Clear and present questions: Formulating questions for evidence based practice

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Clear and present questions: formulating questions for evidence based practice

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Abstract

Purpose – The paper seeks to provide an overview and update of thinking in relation to the theory and practice of formulation of answerable research questions within evidence based information practice.

Design/methodology/approach – The paper reviews the healthcare and information literature on question formulation, augmented by structured and purposive internet searches.

Findings – Although a few key authors have published extensively on all aspects of the evidence-based information practice process, including question formulation, there is little in the way of empirical research.

Research limitations/implications – In the absence of an empirical research base from within the specific domain of information practice, this conceptual paper extrapolates findings from healthcare research to general librarianship.

Practical implications – This article models the process of question formulation using a proposed conceptual framework (SPICE) and encourages practitioners to identify their own practice-based questions.

Originality/value – This is the first article specifically to address question formulation for a general (i.e. non-health) library audience.

Keywords Evidence-based practice, Librarianship, Research

Paper type Conceptual paper

Introduction

> To be able to ask a question clearly is two-thirds of the way to getting it answered (John Ruskin).

How many times in a working day do you question the value of established library practice? What questions do you and your colleagues ask when contemplating the introduction of some new technology or some innovative service? It is true that, on occasions, lack of time or other logistic constraints will conspire to cause what we might label an "evaluation bypass". On such occasions we may continue to perform some task or action even though we are not truly convinced of its efficacy or we may move to uncritical adoption of a new technology or procedure. Hopefully such instances are the exception rather than the rule. Nevertheless we must acknowledge that it does take both time and effort to "start stopping" or to "stop starting" (Gray, 1997). Thus it becomes critical that all information professionals become efficient at identifying, formulating and addressing relevant questions from their own practice.

Within other domains of evidence-based practice, most notably evidence-based healthcare, a considerable knowledge base has been built up around the formulation of

questions. We know, for example, that on average physicians ask two questions for every three patients seen (Booth, 2005). We know too that a large percentage of these questions (30-60 per cent) will go unanswered – in some cases because the one asking does not believe that the answer is to be found (Booth, 2005). Frequently questions will be answered with reference to colleagues or from outdated textbooks (Booth, 2005). It would be reassuring to believe that, as a profession, our knowledge of the research literature in librarianship is such that we can correctly anticipate whether the answers to our questions from day-to-day practice do exist. The truth is that very few of us have regular and intensive contact with our own evidence base. This situation is further aggravated by the fact that many of our activities lie within domains populated by other research literatures, for example management, education, marketing and computer science (Crumley and Koufogiannakis, 2002).

Why ask questions?

Questioning the fundamentals of daily work practice is a defining characteristic of a professional. As Geroud remarked almost a century ago:

> No questions arise more frequently in the mind of the progressive librarian than these: Is this method the best? Is our practice, in this particular, adapted to secure the most effective administration? Are we up to the standard set by similar institutions of our class? These questions are of the most fundamental type, and upon the success with which we answer them depends much of the success of our administration (Gerould, 1906, p. 761, cited in Hiller and Self, 2004).

To illustrate, the basic techniques of butchery have changed little over the last three centuries. In contrast, over the same period of time surgery has evolved and developed a knowledge base on the back of questioning practice. The former is a trade, the latter a profession. One hopes a similar contrast exists between bookselling and librarianship!

Donald Schon points out that the concept of "reflection" is central to understanding what professionals do (Schön, 1983). All too often in the past librarians have based their practice on what Schon dismisses as "technical-rationality", where a professional learns specialized scientific and theoretical knowledge that he or she applies to the situation at hand (Horton, 2002). Such a model does not equip us well to derive new insights, especially when faced with new technologies. So, for example, we may view web pages as an extension of page-based systems and online catalogues as analogous to card catalogues, rather than developing a new paradigm that harnesses the latent advantages of these new technologies.

In contrast Schon advocates reflection-in-action and reflection-on-action. Reflection-in-action is what we might call "thinking on our feet". We build new understandings from our experiences, feelings and theories within a context or situation as it unfolds. We do not come in with predetermined solutions but remain alive to new insights as a situation develops. We may try something new (an "experiment") which helps us to gain an additional understanding and which may modify the situation that we have encountered.

