described the pedagogical practices of 36 distinct universities, institutions, or organizations. About two-fifths (22/53, 41.5%) of the articles were from QS top 120 universities in dentistry.

For the types of articles, 14 (26.4%) articles were purely narrative, which mainly described the pedagogical modalities and teaching experiences of dental schools. Among 39 research articles, the vast majority (33/39, 84.6%) used an observational design, in which 16 were cross-sectional, 15 were cohort design with control, and 8 were cohort design without control. All 6 experimental studies used before-and-after comparison. Only 1 study adopted a randomization controlled design [21].

For the main objectives of included articles, the majority (24/53, 45.3%) were about the effectiveness of teaching based on single-centre investigation, including specific courses, teaching strategies, or teaching contents. Three articles were questionnaires that surveyed deans or curriculum directors of different schools regarding how relevant content was taught in their institutions [22-24].

From the main teaching content, only 9 (17.0%) articles specifically explored the teaching of CA, and 10 (18.9%) investigated the teaching of RM and statistics. Over half of the articles (31/53, 58.5%) mainly focused on the teaching of EBD or EBP, integrating CA or RM as part of the teaching content. In terms of the teaching audience, most articles (38/53, 71.7%) described professional degree education (DDS, DMD, BDS, etc.), 12 (22.6%) involved postgraduate or resident education, 6 (11.3%) mentioned training of faculty members, and 4 (7.5%) described the continuing education of dental practitioners.

The overall teaching of CA and RM

Figure 2 summarizes six aspects of teaching described in the included articles. Among the articles that mentioned their instructors, most courses are taught by dental or medical faculty. Other instructors included epidemiologists, statisticians, journal editors, researchers, and librarians. An included survey showed that almost all dental hygiene programs (95%) used dental hygiene faculty to teach CA [23].

Regarding the teaching of CA, surveys on UK dental schools [22] and US dental hygiene program directors [23] indicated that the vast majority of schools commence teaching CA skills in the first or second year of professional degree studies. All other articles that explicitly mentioned when to start teaching CA also began in the first or second year. In the survey of 12 UK dental schools, the total study time of CA ranged from 11.5 to 30 hours, with an average of 22.1 hours [22]. One university introduced a 4-year curriculum specialized in teaching CA named Skills in Assessing the Professional Literature (SAPL) [25]. Most schools in the included articles taught CA skills within the EBD curriculum, while EBP was not included in the curriculum of dental undergraduates in India [26].

RM-related contents were more often taught in the postgraduate stage in included studies. One school explicitly stated that biostatistics was not taught in the BDS curriculum and was only taught at the postgraduate stage [27]. The survey of US dental hygiene program directors found that regarding the teaching of RM, 20% offered a separate course, 70% taught RM as part of other courses, 8% did not teach RM, and 2% used other methods to teach [23]. **Figure 3** depicts the distribution of different teaching contents among different groups of learners and various teaching forms adopted.

Teaching content and methods

Despite differences in the main teaching content, the vast majority of articles (49/53, 92.5%) involved the teaching of CA. Among these, the majority involved teaching of types of study design and their strengths and weaknesses (21/53, 39.6%), followed by statistics-related content (18/53, 34.0%), the level or hierarchy of evidence (14/53, 26.4%), and RM (10/53, 18.9%). Several articles mentioned the tools they taught for CA of literature, including Critical Appraisal Skills Programme (CASP) tools [28, 29], Literature Analysis Form (LAF) [25, 30, 31], AMA Manual for Evidence-Based Clinical Practice [32], AMSTAR [33], Timmer scale [34], and Assessing Competency in Evidence-Based Medicine (ACE) tool [35]. In the teaching of RM and statistics, basic concepts related to study design and statistics were the teaching focus for professional degree students, while more emphasis was placed on how to conduct research (including writing protocol, implementation, and statistical analysis) for postgraduate students or residents.

Regarding teaching methods, while lectures were the most commonly used (24/53, 45.3%), the majority of institutions employed a combination of teaching strategies that integrated both theoretical and hands-on elements, including class discussions, group activities, and research projects. In the survey of UK dental schools, 11 out of 12 reported that CA was taught using multiple methods, and the most common combination of methods was “lectures, workshops, and web-based learning” [22]. One school adopted a flipped classroom approach, where all materials were presented in the form of e-lectures and then consolidated through structured group tutorials [29].

