

On the Adequacy of Expert Teachers: From Practical Convenience to Psychological Reality

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Abstract

This literature review examined approximately 10000 titles in five representative journals in education. It is conducted at two levels. Section A identified the preferred terms and metaphors to describe teachers at different expertise levels. Results indicated a great inconsistency in terms of terminology as well as definition of the same terms or metaphors in different journals, with a lot of them being suggestive and poetic. Section B started with the two most frequent terms, "expert" & "experienced", and put thirty two empirical studies into content analysis to uncover how their respective samples were operationally defined and selected. Findings showed both terms were constantly under-represented and there was a lack of dependable agreed-upon definition of "experienced and expert". It is argued our limitations in educational knowledge could be partly attributed to such poor conceptualizations, imprecise operationalization, and 'reductive bias' of researchers.

Keywords: expert, experienced, reductive bias, teacher sampling

I. Introduction

Human expertise is deep and esoteric. In nearly every field of human endeavor, the performance of some practitioners is so outstanding and superior that the early studies of "expertise" tended to attribute it to either "innate talent", using terms such as "prodigies" (Feldman, 1986); genius (Weisberg, 1986), and exceptional performer (Smith, 1983); or societal conditions, i.e. committed parents or teachers (Lehman, 1953). The early studies of expertise, called absolute approach, focused just on "exceptional individuals", i.e. outliers, world-class chess masters or mathematicians. However, by the early 1970th, the study of expertise inclined more towards a relative approach, with a focus on expert-novice differences, (Chi, 2006; 2011). The pioneering relative research comparing the performance of expert-novice was originally carried out by de Groot (1946) and Chase & Simon (1973). Genberg (1992, p.485) noted there are two theoretical conceptualizations of expertise. The first, based on an information processing approach (Anderson, 1980), emphasizes hierarchically structured knowledge and its linear application to solve problems. The second, an intuitive approach (Dreyfus & Dreyfus, 1986), considers expertise as the elaboration of knowledge of situations and pattern recognition. Although the psychological study of expertise has been invigorated by the advent of expert systems, its root could be traced back to earlier studies in the tradition of Judgment and Decision-making (Hoffman, 1996, p.81).

The issues of defining, identifying, training and preserving qualified or expert teacher have always been the concern of both research and practice in education. Most studies of expertise in teaching, drawing on either intuitive or information-processing framework, also have compared the behavior and performance of novice to those of experts (Berliner, 1988; Chi, Glaser & Farr, 1988; Livingstone & Broko 1990; Nois & Nois, 1997). Since the mid-1980s, expertise has been mostly associated with reflective practitioner (Schön, 1983). Some studies also advocated a "checklist of expert behavior" (Smith & Strahan, 2004). Furthermore, the idea of "expert teacher" has found its way into educational policy discourse. No Child Left Behind Act (NCLB) of 2001, as a nationwide movement to reform public education, mandated that a highly qualified teacher be in all classrooms by 2006. To accomplish such a laudable goal, there is an urge to define a "highly qualified teacher", which turned out to be unusually difficult

(Berliner, 2005, p.205). The main reason could be due to the nature of teaching profession: it is an ill-defined domain in which the experts are not readily detectable, compared to well-defined domains like chess or medicine (Ericsson, 2009). It could be also partly attributed to the fact that the discernment of quality, an integral part of a highly qualified teacher, always requires insight and good judgment, which are highly subjective (Fenstermacher & Richardson, 2005)

This literature review is conducted at two levels, both aims at capturing difficulty of "definition" in education. Although people believe that they know human expertise when they see it, it nonetheless escapes easy definition. Metaphors have been adopted to allow that which is nonverbal to be made verbal (LaFrance, 1997, p. 163). Section A examines some of the prevailing metaphors for describing teachers at different levels of expertise or career development. Five representative journals in teaching/education were selected and over 10000 titles were put into a thorough examination. Results indicated a great inconsistency, not only in terms of terminology, but also in terms of definition of the same terms or metaphors in different journals. Furthermore, it turned out, instead of evolving over time toward greater solidarity, a lot of terms remain suggestive and poetic.

Two terms, namely expert & experienced, appeared in all five journals through all decades of publications. Section B reviewed 32 empirical and comparative articles which involved participants' selection. The aim was to uncover how these two terms were operationally defined and what indicators or criteria were considered to choose their sample groups. Findings showed majority of these studies didn't take any effort to make sure their sample was "expert" and the indicators were mostly vague, inconsistent or poorly accounted for. This study does not aim at providing any ready-made solution to operationalization, rather we tried first, to point out the problem, and then suggested a tentative explanation for this observation as well as called on joint collaboration of all members of the educational and teaching community to promote valid and consistent use of more grounded, vigorous and scientific terms and metaphors.

2. Section A: Metaphors/Terms

Professions and careers, no matter what status they enjoy in a society, have their own specific terms and metaphors which allow them not only to define and structure the world they are engaged in, but to create a shared understanding among the community of its practitioners. As MacCormac (1985, p. 9) indicated "Explanations without metaphors would be difficult if not impossible, for in order to describe the unknown, we must resort to concepts that we know and understand, and that is the essence of metaphor- an unusual juxtaposition of the familiar and unfamiliar". Some terms are highly domain-specific, i.e. they gain their salience and meaning through being used in the context of that profession, others could be borrowed, redefined or fine tuned to the exigencies of a particular domain, the rest are general terms used in mundane conversation. The major aim of this section is to uncover terms and metaphors being used in teaching, as one of the most long-established career, to describe the quality of its vital capital, "Teachers". Several terms are used to describe either the quality of teacher (e.g. *expert*) or their current level of activity (e.g. *student teacher*). Thus, the following research question was formulated accordingly:

2.1 Research Question

- **Q.1.** *Is there any consistency in terms or metaphors being used to describe teachers at different levels of expertise or career development?*

2.2 Method

This revised review method was partly adopted from an integrative, five-phase review method suggested by Whittemore and Knaft (2005), namely: a) inclusion criteria, b) problem identification c) literature search d) data evaluation e) data analysis and presentation of instructional principle suggested (Elvira, et.al. 2017). The first step is formulation of inclusion and exclusion criteria. We tried to choose 'representative journal sample' which a) deal with teachers, teaching and instruction in education generally, rather than focusing on a particular domain, i.e. reading, second Language, math, etc, b) have IF over 1.5 c) published by leading scholarly publishers, e.g. *Sage and Elsevier* d) have a minimum publication history of 25 years. Selecting journals with a publication background of 25 years permitted us to probe a wide spectrum of preferred terms and metaphors over two decades. Table 1 summarizes the five selected journals.

Table 1. *Sampled Journals*

Journal	Publisher	IF (2015)	Years publication ~	of Examined issues ~
Learning & Instruction	Elsevier	3.7	25	125
Educational Researcher	Sage	2.96	33	400
Journal of Teacher Education	Sage	2.28	65	290
American Educational Research Review	Sage	2.27	50	200
Teaching & Teacher Education	Elsevier	1.6	30	180

The second step, problem identification, entailed conducting a detailed search of five selected journals: each journal was subjected to thorough scanning: approximately 10000 titles were inspected. Active keyword search was deliberately avoided, since the primary purpose was an inductive and discovery-oriented approach towards identifying the terms and concepts being used by the authors for describing teachers. We remained completely open to whatever terms used by the authors indicating teachers' level of expertise or stages of development, e.g. beginner, effective, experienced. Therefore, it was more a semantic-mining approach than a mere pre-determined lexical-mining.