Reflection-on-action is done later, after an encounter. We may write up notes in a "benchbook" or diary, we may analyse our experience with our supervisor or a professional mentor or we may even share our insights via a discussion list or blog. Valuable time spent reflecting-on-action enables us to explore why we acted the way

that we did. In revisiting our experience we develop sets of questions about our activities and practice.

Having established a connection between professional, reflective practice and the asking of questions it is appropriate to acknowledge that the catalyst for such questions comes from a myriad of sources – for example, from daily practice, from research or from the observations of our users. This is explicit in broader definitions of evidence-based practice:

> Evidence-based information practice (EBIP) is an approach to information practice that promotes the collection, interpretation and integration of valid, important and applicable *user-reported*, *librarian observed*, and *research-derived* evidence. The best available evidence, moderated by user needs and preferences, is applied to improve the quality of professional judgements (Booth and Brice, 2004a).

Similarly, the sources of evidence to answer such questions may themselves derive from research, from the reports of users or from our own professional experiences. This many-to-many relationship, by which either source or satisfier of a question may derive from any or all of these routes, corrects early misconceptions of evidence-based practice which expected all roads to lead to the research literature.

The place of questions in evidence based practice

The first stage of evidence-based practice, whether in medicine, nursing, education or librarianship, is to convert information needs from practice into "focused, structured questions" (Rosenberg and Donald, 1995; Sackett and Rosenberg, 1995; Booth, 2000). Of course this assumes that a practitioner is aware of their own knowledge deficits – "knowing what they need to know" is a little-explored but nevertheless basic requirement when initiating the process of evidence-based practice. By using the phrase "posed questions" Eldredge (2000a) implicitly acknowledges the need for articulation of information needs:

> Questions drive the entire EBL process. EBL assigns highest priority to posed questions with greatest relevance to library practice. The wording and content of the questions will determine what kinds of research designs are needed to secure answers.

Related to this is the need for some degree of uncertainty to be present. If you, as a library practitioner, have identified an issue that requires resolution (e.g. researchers are having difficulty keeping up to date) but you automatically assume that you know the answer (e.g. automated current awareness services) you will progress directly to your preferred solution. Therefore the likelihood of you pursuing an answer for a question depends less on whether the evidence to answer a question actually exists than whether you are at a prior state of uncertainty. This phenomenon explains why the role of mentor or research supervisor is often key to evidence based practice (Booth, 2004a) – the presence of a "naïve" questioner can often provide the stimulus for a more experienced practitioner to question long-held assumptions.

In the nursing profession, evidence-based practice received considerable stimulus from challenging "nursing rituals" (such as preoperative fasting and perineal shaving) (Walsh and Ford, 1989). Asking questions concerning procedures that had previously proved immune from questioning can thus have a considerable impact. Do we actually need a classification scheme in this age of machine-readable databases – would simply using call numbers prove sufficient? Should we be buying books "just in case" or

should we rely instead on "just in time" ordering of interlibrary loans? Do we need professionally qualified staff on enquiry desks or could paraprofessionals fill this role, with reference to a professional colleague when necessary? No doubt readers of this article already have a position on some, if not all, of these issues – but is it evidence-based?

In their definition of evidence-based librarianship, Crumley and Koufogiannakis (2002) hint that its emphasis should be on the diurnal (might we even say mundane?) rather than on the novel and experimental:

> Evidence-based librarianship (EBL) is a means to improve the profession of librarianship by asking questions as well as finding, critically appraising and incorporating research evidence from library science (and other disciplines) into daily practice (Crumley and Koufogiannakis, 2002).

Explicit prioritisation of questions is fundamental before we even get so far as their formulation; focusing not simply on the most obviously costly areas of our practice but also on high volume, high impact, high risk, etc. (which, of course, may ultimately have large cost implications). It has also been noted that identifying the "most important research questions" risks conflating those that have yet to be answered (a research agenda issue) with those that have been answered satisfactorily but which are yet to impact upon practitioners (a dissemination issue) (Booth, 2001a, b).