Teaching outcomes and evaluation

Many articles assessed CA as part of the teaching outcomes of EBD, and only a few articles separately evaluated the teaching outcomes of CA or RM. The methods of outcome assessment included writing reports and assignments, group appraisal and presentations, multiple-choice question exams, and questionnaires. The most commonly used questionnaire was Knowledge, Attitudes, Access, and Confidence Evaluation (KACE). One study compared the validity of three different assessment methods: group assignments, exams, and self-rating questionnaires [36]. In addition, two surveys of UK schools both indicated that the majority of the respondents conducted summative assessments of CA skills in exams [22, 24]. **Figure 4** summarizes the teaching outcomes reported in the included articles.

Regarding teaching evaluation, only 14 (26.4%) articles mentioned their methods of teaching evaluation. The vast majority of these evaluations were from learners. One article mentioned teacher self-evaluation [37], and one described evaluation by peer faculty and external reviewers [29]. The most frequently used teaching evaluation method was questionnaires (including Likert scale and open-ended questions), and a few used qualitative interviews [29, 38, 39]. The aspect most frequently evaluated was teaching contents, followed by instructors, teaching methods, assessment methods, and assignments.

Faculty development

Five universities mentioned their faculty development strategies, among which the most frequently employed strategy was to conduct EBD workshops where CA was taught. The

duration of the workshops ranged from 2 to 5 days. Two of these schools adopted an interprofessional training approach to facilitate communication among faculty members from different medical specialties [40, 41]. Hinton et al [14, 42] described that their school employed a multipronged method to cultivate EBD faculty. Different training strategies were adopted based on the interests and backgrounds of the faculty, including research day activities, special courses designed for clinical faculty, and providing financial support for off-campus conferences. Additionally, they also identified talented students and created a specialized educational track, aiming to cultivate future dental educators and researchers. Besides the university-based training, an academic organization carried out a four-day Faculty Development Institute program to teach faculty the principles and teaching strategies of EBD. The participants were guided to design their teaching implementation plans, and educational support and progress monitoring of implementation were provided [43].

Discussion

The ability to identify high-quality research, critically evaluate literature, and interpret study results appropriately is fundamental for providing high-quality evidence-based dental care [44]. Learning CA and RM provides a systematic and scientific approach. Even before the emergence of evidence-based medicine (EBM) in the 1990s, medical schools recognized the importance and started to teach CA skills [45]. Incorporating CA skills into dental education has also become a goal and requirement globally [24]. Early introduction of EBD concepts and CA skills can better prepare dental students for future EBP [46, 47]. In the present review, while some institutions offered specialized CA courses, most integrated these skills within broader

EBD curricula. Teaching EBD skills often starts in the first or second years of dental education, which is similar to EBM teaching in medical education [48]. Postgraduate and residency RM training further enhances evidence-based decision-making abilities, with evidence showing such training improved clinical competence and increased interest in clinical research careers [15].

In the included articles, nearly two-thirds originated from North America (predominantly the United States). This suggests that regions with well-developed education and rich research resources tend to support empirical investigations into dental education. However, this geographic concentration may underrepresent educational practices in other regions, thereby limiting our understanding of the global landscape of CA and RM teaching.

The growing emphasis on EBD also highlighted the importance of biostatistics training. Biostatistics and RM are the courses taught in many postgraduate programs in different countries [49, 50]. However, traditional statistical teaching often faces challenges due to its strong theoretical features and lack of dental-specific examples [51]. In this review, a university implemented innovative reforms to address these challenges, including the use of oral health examples drawn directly from dental research literature rather than general medical cases. They also restructured their curriculum to introduce epidemiology before statistics, embedding statistical concepts within epidemiology to reduce student anxiety about statistics [29].