2.3 Results

About 10000 titles in 1200 issues of 5 journals were examined. Since the focus was on titles, i.e. terms used exclusively in titles to describe teachers' stages of development, we derived two major categories: a) terms being used to describe early-stages of teachers' development, b) terms alluding to later-stages of teachers' development, as they progress ahead in their career (see Table 2 & 3).

Table 2. *Terms describing early-levels*

		T & T	JoTE	ER	AERJ	L & I
1	Novice	✓	✓	✓	✓	✓
2	Beginner	✗	✓	✗	✗	✓
	Beginning	✓	✓	✓	✓	✓
3	Student	✓	✓	✗	✓	✓
4	Candidate	✓	✓	✗	✗	✗
5	Preservice	✓	✓	✓	✓	✓
6	Pre-service	✓	✓	✗	✗	✓
	Prospective	✓	✓	✓	✓	✓
7	Future	✓	✓	✗	✗	✗
	tomorrow	✗	✓	✗	✗	✗
8	First/ Second year	✓	✓	✗	✓	✓
9	New	✓	✓	✗	✓	✗
10	Freshman	✗	✓	✗	✗	✗
11	Early Career	✓	✓	✓	✓	✗
12	Young	✓	✗	✗	✗	✗
13	Rookie	✗	✓	✗	✗	✗
14	Aspiring	✓	✗	✗	✓	✗
15	Postulant	✓	✗	✗	✗	✗

Table 3. *Terms describing later-levels*

		T & T	JoTE	ER	AERR	L & I
1	Expert	✓	✓	✓	✓	✓
2	Effective	✓	✓	✓	✓	✗
3	Skilful	✓	✗	✗	✗	✗
4	Professional	✓	✓	✗	✗	✗
5	Qualified/quality	✓	✓	✓	✓	✗
6	Successful	✓	✓	✗	✗	✗
7	Experienced	✓	✓	✓	✓	✓
8	Exemplary	✗	✓	✓	✓	✗
9	Superior	✗	✗	✓	✓	✗
10	Ideal	✗	✓	✗	✗	✗
11	Best	✗	✗	✓	✓	✗
12	Competent	✗	✓	✗	✗	✗
13	Good	✓	✓	✗	✗	✗
14	Veteran	✓	✓	✗	✗	✗
15	Practicing	✓	✓	✗	✗	✗
16	In-service	✓	✗	✗	✗	✗

Category A, early-stage, had 16 terms and category B, later-stage, had 15 terms respectively. According to their frequency of occurring in different journals, these terms were further organized into three groups: Full (all journals), High (3 journals) and Low (1-2 journals) coverage (see Table 4). Category A showed that four terms, namely: *novice*, *preservice*, *beginning* & *prospective*, were found in all five journals. The least used terms were *rookie*, *young*, *aspiring*, *freshman*, and *candidate*. As for category B, only two terms, namely *expert* & *experienced*, had full coverage. Most of other terms appeared only in one or two journals, *skillful*, *professional*, *successful*, *superior*, *best*, *veteran*, etc.

Table 4. *Terms' frequency in titles*

	Full coverage	High (~3)	Low
Early-level	Novice	Early career	Rookie
	Preservice	Student	Young
	Beginning	Pre-service	Aspiring
	Prospective	New	Freshman
			Beginner
Higher-Level			Candidate
			Postulant
			Skilful
	Expert	Effective	Professional
	Experienced	Qualified/quality	Successful
		Exemplary	Superior
			Ideal
			Best
			Competent
			Good
			Veteran
		practicing	

There are a number of important observations worthy to mention here:

- a. The number of studies on teachers' expertise in early levels was strikingly higher compared to studies on higher levels of expertise,
- b. The above-mentioned terms are the terms appeared in the title. However, almost the very same terms appeared in the content of all five journals, i.e. L & I, ER & AERJ, had articles in which the authors used terms like "*veteran, ideal, and best*".
- c. Terms used to define teachers at earlier levels seem to be more objective and easier to define: *student, first year, beginning, preservice*; while terms used to define teachers at higher levels are more vague and subjective, defying a clear definition: *ideal, best, exemplary, good*.

2.4 Analysis

In this section, we deal with two issues which are found of great concern: *consistency* and *precision*. As it could be observed, key terms employed in titles to describe teachers at different levels of their development are not only inconsistent, but also some of them do not reflect any allegiance with academic discourse in education (i.e. *rookie*); or too general and ambiguous (i.e. *good, best, ideal*). It should be also noted, to indicate a *lack* of quality in teachers' performance, a number of other terms were used, e.g. *poor* and *worst* teacher, which can add even more to the complexity of issue. There were also some stylistic variations, i.e. *Teaching and Teacher Education* warranted both '*in-service*' and '*inservice*' in its titles, but all journals unanimously preferred *preservice* to *pre-service* in titles. A closer look into the content of some articles revealed most terms/metaphors are used often interchangeably, i.e. Carter et al., study (1988) employed "expert" in title, but used other terms like "experienced, competent, effective" to refer to the same concept. Such 'Laissez faire' approach, in which everyone could use any term as they like, pose a great threat to *terminology adequacy*, they can't sufficiently, fully and suitably differentiate meaningful aspects of a quality.

As for precision of terms, it seems teaching is suffering from lack of agreed-upon definition for its constitutive terms, which are at times quite contradictory and misleading, even within the same journal. For instance, "*Aspiring Teacher*" is found to have the following definitions:

- a) Those **yet not admitted** to teacher education program. T & TE, 47 (2015)
- b) **Novice** teacher, who were third year students studying at a teacher training college. T & TE, 22 (2006)
- c) **Preservice** teachers at each of four levels of teacher education program participated, including student teachers, T & TE (2007)
- d) **Postulant** teachers. JoTE (1988)

The depth and complexity of this issue could be more grasped when one finds that the very four terms are treated quite differently. Firstly, Novice is not defined unanimously, rather it is defined as "*student teacher*" (Livingstone, 1989; Bliss & Mazur, 1996; Ethel, 2000); "*first-year teacher who are newly certified*" (Carter et al., 1988; Tochon & Munby 1993); "*inexperienced with minimum two-year experience*" (Rich & Almozilino); "*teachers with three years or fewer year experience*" (Tscham & Moran, 2007; Caspersen, 2013). Some authors, e.g. Tschannen et al., 2007; Caspersen, 2013; tried to substantiate their Novice Sample by citing either Berliner, et al., (1988) or Watkin (2003) "3 years of experience has often been used to delineate novice or an advanced beginner teachers in the policy arena". However, most of other terms were used without any effort to clearly define them.

Secondly, the very four definitions are differentiated sharply by a lot of authors. For example, *Novice* and *Preservice* were treated as two different samples and contrasted in terms of their performance. Furthermore, *postulant* doesn't necessarily equate with "preservice or novice", rather it has its own established definition "content matter expert from business with a desire to change career and teach in public schools, but with no pedagogical training" (Berliner, 1987. T & TE). It should be also noted that some studies did not provide any definition for these terms, just like it was taken for granted they are equally shared and understood by its reader.