The goal of this primary stage, variously called "focusing or formulating your question" (Richardson *et al.*, 1995), is to convert a precise, yet possibly vaguely expressed, information need into an "answerable question". This is mirrored within our own profession where Crumley and Koufogiannakis state:

> The first and most important step in enabling librarians to practice their profession in an evidence-based manner, is to ensure they know how to ask well-structured questions; a much harder task than one might initially suppose – having a well-built question focuses your search for information (Crumley and Koufogiannakis, 2002).

Background and foreground questions

In the early years of evidence-based medicine, Richardson and colleagues proposed a valuable distinction between "background" and "foreground" questions (Richardson and Wilson, 1997). Background questions are typically asked by those who are relatively inexperienced within a subject area. Thus a novice librarian might ask "What are the likely causes of high rates of journal mutilation?" or "If the library introduces e-books what are the likely consequences?".

Alternatively a more experienced practitioner may ask a background question when they are encountering a situation for the first time. They may ask "What are the possible solutions to high rates of plagiarism or poor standards of referencing in academic assignments?" or "What have my colleagues in other libraries tried to combat this problem?". The defining characteristic for each of the above four questions is a need to address a general knowledge deficit. To answer such questions the professional will wish to identify a broad range of options or explanations, perhaps through an overview article or an informal survey of colleagues' opinions. Having filled their knowledge gap with reassuring detail they are then able to narrow down to a more limited range of options. Alternatively, they may be able to identify more specific knowledge deficits that require follow-up. Of course this assumes that their method of

identifying options is not prone to bias; a review may selectively report alternatives according to its author's preferences or interests while a solicitation via a discussion list may attract those with polarised views rather than the "silent majority".

Thus our prior level of knowledge on the topic often determines the type of question that we ask. Background questions broadly equate to what we might describe as "fact-finding". Eldredge (2002a), in a preliminary attempt to characterise question types, which might then map to particular sources of evidence, identified prediction questions ("What would happen if . . .?") and exploration questions ("What are the likely causes of . . .?") as two of the three major question types (see below).

In contrast, if I am already aware of two or more alternative competing choices of action but I am unable to decide which course to take, this is a foreground question, suggesting that I am at a point of decision-making (Richardson and Wilson, 1997). It takes the form "In a population of engineering students are electronic journals more effective than print journals in achieving awareness of latest technological advances?" As implied by this format, the level of prior knowledge required to pose such a question is much greater than that required for a background question. Our choice between such alternatives may be determined (assuming the existence of suitable studies) from research studies published in the journal literature. Those who are more experienced in a profession are most likely to ask foreground questions unless, as previously mentioned, they face a situation or service that they have not previously encountered. The existence of two or more alternatives suggests that some form of comparative study will be most useful in addressing this question. Of course, where a straight head-to-head comparison does not exist we may have to look at studies where choice A and choice B are compared separately to a third alternative or arrive at some crude "balance sheet" of likely advantages and disadvantages for each alternative.

Types of questions
Efforts to classify clinical questions into question types (Gorman and Helfand, 1995; Barrie and Ward, 1997) initially predated and, subsequently, ran parallel to work on question formulation within evidence based healthcare. In contrast, the early days of evidence based information practice have seen attempts by Eldredge (2002a) to disaggregate a wealth of practitioner questions into three main question types:

(1) prediction questions;

(2) intervention questions; and

(3) exploration questions.

Prediction questions typically seek to predict an outcome under specific predefined circumstances. The preferred research design, the cohort study, involves a defined population, exposure to some "change factor", and observed outcomes (Eldredge, 2002b). Classic cohort studies include a comparison with a similar group that has not had exposure to the "change factor". They are particularly valuable within the area of practitioner based research because, as "observational studies" they involve simply recording what happens before and after a particular exposure without seeking to prescribe or modify user behaviour in any way. Eldredge (2002a) has identified such prediction questions as:

- Are students who have been taught information skills more or less likely to continue to further study?
- Do library skills courses improve the information-seeking skills of students?
- Do library desk staff members provide accurate responses to reference questions?