A systematic review found that isolated EBM training produced only short-term knowledge gains without affecting attitudes, skills, or behaviours, while integrating EBM teaching into clinical training achieved sustained and comprehensive improvements [52]. Another study also found that teaching EBD only in the first year and evaluating students' EBD

behaviour in the third year yielded unsatisfactory results [33]. Curriculum reform process in several dental schools shows progression from fragmented individual teachings (teaching epidemiology, biostatistics, RM, and clinical courses separately) to comprehensive EBD systems [29, 37, 53]. In addition, EBP requires much more than knowledge acquisition and access to evidence, and it is necessary to cultivate students' attitudes and beliefs to drive their continued behavioural change. A survey found that although dental curricula emphasize EBP, they often inadequately cover biostatistics and research methodology, and hands-on research experience plays a critical role in shaping professional development and readiness as competent dentists [54].

In this review, lectures were the most frequently used teaching method. However, a study found that over 70% of dental students had multiple learning preferences [50]. Therefore, it is necessary for teachers to adopt diverse teaching methods to suit more students. Small group workshops prove particularly effective by promoting better preparation, engagement, and critical thinking [55]. Furthermore, technological advancements have enabled schools to incorporate online resources, providing students with flexible learning opportunities. A school adopted the flipped classroom method, using e-lectures for teaching. Its advantages were that e-lectures can ensure the continuity of courses and teaching quality, and graduate students and staff can also utilize these lectures and relevant resources [29]. Another school's strategy was to use existing resources on the internet for teaching [27]. This may be a potential solution for institutions lacking relevant faculty, though finding suitable resources to create a complete and systematic curriculum could be a challenge.

As mentioned above, engagement in research is also a crucial way for learning research methodology. However, student participation in research varies across institutions and regions. At research-intensive schools, dental students routinely engage in research projects as part of their standard training. Consequently, CA and RM teaching may be perceived as commonplace and rarely receive focused investigation, which means their established, everyday practices remain underreported. In addition, institutional support and resource allocation for CA and RM teaching differs across schools. Research-intensive institutions may dedicate more faculty and financial support and provide research programs and relevant training activities to foster a strong research culture and student engagement, while schools with limited resources may prioritize traditional lectures that are more clinically focused.

Teaching CA and RM faces several implementation challenges, with primary obstacles including insufficient faculty, limited time, and lack of financial support. Faculty development presents a particular concern as clinical instructors often lack an EBD background and may struggle with the statistical and epidemiological concepts underlying CA and RM [14, 23, 53]. In addition, resistance to changing conventional teaching methods hampers the implementation of evidence-based teaching for all subjects [56]. Our findings indicate that teachers with EBD-related training showed greater interest and confidence in teaching these skills, and were more likely to participate in relevant continuing education or academic conferences. Therefore, institutional resources and support for faculty development are predictive factors for the implementation of evidence-based teaching [57]. Outcome assessment presents another issue since it predominantly relies on instructor evaluations, which can lead to unbalanced assessment and delayed feedback [58]. Furthermore, tracking long-term outcomes becomes

challenging as students learn core concepts during early years of dental education but only begin applying CA and RM in clinical practice when they approach graduation.

Our scoping review has some limitations. First, scoping reviews have inherent limitations as they emphasize breadth over depth. This scoping review provided a broad overview across undergraduate, postgraduate, practitioner, and faculty education contexts, which aimed to comprehensively map the teaching practices and trends in CA and RM teaching, and may not capture some details. The significant heterogeneity in teaching methods and outcome assessments across articles prevented meaningful quantitative synthesis. Second, most included articles were from North America and the findings might not represent other parts of the world. In addition, only one randomized controlled trial was included, with most studies adopting an observational design, based on single-centre investigation, and evaluating only short-term effects of teaching through end-of-course assessments or final examinations. Although multiple studies have examined CA or RM teaching, the evidence assessing their teaching outcomes (such as improvements in students' skills or changes in clinical decision-making behaviours) remains scarce. Future investigations could focus on the development of valid outcome measures, and assess the impact of CA and RM teaching on students' professional growth and practice based on long-term follow-up.

Conclusions

Research on CA or RM education in dentistry is predominantly observational, which typically adopted before-and-after self-comparison designs or uncontrolled designs. The methodological limitation hinders the generation of robust evidence demonstrating the

effectiveness of CA or RM educational interventions. There is still a lack of evidence regarding the long-term effects of CA and RM teaching activities, as well as their influence on clinical practice and patient outcomes.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the authorship and/or publication of this article.