2.5 Discussion

2.5.1 On the Accountability of Journals

This thorny issue of terminology and agreed-upon classification might not have a ready-made solution currently. The same problem has been already observed in other areas of science, i.e. Medicine (See Bhopal, et al., 2000). However, such repeated exposure to incorrect or inconsistent terms and metaphors may instigate or reinforce a wrong assumption about concepts which would be difficult to alter. Promoting valid and consistent use of scientific terms requires a joint collaboration of all members of a scientific community, i.e. policy makers, journal editors, reviewers,

researchers, readers and other interested groups. Refereed journals published by leading publishers, however, have a special responsibility as the *guardians of scientific discourse* which could enhance quality assurance in the terms and concepts being used. Therefore, to avoid future under-or-over representation and bafflement, there seems to be an urgent need for scientific community to take initiative against such vague and imprecise use of language. Journals' staff could play a greater role to facilitate 'shared understanding and communication'. Here are a number of viable suggestions which could be considered:

- a. discussing and arriving at a consent in using more objective, clear and domain-specific terms among editorial staff and advisory board,
- b. discouraging usage of terms which do not have any allegiance to educational science or judged as 'arbitrary' in their 'Guidelines for Submission' or their 'Journal's Policy' section,
- c. encouraging authors to use more scientific terms by providing advice and guidance through review process,
- d. urging authors to compensate for the lack of clear *definition* or agreed-upon classifications of terms by *describing* the key terms fully.

2.5.2 On the Legitimacy of Variation

The authors, by no means, aim at suggesting imposing any standardization or purification of the language at the cost of authors' creativity. 'Choice and diversity' should be tolerated and appreciated; and researchers should be given right and freedom to choose their preferred language of expression. Copeland, Birmingham & De Meulle (1994), for instance, coined new terms such as *Neophytes, Apprentice, Masters, and Laics* to refer to preservice, novice, experienced and postulant teachers, with a lengthy elaboration about each category. The appropriateness and functionality of such terms could be evaluated within its contexts. According to Widdowson (1974) 'Scientific concepts make up cognitive deep structures which can be realized in various languages throughout the world as a textualization of a variety of discourse... which scientists and technologists acquire through education'.

However, future contributors to scientific journals could also consider the following suggestions:

- a) substantiation of key words used in the Title,
- b) avoiding general terms used in mundane or layman's language to imply "degree in quality", e.g. good, best, ideal, superior,
- c) informal terms without any substantial content in teaching, e.g. rookie (*informal*, Oxford Advanced Dictionary), tomorrow, young, future, aspiring,
- d) and the last, but not the least, terms are like medicine, they should be used with care.

3. Section B: Selective Literature Review

The constant recurring of 'experienced' & 'expert' teachers in all five journals over 50 years vouches for the fact that it's a constitutive concern, an issue which is the core of a field and attracts a serious attention. It also indicates their complexity and multidimensionality which might not be immediately resolved or reduced to available solutions. In this section, first, we elaborate the current status and treatment of both concepts in education. Then, we present findings on how empirical studies, focused on these two groups, selected their samples. Palmer et al., (2005) categorizations was employed to analyze adequacy of selecting criteria. Finally, we present a tentative explanation about why researchers go about sampling procedure in such under-representative manner.

3.1 Expert Teacher

Seminal studies carried on Expert teachers in these five journals identified and verified the same constructs and claims made about experts in general: Expert teachers differ from novices along several dimensions, to mention a few (a) pattern recognition; (b) knowledge structure and representation (c) well-repertoire of routines or well-learned procedures (e.g., Berliner, 1986; Borko & Livingston, 1989; Leinhardt & Greeno, 1986).

Moreover, there were endeavors for developing models of expertise in teaching. National Board for Professional Teaching Standards (NBPTS) is a standard-based model of teacher expertise. Another model of expertise was developed by Hattie, Jager, Strahan, and Baker (1998). This model, based on a synthesis of 134-meta-analysis related to students outcome and extensive literature review, aimed at validating of certification decisions made by NBPTS to determine if teachers certified by NBPTS are different and more expert than those not certified (Smith & Strahan, 2004. p.358)

However, the idea of "Expert Teacher" has also its own critics. Welker (1991) questioned increasing studies on Expertise in teaching and suggested it would diminish the moral and social responsibility of teachers. Calling expertise a Metaphor, he ascribed the common comparison of education with medicine; and searching for a more defined technical competence to the hope of elevating the status of profession. However, he stated, it is not apparent that even the best teachers can approach the diagnosis accuracy of clinician, nor can they afford the type of professionalization process that established medicine as the queen of modern profession. Furthermore, he argued the main goal of education is fostering independence and growth in learners. However, experts, due to their professional privilege, make the community of its users/clients reliant and turn them into passive receiver of expert services. Instead of focusing our attention on identifying and codifying the underlying constructs of expert teacher, which will later be used to prepare and evaluate teachers as Technical specialist, teachers need a broad liberal education and training that prepare them for their complex social role. So, it is not that teachers should not be expert; it is they ought to be broadly competent experts.

Criticizing public education's quick-fix solution to complex human problems, Bereiter & Scardamalia (2001 p. 253) argued: the teaching profession provides a nice case to dismantle the stereotypes of expertise. Public education has managed to acquire most of the ills associated with expertise, without ever managing to convince the public that its practitioners are expert. They ask for a new conception of expertise in teaching that is not confused with credentialing, professionalism and over-specialization.

3.2 Experienced Teacher

There seems to be a tendency in some studies to equate experienced with expert teachers. In fact, "experience" is the *sine qua non* of expertise: i.e. it has been estimated that the development of outstanding understanding and skill in any area of complex recognition, the kind of achievement to which one might ascribe "expertise", requires at least ten years of diligent practice (Hayes, 1985). Extensive experience provides opportunity for refining knowledge, practicing skill, increasing speed and efficiency, heighten familiarity with domain and the ability to identify relationships and pertinent past experiences, automaticity & routinization (Chase & Simon, 1973; Chi, Glaser & Farr 1988; Hoffman, 1992).

All reviewed studies in these journals took for granted the positive contributions of experience and completely ignored its negative side-effect: "Rigidifying Effect", i.e. there are effects on cognition that come with such extended practice that could lead to reduction in cognitive flexibility_ to conditions of relative rigidity in thinking and action which reduces the ability to adapt quickly to changes in circumstances (Feltovich, Spiro, Coulson, 1997, p. 126). Practice, in fact, doesn't always make perfect (Schneider, 1985).

3.3 Research Question

- **Q.2.** Based on what criteria or standards do the studies dealing with Expert/ experienced choose their sample or subject?

3.4 Method

Our inclusion criteria involved: a) articles appeared in the five aforementioned journals, namely: Journal of Teacher Education, Teaching & Teacher Education, American Educational Research Journal, Learning & Instruction, and Journal of Educational Researcher b) empirical works with original research data c) comparative articles with "expert" or "experienced" as one of their comparative groups d) articles exclusively dealt with expertise using empirical data. We didn't include articles which were a) on conference or symposium abstracts, book review b) theoretically, conceptually or argumentatively discussed expertise or experience.

At first 45 articles were selected. The abstracts of all articles were scanned. Eight of them were conceptual/theoretical, two were argumentative, one aimed at developing a tool to evaluate experts, and two articles didn't deal with teachers as their main sample. Eventually 32 articles were included. The whole content of articles, including their appendix and supplementary sections, were examined. Table5 provides the complete list of included articles.