Intervention questions seek to address foreground questions by comparing two or more actions in terms of how "successful" they are in attaining intended goals or outcomes. Characteristics of a study that addresses an intervention question are thus that it is comparative and prospective (that is it compares two or more interventions forward over a predetermined period of time). The classic research design for studying an intervention is thus a randomized controlled trial which not only possesses these two desirable characteristics but also adds the inherent advantage of seeking to ensure that each group being compared is as similar as possible to the other groups (Eldredge, 2003). The presence of this "level playing field" at the beginning of a study makes it easier to attribute any changes taking place to the relative effects of the intervention and not to any pre-existing factors. However this is achieved at the cost of having to prescribe certain user behaviours in the interests of conducting an experimental, rather than observational, study. So, for example users may be asked to give prior consent to receiving training six months later in the "control group" than in the corresponding experimental group. Again Eldredge (2002a) has identified such intervention questions as:

- Does weeding some classification ranges in a monographs collection result in higher usage than the unweeded but otherwise similar ranges?
- Which methods of teaching search skills result in clinicians searching for their own evidence in patient care?
- Do students learn searching skills more effectively from librarians or teaching faculty?

Exploration questions typically seek to answer the question "why?". As such they frequently employ qualitative research designs. Factors mediating the intended effects of some new service or training course are often grounded in variations in human attitudes, opinions, feelings, thoughts or behaviours. As such they cannot be easily explored in a large quantitative study where there is a predefined assumption, or hypothesis, of how an intervention might work. Single studies for answering exploration questions may be used to generate a hypothesis for subsequent exploration in a cohort or randomized controlled study. Alternatively they may be used to explore an effect that has been demonstrated in a quantitative study but which has not been satisfactorily explained. For example, trainers frequently report that, while initial training usually reduces anxiety, perversely further training may increase anxiety. Only a qualitative study would be able to explore why this might occur – perhaps revealing that a certain level of training may make readily apparent how complex it is to obtain a full understanding of the subject being taught. Thus, for a student with no knowledge of database searching it may be reassuring to learn how to search the ERIC database. However, once they have obtained this valuable insight if we continue to cover all the other databases available within education their initial anxiety may be replaced by a different yet related concern – a qualitative study would reveal if this is

the case. Of course qualitative research is not, in itself, a single research design but comprises a toolbox of such methods as "focus groups, ethnographic studies, naturalistic observations, in-depth interviewing, Delphi techniques, nominal group processes, and historical analyses". Eldredge (2002a) has again identified such exploration questions as:

- Why do potential users, who are presently non-users, not use their library?
- Why do some users prefer certain information resources over equally relevant information resources?
- Do librarians improve or worsen users' perceptions of information overload?

Of course, reducing library practitioner questions into these three discrete categories may have the unintentional effect of blurring the wealth of information practice that may be subject to a questioning approach. Exponents of evidence-based healthcare (the Evidence Based Medicine Working Group, 1992) devised a mixed typology including both question-types, for example, diagnosis, (a)etiology, prognosis and therapy and study types (e.g. economic analysis, systematic review, practice guideline). A more purist typology for evidence based information practice (Booth, 2004b) might include:

- information needs;
- information behaviour;
- causation;
- information delivery;
- use studies;
- interventions to promote uptake and utilisation of resources;
- information retrieval;
- information presentation;
- information impact;
- cost-effectiveness/cost-benefit; and
- service organisation and management.

Booth and Brice (2004b) use this taxonomy as a strategy for developing the CRISTAL series of user guides, based on question types as opposed to study types, to enable librarians to ask meaningful questions of published research. Currently such guides exist for category 1 (Information needs) and category 5 (Use studies).

Crumley and Koufogiannakis (2002) have explored in much detail six domains of library practice and their corresponding evidence base:

(1) *Reference/enquiries* – providing service and access to information that meets the needs of library users.

(2) *Education* – finding teaching methods and strategies to educate users about library resources and how to improve their research skills.

(3) *Collections* – building a high-quality collection of print and electronic materials that is useful, cost-effective and meets the users needs.

(4) *Management* – managing people and resources within an organization.

(5) *Information access and retrieval* – creating better systems and methods for information retrieval and access.

(6) *Marketing/promotion* – promoting the profession, the library and its services to both users and non-users.

They suggest that matching librarianship questions to one of the above domains, or a subsequently added domain of professional issues (Koufogiannakis *et al.*, 2004), can:

- help librarians decide the appropriate search terms to answer that type of question;
- determine the sources to be used to answer these questions; and
- allow librarians to focus upon what they are really asking, rather than permitting the question to snowball in many different directions.