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Table

Table 1. Characteristics of 53 included articles.

Characteristic	Category	n (%)
Publication year	Before 2005	5 (9.4)
	2005-2009	8 (15.1)
	2010-2014	11 (20.8)
	2015-2019	18 (34.0)
	2020-2024	11 (20.8)
Continent	North America	34 (64.2)
	Asia	11 (20.8)
	Europe	6 (11.3)
	Africa	1 (1.9)
	Oceania	1 (1.9)
QS top 120 universities in dentistry [a]	Top 50	11 (20.8)
	51-120	11 (20.8)
Type of article	Narrative	14 (26.4)
	Observational study	33 (62.3)
	Experimental study	6 (11.3)
Study design [b,c]	Cross-sectional	16 (41.0)
	Before-and-after comparison	11 (28.2)
	Comparison between different groups	6 (15.4)
	Uncontrolled cohort	8 (20.5)
Objective	Effectiveness of teaching	24 (45.3)
	Design of a course/curriculum/program	13 (24.5)
	Description of teaching experience	11 (20.8)
	Others	5 (9.4)
Main teaching content	Critical appraisal	9 (17.0)
	Research methodology and statistics	10 (18.9)
	EBD or EBP	31 (58.5)
	Others	3 (5.7)
Learners [b]	Professional degree students (DDS, DMD, BDS, etc.)	35 (66.0)
	Postgraduate students or residents	12 (22.6)
	Dental hygiene students	4 (7.5)
	Faculty	6 (11.3)
	Practitioners	4 (7.5)

BDS, Bachelor of Dental Surgery; DDS, Doctor of Dental Surgery; DMD, Doctor of Dental Medicine; EBD, evidence-based dentistry; EBP, evidence-based practice.

Figure legends

Figure 1. PRISMA flow diagram of article selection.

Figure 2. Six aspects of critical appraisal and research methodology teaching in the included articles.

BDS, Bachelor of Dental Surgery; DDS, Doctor of Dental Surgery; DMD, Doctor of Dental Medicine; EBD, evidence-based dentistry; EBP, evidence-based practice.

Figure 3. The distribution of different teaching contents among different groups of learners and the adopted forms of teaching.

BDS, Bachelor of Dental Surgery; DDS, Doctor of Dental Surgery; DMD, Doctor of Dental Medicine; EBD, evidence-based dentistry; EBP, evidence-based practice.

Figure 4. Teaching outcomes of critical appraisal and research methodology in dental students, faculty and practitioners.

EBD, evidence-based dentistry; EBP, evidence-based practice.