Table 5. Selected articles

	Journal	Year	Author	Comparative categories
1	JoTE	1959	Beard	Experts
2	JoTE	1988	Carter,Cusbing, Sabers, Stein & Berliner	Expert vs. Novice
3	JoTE	1989	Livingston & Broko	Expert vs. Novice
4	JoTE	1991	Westerman	Expert vs. Novice
5	JoTE	1993	Martin & Reynolds	Veteran vs. Rookie
6	JoTE	1995	Rodriguez & Sjostrom	Experienced vs. Novice.
7	JoTE	1996	Bliss & Mazur	Experienced vs. Novice.
8	JoTE	2000	Ethel & McMeneiman	Expert
9	JoTE	2002	Meijer, Zanting & Verloop	Experienced vs. Student
10	JoTE	2003	Levin & Rock	Experienced vs. Preservice
11	JoTE	2009	Hatch, Sun, Crossman & Neira	Veteran vs. Novice
12	JoTE	2015	Wolff, Bogert, Jarodzka & Boschuizen	Expert vs. Novice
13	T&TE	1986	Magliaro & Borko	<u>Experienced vs. Student T</u>
14	T&TE	1987	Carter, Sabers, Cushing	<u>Expert, Novice, vs. Postulant</u>
15	T&TE	1989	Strahan	<u>Experienced vs. Novice</u>
16	T&TE	1991	Kremer-Hayon	<u>Expert vs. Novice (supervisors)</u>
17	T&TE	1991	Needels	Experienced vs. <u>Student vs. first-year Teachers'</u>
18	T&TE	1993	Tochon & Munby	Expert vs. <u>Novice</u>
19	T & TE	1993	Rich	Expert
20	T&TE	1997	Allen & Casburgue	<u>Expert vs. Novice vs. Intermediate</u>
21	T&TE	1999	Sanchez, Rosales, Canedo	Expert vs. <u>preservice</u>
22	T&TE	1999	Rich & Almozlino	<u>Veteran vs. Novice</u>
23	T&TE	2007	Tschannen-Morana, Woolfolk Hoyb	<u>Experienced vs. Novice</u>
24	T&TE	2007	Joram, E	<u>Aspiring, vs. Practicing teachers' vs. Professors'</u>
25	T&TE	2008	Leshem	Veteran vs. <u>Novices</u>
26	T&TE	2013	Caspersen	Experienced vs. Novice
27	AERJ	1989	Borko & Livingston	Expert vs. Novice
28	AERJ	1990	Swanson, Oconor & Cooney	Expert vs. Novice
29	AERJ	1994	Copeland, Birmingham & De MEulle	Experienced vs. Aspiring T
30	L&I	2001	Castejon & Martinez	Expert vs. Novice
31	L&I	2010	Jarodzka, Scheiter & Gerjets	Experts vs. Novices
32	L&I	2010	Kwangsu & McArthur	Expert

3.5 Results & Analysis

Table 6 shows comparative categories found in our 32 sampling articles. It could be observed the most frequent comparative category is "Novice vs. Expert": 12 studies out of 32 (40%) preferred these metaphors to label their

samples. 20 studies out of 32 (70%) preferred the term "Novice" to define their early-career sample, other terms included *rookie, aspiring, student, preservice, first-year*, and 10 studies (30%) used "experienced" to label their sample.

Table 6. Comparative categories

a.	Expert
b.	Novice vs. Expert
c.	Novice vs. Experienced
d.	Novice vs. Veteran
e.	Rookie vs. Veteran
f.	Aspiring vs. Experienced
g.	Aspiring vs. Practicing vs. Professor
h.	First-year vs. Experienced
i.	Preservice vs. Expert
j.	Student vs. Experienced
k.	Preservice vs. Experienced

To identify criteria used by researchers to select their sample, we draw on four categories suggested by Palmer et al., (2005) in their literature review of indicators, criteria or markers used in selecting expert/experienced teachers, namely: a) experience b) social recognition c) professional membership d) performance-based criteria. However, we remain open to other aspects and variations in each category and try to capture any other criteria mentioned by researchers (see table 7).

Table 7. Selecting criteria

	Experience	Nomination	Professional membership	Performance-based criteria
Expert		Recommended by expert closely associated with association	a. associated with Association for Teaching b. had positions as head, director, supervisor, principal	
Expert	a. 5 years b. taught wide ranges of courses /levels	nominated by principal		Normative: observed by researchers, their performance set them aside from other experienced and competent
Expert		identified by administrator and teacher coordinator		
Expert	5 years			Criterion-based: observed by administrator personnel skilled in observation. Teachers who implement and integrate curriculum, promote

			reflection, willing to develop problem solving approach toward teaching, committed to improve
Veteran	10 years		Due to excellence in teaching (no info)
Experienced	6 years		
Experienced	18-29 years		
Expert		Nominated by teacher educators	Criterion-based Experienced, Exemplary practitioners who was video-taped
			a. Position as mentor
Experienced	8-33 years		b. Associated with Teacher education Dep
Experienced	2-29		position as Mentors
Veteran			Position as teacher educators
		a. Nominated by school supervisors	a. Position as teacher trainer
Expert	10 years	b. Nominated by colleagues	b. Degree: Relevant certificate in their subject domains
			Criterion-based: Experts are selected for their proficiency in creating a positive learning environment
Experienced	7 years		Position as head teachers of grade-level teams
		a. more than 5 years	Normative: observed by project personnel (knowledgeable & trained about research on teaching, and had experience as classroom teachers)
Expert		nominated by school superintendents and/or principals.	18 out of 54 nominates were selected
		b. taught in wide ranges of courses & levels	
Experienced	3-22		
Expert	20-30 years		
		More than 5 years	Degree: Working towards M.A
Experienced			

Expert	Minimum of 7 years	<p>The purpose of the research was explained to eight resource persons whose competence was recognized by the district administration of the junior high schools of Geneva, and whose professional responsibilities gave them particular knowledge of the 450 Language Arts teachers in their schools.</p> <p>Each resource person was asked to recommend 5 to 10 teachers whom they considered to be the most experienced at the junior high school level. Each was asked to write the criteria used to select the teachers he or she nominated.</p>	<p>a. Certification: High School Educational Studies Degree</p> <p>b. Degree: M.A degree</p> <p>State nomination with tenure</p>
Expert	They were experienced	Highly regarded by principal & colleagues	<p>Criterion-based expressed confidence in their teaching ability,</p> <p>generally facilitated good progress in student achievement.</p>
Expert	Min: 10 years	Nominated by principal: As talkative & effective	
Expert	3-10	Well appraised by fellows	<p>Normative: ranked as the best by research team</p> <p>Their evaluation was confirmed by the school counsellor</p>
Veteran	Min:7 years		
Experienced	4 years		
Professors	Taught a variety of courses		Degree: had PhD

	Previously worked as K-12			
Veteran		Self-nomination: Researcher as a teacher trainer		
Experienced	8-15	Nominated by local administrators		
Expert		Nominated by building administrators and county teacher center coordinators		
Expert	10 years	Nominated by: Central office for each district	a. M.A degree B. position as Mentor (process in explained)	Criterion-based: Interview & Observation b. Evaluation: outstanding T
Experienced	a. 20 years b. Taught at all levels		consistently selected over the years to serve as Cooperating Teachers for the UCSB Credential Program.	Normative: rated as Superior Teachers, the highest rating possible, by three different UCSB student teaching supervisors.
Expert	Min 10 years (called extremely experienced)		Advisor in the center for Educational Reform (had knowledge of new educational system)	
Expert			Professor PhDs	
Expert	8 years Of similar intensive course		Had a PhD in writing	Criterion-based: teacher evaluation record

3.5.1 Experience

Majority of the reviewed studies operationalized experience as "years of practice" and very few considered "previously taught courses/levels". 7 studies out of 32 didn't mention any evidence for experience and one study merely used "they were experienced", without further elaboration. The remaining indicated various years, ranging from 2 to 33 years, to refer to their expert or experienced groups, with majority of them mentioned more than 5 years of experience. One might wonder how a person with 2 years of experience could be put in the same level with others who have more than 30 years of experience.