Structures for formulating questions

Clearly much work remains in establishing a consensual framework within which to group and characterise questions for information practice. A further area of activity which parallels developments within evidence-based healthcare is work to devise a structure or "anatomy" for a "focused" or answerable question (Richardson, 1998; Flemming, 1998; Geddes, 1999). Drawing on the terminology of epidemiology (the study of populations), evidence-based practitioners are encouraged to analyse the components of a foreground question according to four common features:

(1) *population* – the recipients or potential beneficiaries of a service or intervention;

(2) *intervention* – the service or planned action that is being delivered to the population;

(3) *outcomes* – the ways in which the service or action can be measured to establish whether or not it has had a desired effect; and, optionally

(4) *comparison* – an alternative service or action that may or may not achieve similar outcomes.

Booth (2004b) illustrates this with an example that bridges the information practice/healthcare domains: in pregnant mothers (population) is a touchscreen information service (intervention) more effective than printed information leaflets (comparison) in terms of knowledge of factors likely to cause prenatal harm (outcomes).

Occasionally the "I" of intervention in this PIOC or PICO mnemonic is replaced by "E" for exposure where an action is unintentional or unplanned. For example, increasing illiteracy (exposure) among school-leaving teenagers (population) measured in terms of employability (outcome) compared with literate schoolchildren (comparison) yields a similarly focused question (Booth, 2004b). Of course not all questions have all four components present – indeed where only two components exist they are what we have previously characterised as "background questions" (Richardson and Wilson, 1997).

Once we have identified a topic which carries uncertainty, a specific question needs to be defined in terms of its components. Does this uncertainty relate to all users or to a particular group of users? Is it a particular service, or aspect of a service, that is causing disquiet? What are the options or alternatives? How would you know if you

could have done things better? Crumley and Koufogiannakis (2002) thus recommend that "Librarians should consider adopting a modified form of the well-built clinical question (commonly known as PICO) for EBL". Booth (2004b) responds to this exhortation by devising a mnemonic – SPICE – which makes two significant changes to acknowledge the particular needs of our profession. The first change recognises that information practice is a social science, not a "hard science", by splitting the population component into both setting and perspective. This recognises that evaluation within information practice is typically subjective and requires definition of the specific stakeholder view that is the focus (e.g. undergraduate students, doctoral students, academic staff, library staff, library managers, etc.). The second change is to encourage a broader evaluation framework than might be indicated by the component "outcomes". This term is considerably more ubiquitous in healthcare than in information practice where other terms might be preferred. By replacing "outcomes" with "evaluation" the SPICE model incorporates other concepts such as "outputs" and "impact" together with less tangible effects of a library or instructional intervention. The resultant SPICE framework thus comprises:

- Setting – where?
- Perspective – for whom?
- Intervention – what?
- Comparison – compared with what?
- Evaluation – with what result?

So, from the perspective of an undergraduate student (perspective) in a university library (setting) is provision of a short term loan collection (intervention) more effective than a general collection (comparison) in terms of the percentage availability of recommended texts (evaluation)?

Cynics may argue that there is, in fact, minimal justification for developing a separate variant of the focused question specifically for information practice. It is true that question formulation is not the prerogative of evidence-based practice, and other models of question formulation, such as the typology devised by White (1998), may appear more intuitive to an information professional. Even within evidence-based practice other variants exist such as the ECLIPSE model devised by Wildridge and Bell (2002) for questions regarding health policy and management. Indeed the SPICE model may be dismissed as simply a mechanism for turning a once-implicit information need into an answerable question – a means of getting people "to tell you what they want, what they really, really want". Such a facetious comment is supported by White's observation that the study of questions provides an "insight into the mental activities of participants engaged in problem solving or decision making" (White, 1998).

Matching the research design to the question

A valuable principle established by the evidence-based healthcare movement is that practitioners should not waste energies in arguing the inherent superiority of one particular research paradigm or philosophical approach. Instead, the most appropriate study design should be selected for each type of question (Sackett and Wennberg, 1997):

Our thesis is short: the *question* being asked determines the appropriate research architecture, strategy, and tactics to be used – not tradition, authority, experts, paradigms, or schools of thought.