Figure 1

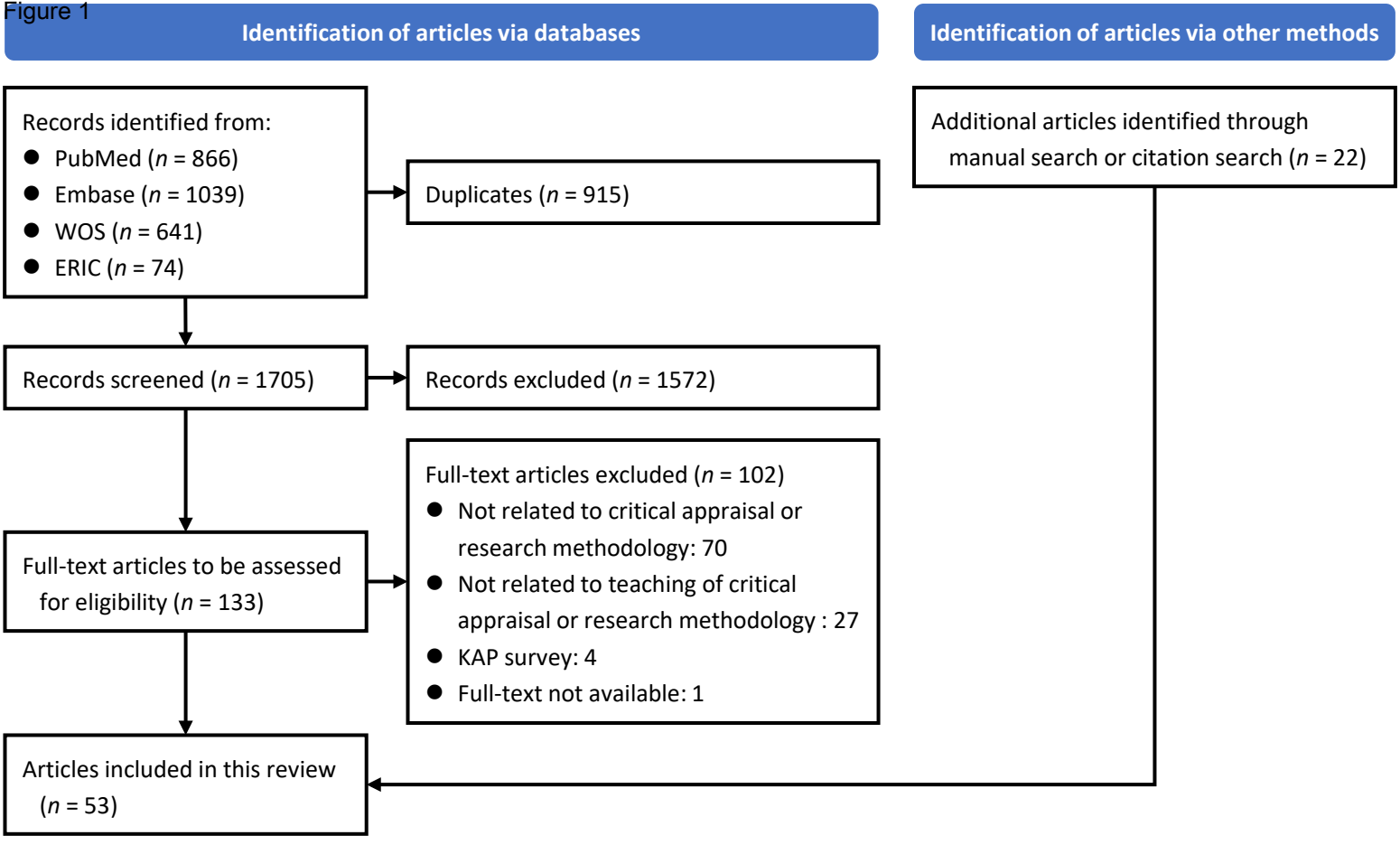

Identification of articles via databases
Identification of articles via other methods
Records identified from:
PubMed (n = 866)
Embase (n = 1039)
WOS (n = 641)
ERIC (n = 74)
Duplicates (n = 915)
Additional articles identified through manual search or citation search (n = 22)
Records screened (n = 1705)
Records excluded (n = 1572)
Full-text articles excluded (n = 102)
Not related to critical appraisal or research methodology: 70
Not related to teaching of critical appraisal or research methodology : 27
KAP survey: 4
Full-text not available: 1
Full-text articles to be assessed for eligibility (n = 133)
Articles included in this review (n = 53)