"Years in practice" is indicated by some authors as a reasonable operationalization of experience, i.e. '5-7 years needed for a motivated teacher to acquire expertise (Berliner, 2004, p.202). Furthermore, there is an urge to make

sure 3 years should be in the same grade or level. Only one study mentioned "8 years of teaching the similar intensive course".

Though "experience" seems to be the most straightforward criterion which could be easily defined, there are some concerns regarding "quantitative operationalization" of experience, e.g. Rich & Almozlino (1999, p. 618), calling their sample "veteran" (experienced), still vowed their doubt: "Teaching experience was operationalized here as years of service in class instruction. Clearly this is an oversimplification that masks important elements reflecting the quality of that experience. However, earlier research (e.g., Berliner, 1994) has demonstrated the value of this variable which serves as a proxy, much as does years of education relative to quality of education. Benner (1982, p. 407) also pointed out: "experience in acquisition of expertise has a particular definition that has to be clarified. Experience is not the mere passage of time or longevity; it is the refinement of preconceived notions and theory by encountering many actual practical situations that add nuance or shades of difference". Field & Macintyre (2001, p. 885) expressed "we found it to be a source of difficulty and disagreement about what counts as experience: Mastering subject-matter; building a repertoire of teaching strategies; developing classroom management skills and assessment. In fact, this is the accumulation of skills based on experience and practice which are the key, not maturational process or time per se. The reviewed studies didn't put any effort to differentiate between expert and experienced non-expert, only one study mentioned 'observed by researchers, their performance set them aside from other experienced and competent'. But, it didn't provide any elaboration in which ways they were distinguished from competent or experienced.

3.5.2 Nomination

In trying to highlight context-dependency and social-situated nature of expertise over individual cognitive competence, Agnew, Ford & Hayes (1997, p. 220) argued expertise is not synonymous with having knowledge, since it doesn't reside in the individuals. Rather, it is the product of dynamic interaction between cognitive and social process. They, instead, emphasized the importance of Nomination or social perception as the minimum criterion of expertise: expert is not the most knowledgeable among us; expert is a Role that some are selected to play on the basis of all sorts of criteria set by a constituency or niche, a large group of people who consider that you are an expert.

15 out of 32 studies (50%) used nomination as a yardstick to select their sample. The nominators included: by school principal, supervisor, colleagues, administrators, coordinator and experts closely associated with organizations. The only explanation is "highly regarded, appraised or recommended by". One study used self-nomination, i.e. the researcher acted as expert. Only one study elaborated a 3-stage process of nomination: first, the purpose of the research is explained to eight resource persons whose competence was recognized by the district administration and whose professional responsibilities gave them particular knowledge of teachers in their schools. Then, each resource person was asked to recommend 5 to 10 teachers whom they considered to be the most experienced at the junior high school level. Eventually, each was asked to write the criteria used to select the teachers he or she nominated.

3.5.3 Professional Membership/Position

Professional membership was operationalized as 'affiliation/position' and 'academic degree/certification'. 14 studies out of 32 (45%) used "affiliation" to or "position" at a professional organization as a proper standard to select their experienced or expert sample. Professional positions included: head, director, supervisor, mentor, teacher educator, trainer, advisor, cooperating teacher for a center, school or a college, with one study considering 'knowledge' associated with position: 'Advisor in the center for Educational Reform who had knowledge of new educational system'. Academic degrees, i.e. PhD, M.A & professors, were also used by 7 studies (22%) as a justified indicator in sample selection. 2 studies mentioned 'Relevant certificate in their subject domain.

3.5.4 Performance-based Criteria

Palmer et.al (2005, p.19) differentiated between 'Normative' and 'Criterion-based' Performance criteria. Normative criteria require comparison to other potential participants in that these expert teachers were chosen on the basis of how well they performed on a specific task as compared to peers or novice, i.e. direct observation of teacher performance by independent experts. Criterion-based performance, on the other hand, rates performance of teachers against a predetermined standard, i.e. student achievement. 10 studies (30%) used performance-based criteria. 4 studies used Normative-based performance: e.g. 'observed by researchers, their performance set them aside from other experienced and competent'; ranked as the best by researcher, or observed & selected among other teachers by 'trained, knowledgeable and skilled project personnel'.

7 studies used criterion-based performance. The criteria mentioned to identify and select expert sample were as follow:

- a. expressed confidence in teaching

- b. facilitated good progress in students' achievement
- c. creating positive learning environment
- d. teacher evaluation record

Only one study tried to consider multiple-criteria (implement and integrate curriculum, promote reflection, willing to develop a problem-solving approach toward teaching, committed to improve). 2 other studies only mentioned (due to excellence and being exemplary in teaching), without any clarification.

3.5.5 Expert Selection: What is Left?

The very fact that only one empirical study (Swanson, O'Connor & Cooney, 1990) out of 32 used all four indicators and tried to collect more evidence to support construct validity of 'expertise' requires a special attention. Furthermore, even those four criteria can't capture "expertise in teaching" and such poor operationalization poses a 'construct under-representative' threat (Messik, 1989). Experts differ from novices *qualitatively*, i.e. they *see* and *know* the domain differently. Thus, experts' perception, knowledge organization, knowledge representation, reasoning and judgement are essentially responsible for their superior performance. How these qualities are operationally defined and measured in these studies? We found no evidence. The most fundamental differences between expert and novice is knowledge. What looks on a surface level as a sheer intellectual brilliance, relies on an extraordinary body of task-specific, highly contextualized knowledge (Bereiter & Scardamalia, 2001). There are many metaphors for defining and operationalizing knowledge. Although, we should not conceive knowledge as a 'thing', it definitely resides in individuals' minds. However, knowledge is also an attribution that resides in social groups. How else could it be developed, taught, or standardized? How could someone be regarded as an expert if her judgments are not followed in the decision made by other people (Hoffman, 1996)? The current indicators or criteria for selecting expert teachers, namely experience, nomination, membership and performance, could be re-examined to capture more aspect of teachers' 'knowledge & cognition', i.e. reasoning, perceptual ability, structure and organization, problem-solving strategies. In other domains, such methods do not necessarily entail 'Test' of knowledge in paper-and-pencil; rather they design domain-appropriate tasks: cognitive simulation, think aloud, means-end-analysis, divide-and-conquer, etc. It might be the high time for scholars in education to consider more than an 'observation check-list' or 'teacher evaluation profile' to identify an expert teacher, since they mostly identify 'good practice', while expertise is beyond 'good enough'.

3.6 Teacher Expertise: Tentative Challenges & Explanations

In this section, we are not going to rush into conceptualizing what we've already discussed in a form of a theory or hypothesis; or prescribing some solutions about what should be done. Instead, we try to pursue the goal of enhancing and deepening our understanding about this phenomenon by trying to explain 'where lies the challenge in defining and selecting "expert" in teaching & why the researchers address expertise in under-represented ways.