Booth (2001b) models this process by taking three questions identified by the Medical Library Association and attempting to match them to an appropriate research design. Within the specific context of user studies Wildemuth (2003) makes a useful distinction between questions that call for "extensive" methods and those that call for "intensive" methods. Such a catholic approach to evidence and the range of study approaches available to generate it goes some way towards countering Plutchak's recent objection that:

As Eldredge and others have pointed out, the key to applying evidence-based principles is to be sure to ask the right questions, and I have not been convinced that the questions that are most important to librarianship are the kinds of questions that are amenable to the sort of rigorous investigation that EBL, it has seemed to me, calls for (Plutchak, 2005).

Evaluating the impact of formulated questions

In a recent communication to the evidence-based-health discussion list (August 2005) Scott Richardson, an early proponent of question formulation, outlines seven potential benefits from the question formulation process. Although research into question formulation within our own professional context is much more immature it is nevertheless possible to extrapolate that these benefits, albeit slightly reworded, also exist for our own evidence-based practice:

(1) to use our scarce learning time on evidence that directly relates to *our users*' needs;

(2) to optimise our scarce learning time on evidence that directly relates to *our own* learning needs;

(3) to suggest high-yield search strategies;

(4) to suggest the forms that useful answers might take;

(5) to improve articulation and communication of problems with colleagues;

(6) when teaching, to help our learners understand the content of what we teach, while modeling a useful skill for lifelong learning; and

(7) to build both our knowledge base and our learning skills and to reward (rather than punish) curiosity.

Research within evidence-based healthcare suggests that a structured approach to question formulation causes those who have learnt this to:

· ask more questions (Villanueva *et al.*, 2001);

· undertake more searches (Cabell *et al.*, 2001); and

· use more detailed search methods and find more precise answers (Booth *et al.*, 2000; Rosenberg *et al.*, 1998).

Precise questions have been linked to more efficient searching for the needed evidence (Snowball, 1997; Eldredge, 2000b): "Fuzzy questions tend to lead to fuzzy answers" (Oxman and Guyatt, 1988). Additionally, as many initial questions lead to other questions, the question formulation process is an iterative activity (Eldredge, 2000a).

Practitioners' questions versus researchers' questions

There is a frequently reported mismatch between questions generated by practitioners and those addressed by researchers. For example, Farmer and Williams (1999) asked: "Why are practitioners' research priorities so much more concrete than those of the funding bodies?" – a theme echoed by Dwyer (1999) when she described the practitioner's "focus on answering practical questions". While the initiative of Jonathan Eldredge and his colleagues on the Medical Library Association's Evidence-Based Librarianship Implementation Committee (EBLIC) in asking practitioners to identify the "most important research questions facing the profession" (Eldredge, 2001) is to be commended, there is a danger that such lists are dominated by questions around new technologies and interventions ("what we know we don't know) rather than central practices and procedures ("what we don't know we don't know").

Such a complaint is by no means unique to the information sector with frequent tensions between demand-led and more strategic approaches to research priorities. Within a health service context it has been bemoaned that question answering focuses on the margins of the health services where new technologies make a peripheral contribution rather than on the less glamorous core business. This situation is compounded by the fact that researchers, and indeed research funders, are more likely to be beguiled by keyhole surgery and neurological scans than by bandaging and injection administration. What are our equivalents of bandaging and giving injections? – things that we do every day without questioning our procedures and practice. These should be the focus for our clear and present questions.

Bexon (2005), in a recent conference presentation, concludes that while evidence-based librarianship is feasible "there needs to be a greater emphasis on identifying relevant questions and applying the appraised evidence to real life". In this connection Crumley and Koufogiannakis (2002) provide the actionable recommendation that "librarians should consider keeping an online list of questions that have already been studied and those that need to be explored, similar to the trial registries in medicine".

Conclusion

Formulating the question is fundamental to evidence-based practice, irrespective of the discipline involved. Question formulation, and indeed question answering, is a key competency for our profession. Our practice may be informed both by research within information science and by wider developments in evidence-based practice. Much remains to be done in constructing a comprehensive typology of question types and identifying priorities for primary research and for secondary literature review. Once we have established the extent to which questions generated by information practitioners have already been addressed the way will be clear for tackling the outstanding questions that currently present themselves for our attention.

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Further reading

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