Figure 2

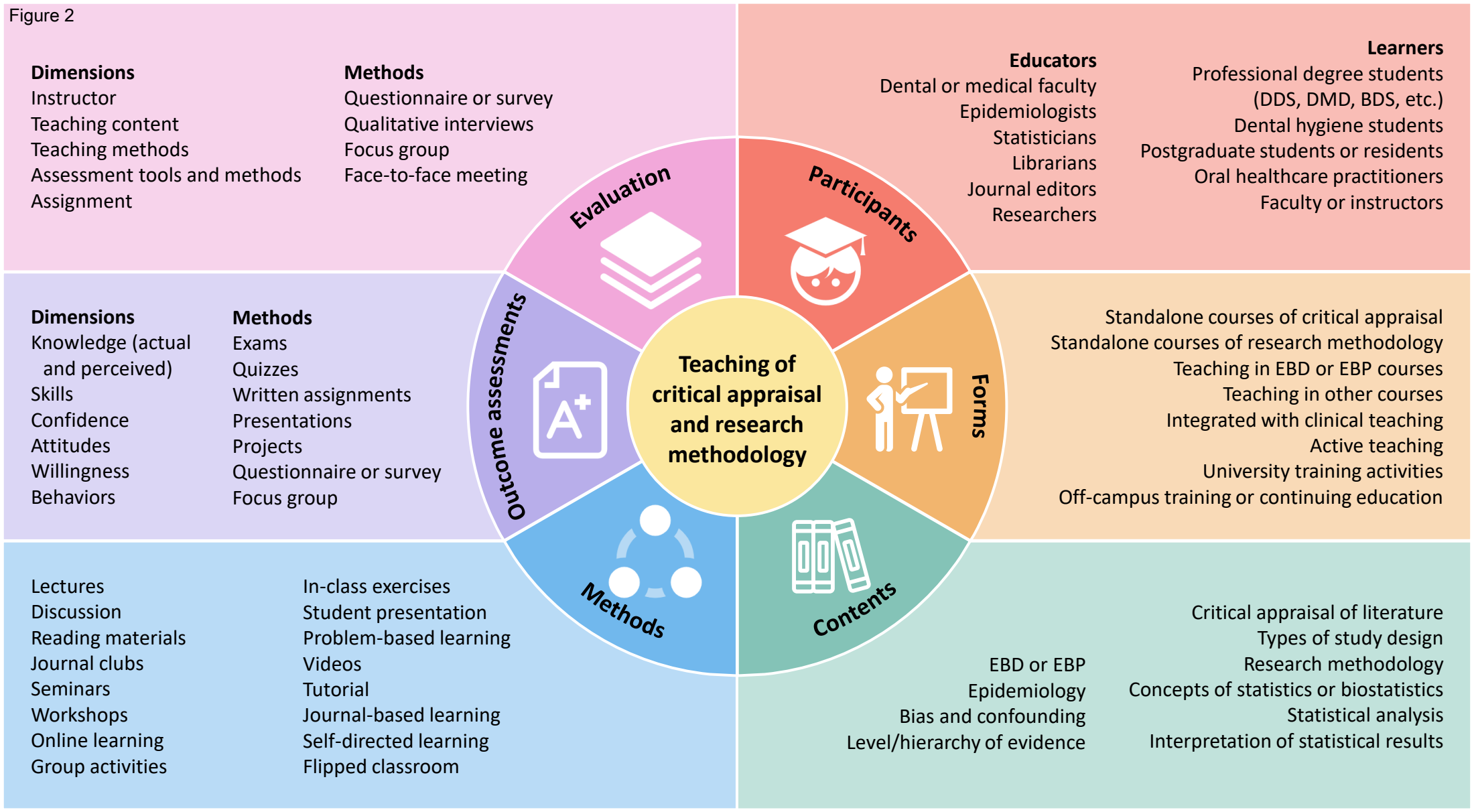

Dimensions
Instructor
Teaching content
Teaching methods
Assessment tools and methods
Assignment
Methods
Questionnaire or survey
Qualitative interviews
Focus group
Face-to-face meeting
Educators
Dental or medical faculty
Epidemiologists
Statisticians
Librarians
Journal editors
Researchers
Learners
Professional degree students (DDS, DMD, BDS, etc.)
Dental hygiene students
Postgraduate students or residents
Oral healthcare practitioners
Faculty or instructors
Dimensions
Knowledge (actual and perceived)
Skills
Confidence
Attitudes
Willingness
Behaviors
Methods
Exams
Quizzes
Written assignments
Presentations
Projects
Questionnaire or survey
Focus group
Standalone courses of critical appraisal
Standalone courses of research methodology
Teaching in EBD or EBP courses
Teaching in other courses
Integrated with clinical teaching
Active teaching
University training activities
Off-campus training or continuing education
Lectures
Discussion
Reading materials
Journal clubs
Seminars
Workshops
Online learning
Group activities
In-class exercises
Student presentation
Problem-based learning
Videos
Tutorial
Journal-based learning
Self-directed learning
Flipped classroom
EBD or EBP
Epidemiology
Bias and confounding
Level/hierarchy of evidence
Critical appraisal of literature
Types of study design
Research methodology
Concepts of statistics or biostatistics
Statistical analysis
Interpretation of statistical results
Evaluation
Participants
Forms
Contents
Methods
Outcome assessments
Teaching of critical appraisal and research methodology