A. Teaching: an "Unstructured Problem"

Much of the research on experts has been conducted in domains (e.g., chess, physics, math, medical diagnosis) where the fundamental structures and rules of procedure are relatively stable and they have established symbolic representation (Cohen and Feigenbaum, 1982). Thus, a possible answer to aforementioned question could be the "nature of teaching" itself. Dreyfus & Dreyfus (1983) considered professions like management, economic forecasting and teaching as "unstructured problem areas", areas which contain a potentially unlimited number of possibly relevant facts and features in which the way those elements are interrelated to determine other events are unclear. Thus, in such areas relevant information, verifiable solutions and effect of decisions or interventions are unclear and vague. Such unstructured areas tend to hamper "ease of identification", there is no doubt that there are expert teachers out there, but there seems to be no systematic way of identifying them, let alone finding a method of fostering it. Bereiter and Scardamalia (2001) added: a normal person can't transplant heart or remove a tumor, but everyone can and does teach in some fashion; so here is not so much a matter of everyone being able to do it as there not being any particular skill or performance that can be singled out in outer manifestation of performance.

Such arguments seem to be valid when one considers teaching is comprised of multiple aspects, e.g. subject matter knowledge (PK), pedagogical content knowledge (PCK), and General pedagogical knowledge (GPK) (Shulman, 1987). Although in other domains, "knowledge" is a defining factor in distinguishing experts, in teaching the superior knowledge in subject-matter does not automatically equip subject-matter experts with effective skills for giving feedback to novices. The so-called 'curse of expertise' (Camerer, Loewenstein, & Weber, 1989) indicates experts use knowledge that novice students cannot refer to even when the experts know the knowledge is unavailable to the novices. Despite having knowledge in subject-matter, lack of "teaching skill" could lead to a misunderstanding

and underestimation, that is teachers have a normatively correct and deeper representation of a topic or concept they are teaching, whereas novice students will have a naïve, shallow and incomplete representation which leads to inefficiency of explanation (Chi, Roy & Hausmann, 2008)

B. Researchers & Bounded Rationality

The second tentative explanation for why researchers chose to tackle expertise in such under-represented ways could be attributed to what Herbert Simon called: "bounded rationality": as human beings, we have mental resource limitations which don't allow us keeping on the order of more than four items actively in our mind. When we encounter with a problem, i.e. teaching, whose potential complexity exceeds our mental capacity, we create a simplified mental representation of the problem and solve it rationally. It is an intelligent approach toward circumventing our mental limitation (Bereiter and Scardamalia, 2001, p.84, Simon, 1957, p. 198). When a researcher wants to deal with selection of expert Teachers, he/she will be overwhelmed by "complexities or constraints" to be considered, operationalized, elicited and measured, i.e. students' rating, principal nomination, value-added score, teacher competence, observable performance, years of experience, training and certification, professional membership, awards and recognitions, etc, so, he/she resorts to his/her intelligent "problem reduction" behavior by ignoring a number of them. Feltovich, et al., (1997, p.134) call this 'detrimental reductive bias': when what is to be understood (e.g. a concept, phenomenon or a case) has features such as 'interactive, deep, multiple, organic', there is a strong inclination to try to treat it as 'separable, single, static and mechanistic'. Such approaches limit our understanding and interpretation of the concept.

However, there remains two points: first, although we should simplify, we have choice in how much we simplify. There is a difference among studies simplifying expertise to an undemanding level of "3-year- experience", to those trying to include a combination of *experience* and *nomination*, to efforts which added evidence from classroom observation. Second, drawing on Bereiter and Scardamalia (2001, p.82) about "becoming expert in an activity", we argue researchers' effort to reduce complexity in this domain, doesn't make the problem of 'expert selection' to be eliminated or disappeared, rather it is the constitutive problem of our profession which urges, once the lower levels achieved, there must be a continual reformulation of problem at higher levels. To make sure our research on expert Teachers become more informative and useful, we should progressively find more efficient and reliable approaches toward operationalizing qualities and indicators of expert teachers.

4. Conclusion

A major challenge of un/ill-structured domains like teaching is operational definition of expertise, since the whole process of teacher education, induction program, professional development, assessment and feedback seem to be directly relevant to defining, identifying, training and preserving expert teacher's development. Although metaphors and terms abound in any field, this review of approximately 10000 titles in high-profile journals in education revealed a substantial treasury of liberal metaphors, mostly being used in a rather loose, vague, inconsistent, poetic and suggestive manner. The findings of this descriptive literature review is not meant to suggest the researchers rigidly adhere to one and only one metaphor, since there is no single metaphor that can lay the claim to entire "truth" of expertise in teaching. Rather, our aim is to highlight the unsubstantiated use of terms in education. Though we acknowledge the difficulty of defining, we reject the nihilist idea "anything goes". Further analysis of 32 empirical studies on Expert/experienced revealed poor conceptualization of variables and crude classifications. Only one study tried to consider different indicators, experience, nomination, professional membership and performance-based criteria, to choose its sample. It was suggested the educational community take initiatives in both substantiation of definition as well as identification of 'expert teacher'.

Reference

- Agnew, N.M., Ford, K.M., & Hayes, P. J. (1997). Expertise in context: Personally constructed, socially selected, and reality-relevant? In P. J. Feltovich, K. M. Ford, & R. R. Hoffman (Eds.), *Expertise in context* (pp. 219–244). Cambridge, MA: MIT Press.
- Allen, R. M., & Casbergue, R. M. (1997). Evolution of novice through expert teachers' recall: Implications for effective reflection on practice. *Teaching and Teacher Education*, *13*, 741–755. <https://doi.org/10.1177/0022487104267587>
- Beard, J. R. (1959). Student Teaching for Experienced Teachers?: Experts Polled on Requiring Student Teaching, Substituting Teaching Experience, and Adopting Student Teaching to Their Needs. *Journal of Teacher Education*, *10*, 475-478. <https://doi.org/10.1177/002248715901000422>
- Benner, P. (1982). From novice to expert. *The American Journal of Nursing*, *82*(3), 402-407.