Figure 3

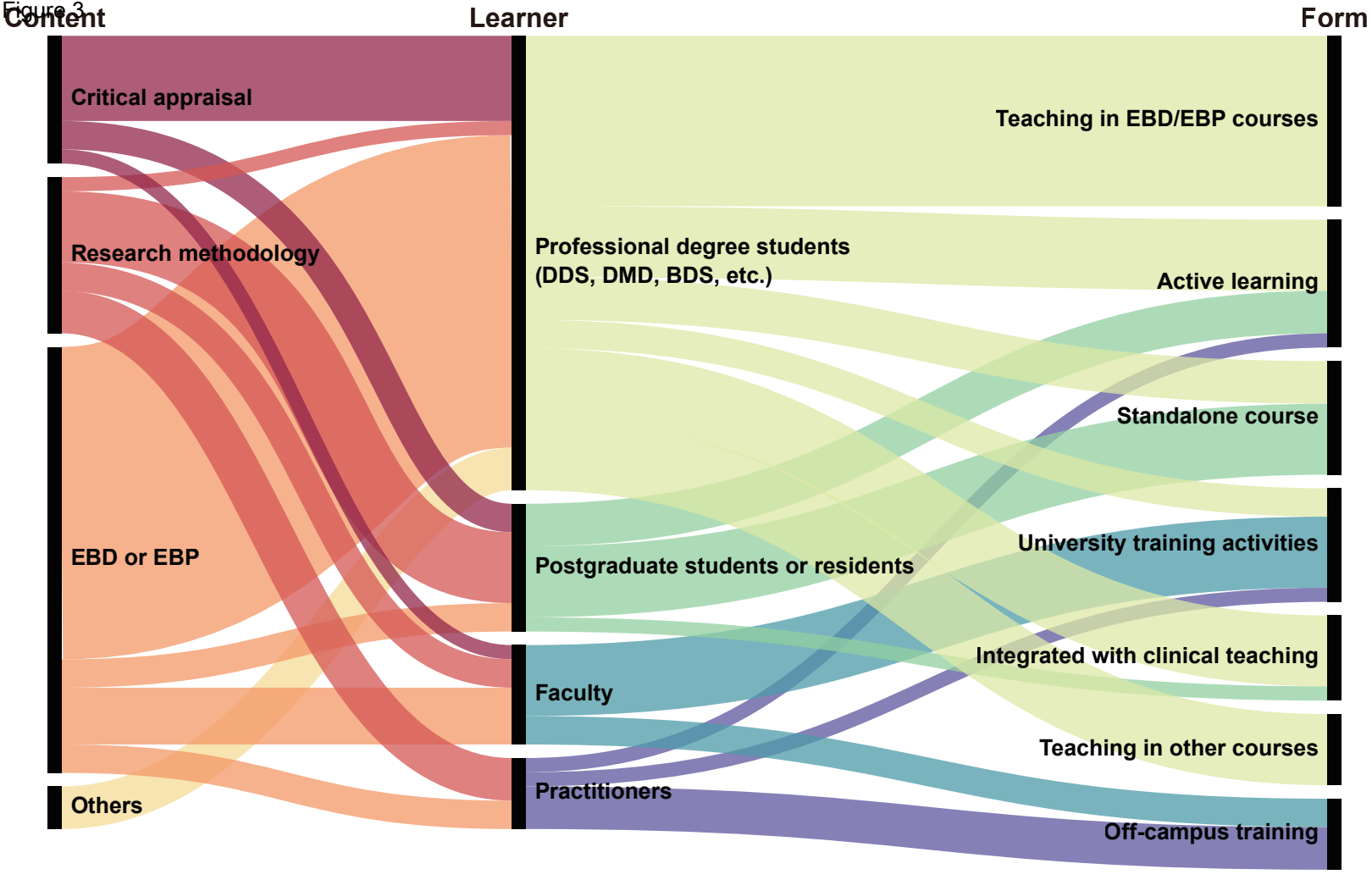
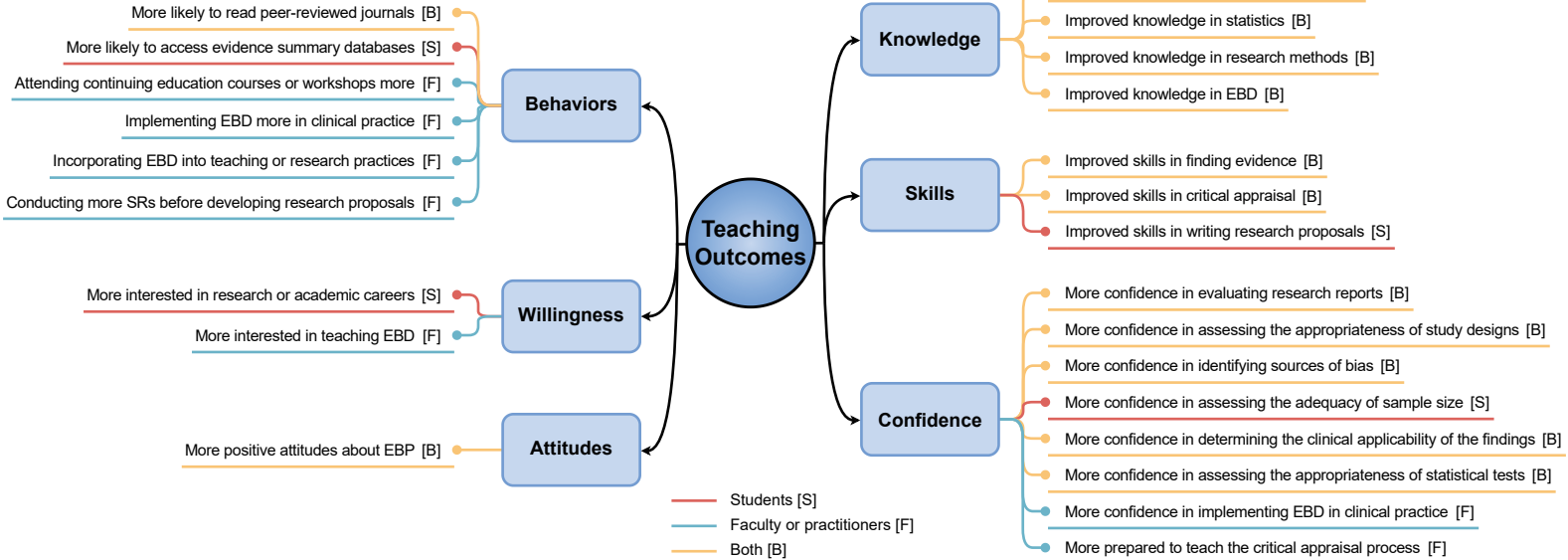