- Bereiter, C. & Scardamalia, M. (1993). *Surpassing Ourselves: An Inquiry into the Nature and Implications of Expertise*. Open Court Publishing Company.
- Berliner, D. (1986). In Pursuit of the Expert Pedagogue. *Educational Researcher*, 15, 5-13. <https://doi.org/10.3102/0013189X015007007>
- Berliner, D. C. (1994). Expertise: the wonder of exemplary performances. In J. N. Mangieri, & C. C. Block (Eds.), *Creating powerful thinking in teachers and students* (pp. 141_186). Ft. Worth, TX: Holt, Rinehart and Winston.
- Berliner, D. C. (2004). If the underlying premise for No Child Left Behind is false, how can that act solve our problems? In K. Goodman, P. Shannon, Y. Goodman, & R. Rapoport (Eds.) *Saving our schools*. Berkeley, CA: RDR Books.
- Berliner, D. C. (2005). *The Near Impossibility of Testing for Teacher Quality*. *Journal of Teacher Education*, 56(3), 205-213. <https://doi.org/10.1177/0022487105275904>
- Berliner, D.C. (1988). *The development of expertise in pedagogy*. Washington, DC: American Association of Colleges of Teacher Education.
- Bhopal, R., Rankin, J. Bennet, T. (2000). Editorial Role in Promoting Valid Use of Concepts and Terminology in Race and Ethnicity Research. *Science Editor*, 23, 75-79.
- Bliss, T., & Mazur, J. (1996). CASENET: Developing Associations of Experienced and Novice Educators through Technology. *Journal of Teacher Education*, 47(3), 185-90. <https://doi.org/10.1177/0022487196047003004>
- Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Educational Research Journal*, 26, 473-498. <https://doi.org/10.3102/00028312026004473>
- Camerer, C., Loewenstein, G. & Weber, M. (1989). The curse of knowledge in economic settings: An experimental analysis. *Journal of Political Economy*, 97. <https://doi.org/10.1086/261651>
- Carter, K., Cushing, K., Sabers, D., Stein, P., & Berliner, D. (1988). Expert-novice differences in perceiving and processing visual classroom information. *Journal of Teacher Education*, 39(3), 25-31. <https://doi.org/10.1177/002248718803900306>
- Caspersen, J. (2013). The *Valuation of Knowledge and Normative Reflection in Teacher Qualification: A Comparison of Teacher Educators, Novice and Experienced Teachers*. *Teaching and Teacher Education*, 30, 109-119. <https://doi.org/10.1016/j.tate.2012.11.003>
- Castejou, J.L. & Martinez, M.A. (2001). The *personal constructs of expert and novice teachers concerning the teacher function in the Spanish educational reform*, *Learning and Instruction*, 11, 113-131. [https://doi.org/10.1016/S0959-4752\(00\)00018-9](https://doi.org/10.1016/S0959-4752(00)00018-9)
- Chase, W. G., and Simon, H. A. (1973). *The mind's eye in chess*. In W. G. Chase, ed., *Visual information processing*, (pp. 215-281). New York: Academic Press. <https://doi.org/10.1016/B978-0-12-170150-5.50011-1>
- Chi, M. T. H. (2006). Two approaches to the study of experts' characteristics. In Ericsson, K. A., Charness, N., Feltovich, P. J., and Hoffman, R. R. (eds.) *The Cambridge Handbook of Expertise and Expert Performance*, (pp 21-30). Cambridge, UK: Cambridge University Press. <https://doi.org/10.1017/CBO9780511816796.002>
- Chi, M. T. H. (2011). Theoretical perspectives, methodological approaches, and trends in the study of *expertise*. In Li, Y. (Ed.), *Expertise in Mathematics Instruction: An international perspective*, (2nd ed.) (pp. 17-39). Springer. https://doi.org/10.1007/978-1-4419-7707-6_2
- Chi, M. T. H., Glaser, R., & Farr, M. (Eds.). (1988). *The nature of expertise*. Hillsdale, NJ: Erlbaum.
- Chi, M. T. H., Roy, M., & Hausmann, R. G. M. (2008). *Observing tutoring collaboratively: Insights about tutoring effectiveness from vicarious learning*. *Cognitive Science*, 3(2), 301-341. <https://doi.org/10.1080/03640210701863396>
- Copeland, W. D., Birmingham, C., DeMeulle, L., D'Emidio-Caston, M., & Natal, D. (1994). Making meaning in classrooms: An investigation of cognitive processes in aspiring teachers, experienced teachers, and their peers. *American Educational Research Journal*, 31(1), 166-196. <https://doi.org/10.3102/00028312031001166>
- de Groot A. D. (1978). *Thought and Choice in Chess*. The Hague: Mouton; (Original work published in 1946).
- Desforges, C (1995). How does experience affect theoretical knowledge for teaching? *Learning and Instruction*, 5(4), 385-400. [https://doi.org/10.1016/0959-4752\(95\)00024-0](https://doi.org/10.1016/0959-4752(95)00024-0)

Dreyfus, H & Dreyfus, S (1984). *Mind Over Machine: The Power of Human Intuition and Expertise in the Era of the Computer*.

Elvira, Q., Imants, J., Dankbaar, B., & Segers, M. (2017). Designing Education for Professional Expertise Development. *Scandinavian Journal of Educational Research*, 61(2), 187-204. <https://doi.org/10.1080/00313831.2015.1119729>

Ericsson, K.A. (2009). Development of professional expertise: Toward measurement of expert performance and design of optimal learning environments. Cambridge University Press. <https://doi.org/10.1017/CBO9780511609817>

Ethell, R. G., & McMeniman, M.M. (2000). Unlocking the knowledge in action of an expert practitioner. *Journal of Teacher Education*, 51(2), 87–101. <https://doi.org/10.1177/002248710005100203>

Feldman, D.H. (1986). *Nature's Gambit: Child Prodigies and the Development of Human Potential*. New York: Basic Books.

Feltovich, P.J, Spiro, R.J., & Coulson, R.L. (1997). Issues of expert flexibility in contexts characterised by complexity and change. In P.J.Feltovich, K.M. Ford, & R.R. Hoffmann (Eds) *Expertise in contexts: Human and machine*. Cambridge, MA. MIT Press.

Fenstermacher, G. D., & Richardson, V. (2005). On making determinations of quality in teaching. *Teachers College Record*, 10 (1), 186-215. <https://doi.org/10.1111/j.1467-9620.2005.00462.x>

Field, J. C. & Macintyre Latta, M. A. (2001). What constitutes becoming experienced in teaching and learning? *Teaching and Teacher Education*, 17, 885-895. [https://doi.org/10.1016/S0742-051X\(01\)00038-5](https://doi.org/10.1016/S0742-051X(01)00038-5)

Hatch, T., Sun, C., Grossman, P., Neira, P., & Chang, T. (2009). *Learning from the practice of veteran and novice teachers: A digital exhibition*. *Journal of Teacher Education*, 60(1), 68-69. <https://doi.org/10.1177/0002764208328683>

Hattie, J. (2003). *Teachers make a difference: What is the research evidence?* Paper presented at the Australian Council for Educational Research Annual Conference on Building Teacher Quality, Melbourne, Victoria, Australia.

Hattie, J., Jaeger, R., Strahan, D., & Baker, W. (1998). *Report on the development of the assessment/data collection instruments and protocols*. Unpublished manuscript, Center for Educational Research at Evaluation, University of North Carolina at Greensboro.

Hayes, J.R. (1985). *Three problems in teaching general skills*. In S.F. Chipman, J.W. Segal & R. Glaser (Eds.), *Thinking and Learning Skills: Research and Open Questions*, 2, 391-406. Hillsdale, NJ: Erlbaum.

Hoffman, R. R. (1998). *How can expertise be defined? Implications of research from cognitive psychology*. Williams, W. Faulkner, & J. Fleck (eds) *Exploring Expertise*. (pp. 81-100) Macmillan. New York. https://doi.org/10.1007/978-1-349-13693-3_4

Hoffman, R.R. (Ed.). (1992). *The Psychology of Expertise: Cognitive Research and Empirical AI*. New York: Springer Verlag. <https://doi.org/10.1007/978-1-4613-9733-5>

Jarodzka H, Scheiter K, Gerjets P, Van Gog T. (2010). *In the eyes of the beholder: how experts and novices interpret dynamic stimuli*. *Learning and Instruction*, 20(2), 146-154. <https://doi.org/10.1016/j.learninstruc.2009.02.019>

Joram, E. (2007). Clashing epistemologies: aspiring teachers, practicing teachers and professors beliefs about knowledge and research in education. *Teaching and Teacher Education*, 23(2), 123 -135. <https://doi.org/10.1016/j.tate.2006.04.032>

Kremer-Hayon, L (1991). *The stories of expert and novice student teachers' supervisors: Perspectives on professional development*. *Teaching & Teacher Education*, 7(5–6), 427-438. [https://doi.org/10.1016/0742-051X\(91\)90039-R](https://doi.org/10.1016/0742-051X(91)90039-R)

Kwangsu, C. & MacArthur, C. (2010). Student Revision with Peer and Expert Reviewing. *Learning and Instruction*, 20, 328-338. <https://doi.org/10.1016/j.learninstruc.2009.08.006>

LaFrance, M. (1997). Metaphors for expertise: How knowledge engineers picture human expertise. In P. J. Feltovich, K. M. Ford, & R. R. Hoffman (Eds.), *Expertise in context*. Cambridge, MA: MIT Press.

Lehman, H.C. (1953). *Age & Achievement*. Princeton, NJ: Princeton University Press.

- Leinhardt, G., & Greeno, J. G. (1986). The cognitive skill of teaching. *Journal of Educational Psychology*, 78, 75–95. <https://doi.org/10.1037/0022-0663.78.2.75>
- Leshem, S. (2008). *Novices and veterans journeying into real-world teaching: How a veteran learns from novices. Teaching and Teacher Education*, 24, 204–215. <https://doi.org/10.1016/j.tate.2006.07.010>
- Levin, B. & Rock, T.C. (2003). *The effects of collaborative action research on preservice and experienced teacher partners in professional development school. Journal of Teacher Education*, 54(2), 135-149. <https://doi.org/10.1177/0022487102250287>
- Livingston, C., & Borko, H. (1989). Expert-novice differences in teaching: A cognitive analysis and implications for teacher education. *Journal of Teacher Education*, 40, 36-42. <https://doi.org/10.1177/002248718904000407>
- MacCormac, E.R. (1985). *A Cognitive Theory of Metaphor*. Cambridge, MA: MIT Press.
- Magliaro, S. G.; Borko, H. (1986) *A Naturalistic Investigation of Experienced Teachers' and Student Teachers' Instructional Practices. Teaching and Teacher Education*, 127-137. [https://doi.org/10.1016/0742-051X\(86\)90011-9](https://doi.org/10.1016/0742-051X(86)90011-9)
- Martin, K. & Reynolds, S. (1993). Veteran and rookie teachers: A stereoptic vision of learning in mathematics. *Journal of Teacher Education*, 43(4), 269-277. <https://doi.org/10.1177/0022487193044004002>
- Meijer, P. C, Zanting, A., & Verloop, N (2002). How Can Student Teachers Elicit Experienced Teachers' Practical Knowledge? Tools, Suggestions, and Significance. *Journal of Teacher Education*, 53(5), 406-419. <https://doi.org/10.1177/002248702237395>
- Miller, G.A. (1979). *Images and models, similes and metaphors*. In A. Ortony, Ed., *Metaphor and Thought*. (pp. 202-250) Cambridge: Cambridge University Press.
- National Center for Education Statistics. (2009). NAEP inclusion policy. Retrieved from <http://nces.ed.gov/nationsreportcard/about/inclusion.asp>
- Needles, MC, (1991). *Comparison of Student, First-Year, and Experienced Teachers' Interpretations of a First-Grade Lesson. Teaching and Teacher Education*, 7, 269-278. [https://doi.org/10.1016/0742-051X\(91\)90034-M](https://doi.org/10.1016/0742-051X(91)90034-M)
- No Child Left Behind Act (NCLBA) of 2001, Pub. L. No. 107–110, 115 Stat. 1425 (2002).
- Palmer, D. J., Stough, L. M., Burdinski, T. K., Jr., & Gonzales, M. (2005). Identifying teacher expertise: An examination of researchers' decision making. *Educational Psychologist*, 40, 13-25. https://doi.org/10.1207/s15326985ep4001_2
- Rich, Y. & Almozlino, M. (1999). *Educational goal preferences among novice and veteran teachers of science and humanities*, 15, 613-629.
- Rich, Y. (1993). Stability and change in teacher expertise. *Teacher & Teacher Education*, 9(2), 137–146. [https://doi.org/10.1016/0742-051X\(93\)90049-M](https://doi.org/10.1016/0742-051X(93)90049-M)
- Rodriguez, Y. & Sjoström, B. (1995). Culturally responsive teacher preparation evident in classroom approaches to cultural diversity: A novice and experienced teacher. *Journal of Teacher Education*, 46(4), 304-311. <https://doi.org/10.1177/0022487195046004009>
- Sabers, D., Cushing, K., & Berliner, D. (1991). Differences among teachers in a task characterized by simultaneity, multidimensionality, and immediacy. *American Educational Research Journal*, 28(1), 63-88. <https://doi.org/10.2307/1162879>
- Sánchez, E., Rosales, J. & Cañedo, I. (1999). *Understanding and communication in expository discourse: an analysis of the strategies used by expert and preservice teachers. Teaching and Teacher Education*, 15, 37–58. [https://doi.org/10.1016/S0742-051X\(98\)00033-X](https://doi.org/10.1016/S0742-051X(98)00033-X)
- Schön, D. (1983). *The reflective practitioner*. Basic Books, New York.
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 1-22. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Smith, S.B. (1983). *The Great Mental Calculators*. New York. Columbia University Press.
- Smith, T.W., Strahan, D. (2004). *Toward a prototype of expertise in teaching: A descriptive case study*. The Journal of the Teacher Education, 55, 357-371. <https://doi.org/10.1177/0022487104267587>

- Sternberg, R. J., & Horvath, J. A. (1995). A prototype view of expert teaching. *Educational Researcher*, 24(6), 9-17. <https://doi.org/10.3102/0013189X024006009>
- Strahan, D. B. (1989). How experienced and novice teachers frame their views of instruction: An analysis of semantic ordered trees. *Teaching & Teacher Education*, 5, 53-67. [https://doi.org/10.1016/0742-051X\(89\)90019-X](https://doi.org/10.1016/0742-051X(89)90019-X)
- Swanson, H. L., O'Connor, J. E., & Cooney, J. B. (1990). An information processing analysis of expert and novice teachers' problem solving. *American Educational Research Journal*, 27(3), 533-556. <https://doi.org/10.3102/00028312027003533>
- Tochon, F., & Munby, H. (1993). Novice and expert teachers' time epistemology: A wave function from didactics to pedagogy. *Teacher & Teacher Education*, 9(2), 205-218. [https://doi.org/10.1016/0742-051X\(93\)90055-L](https://doi.org/10.1016/0742-051X(93)90055-L)
- Tschannen-Moran, M. & Woolfolk Hoy, A. (2007). The differential antecedents of self-efficacy beliefs of novice and experienced teachers. *Teaching and Teacher Education*, 23, 944-956. <https://doi.org/10.1016/j.tate.2006.05.003>
- Weisberg, R.V. (1986). *Creativity: Genius and other myths*. New York. Freeman.
- Welker, R. (1991). Expertise and the teacher as expert: Rethinking a Questionable Metaphor. *American Education Research Journal*, 28(1), 19-35. <https://doi.org/10.3102/00028312028001019>
- Westerman, D. A. (1991). Expert and novice teacher decision making. *Journal of Teacher Education*, 42(4), 292-305. <https://doi.org/10.1177/002248719104200407>
- Whittemore, R. & Knafl, K. (2005). The Integrative Review Updated Methodology. *Journal of Advanced Nursing*, 52, 546-553. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>
- Widdowson, H. G. (1974). Literary and Scientific Uses of English. *English Language Teaching Journal*, 28(4), 282-292. <https://doi.org/10.1093/elt/XXVIII.4.282>
- Wolf, C.E., Bogert, N, Jarodzka, H. & Boshuizen, H. P. A. (2014). Keeping an Eye on Learning: Differences Between Expert and Novice Teachers' Representations of Classroom Management Events. *Journal of Teacher Education*, 66, 68-85. <https://doi.org/10.1177/0022487114549810>