Content
Learner
Form
Critical appraisal
Research methodology
EBD or EBP
Others
Professional degree students (DDS, DMD, BDS, etc.)
Postgraduate students or residents
Faculty
Practitioners
Teaching in EBD/EBP courses
Active learning
Standalone course
University training activities
Integrated with clinical teaching
Teaching in other courses
Off-campus training

Figure 4


Teaching Outcomes
Behaviors
More likely to read peer-reviewed journals [B]
More likely to access evidence summary databases [S]
Attending continuing education courses or workshops more [F]
Implementing EBD more in clinical practice [F]
Incorporating EBD into teaching or research practices [F]
Conducting more SRs before developing research proposals [F]
Willingness
More interested in research or academic careers [S]
More interested in teaching EBD [F]
Attitudes
More positive attitudes about EBP [B]
Knowledge
Improved knowledge in critical appraisal [B]
Improved knowledge in statistics [B]
Improved knowledge in research methods [B]
Improved knowledge in EBD [B]
Skills
Improved skills in finding evidence [B]
Improved skills in critical appraisal [B]
Improved skills in writing research proposals [S]
Confidence
More confidence in evaluating research reports [B]
More confidence in assessing the appropriateness of study designs [B]
More confidence in identifying sources of bias [B]
More confidence in assessing the adequacy of sample size [S]
More confidence in determining the clinical applicability of the findings [B]
More confidence in assessing the appropriateness of statistical tests [B]
More confidence in implementing EBD in clinical practice [F]
More prepared to teach the critical appraisal process [F]
Students [S]
Faculty or practitioners [F]
Both [B]