

EXPERT AND NOVICE TEACHERS TALKING TECHNOLOGY: PRECEPTS, CONCEPTS, AND MISCONCEPTS

Carla Meskill, Jonathan Mossop, Stephen DiAngelo, and Rosalie K. Pasquale
University at Albany, State University of New York

ABSTRACT

When new teachers, teacher trainers, and administrators consider the ways in which technologies can best serve practice, they are wise to turn to experienced teachers and veteran technology users. It is the voices and experiences of these professionals who have worked through the complex processes of adapting curricula, classroom design, dynamics, and teaching approaches that can best inform those new to teaching and learning in general, and teaching with technologies in particular. This study compares and contrasts the "technology talk" of novice and expert teachers of K-8 language and literacy (ESOL). Interview data with eight teachers - two expert (experienced teachers and technologies users), five novice (limited experience in teaching and teaching with computers) and one transitional expert (experienced teacher and non-technology user) serve to illustrate the conceptual and practical differences between those who have adapted technologies as powerful teaching and learning tools and teachers who, in spite of specific formal training in instructional technology, speak about it and its application in starkly contrasting ways. These contrasts are presented as a set of four conceptual continua that can help in explicating novice starting points, transitional issues, and the expertise of computer-using language professionals.

INTRODUCTION

The conceptual and practical differences between novice and expert teachers have been examined by a number of researchers. Pinpointing the qualities of expert practitioners in contrast to those new to the profession has yielded a number of insights that inform teacher training, administration, and teachers themselves. Those differences that have been empirically revealed through a number of qualitative approaches include the relationship between lesson plans and teachers' implementation of them (Allwright & Bailey, 1991; Bailey, 1996; Peterson & Clark, 1978; Richards & Crookes, 1988), differing abilities as regards moment-by-moment decision making (Leinhardt & Greeno, 1986), awareness and accommodation of learners as individuals (Johnson, 1996; Westerman, 1991), ability to shift content on the fly (Freeman, 1989), the number and quality of instructional patterns and routines in their repertoire (Johnson, 1992), and the degree to which planning is undertaken at a macro or micro level (Nunan, 1992, 1996). In nearly all cases, novice teachers appear to respond less effectively to derailments during their planned lessons and have fewer contingencies to apply to novel situations.

Technologies

While numerous recent studies in teacher education delineate discomforts and stumbling blocks experienced by novice classroom teachers, particular precepts, concepts, and misconcepts associated with instructional technologies have not been explicitly explored. One exception may be Watson, Blakeley, and Abbot (1998) who empirically surmise that non-using teachers' perceptions of technology may be "at odds with reality" (p. 15).

What is fairly well understood is that experienced teachers who use technologies effectively with their students can be broadly characterized as viewing technology as a means rather than an ends to learning

(Garner & Gillingham, 1996), that they see themselves in a mainly advisory role (Meskill, Mossop, & Bates, 1999; Norton & Gonzales, 1998), and that as professionals they welcome newness and variety, and continually seek to expand their repertoires (Berg, Benz, Lasley, & Raisch, 1998). Novices, on the other hand, feel they must first and foremost master the routines and rituals of new contexts (Kagan, 1992). When these contexts include mandated technologies use, there is risk of non-reflective appropriation.

Nonetheless, many scholars have pointed to the potential of technologies to be transformative rather than reinforcing the *status quo* (Goodman, 1996; Meskill, 1999; Papert, 1993). As all sectors of the educational community struggle to support teachers in adapting technology to their teaching, it is arguable that the transformative aspect is what needs to be focal. The unanswered question, however, remains: "Transformation into what?" It is the experienced, expert technology-using teacher who can provide a great deal of insight in this regard. This study set out to explore the discourse of expert technology-using educators and contrast the patterns and concepts it reveals with those of novice teachers. The underlying goal of the inquiry is to begin to lay out a clear path of conceptual change or "transformation." The path technologies use in instruction purportedly represents may not as yet be an explicit tool in technology training curricula for educators.

METHODOLOGY

In an effort to address the conceptual and relative practical differences between expert and novice technology-using teachers, recorded interviews were undertaken with three groups. One group consisted of two teachers who had extensive experience using technologies in support of their learners' language and literacy development (Meskill, Mossop, & Bates, 1999). These teachers were selected for their high level of expertise in teaching language and literacy with technology, as well as their willingness and skill at articulating their craft. They were prompted to discuss how and why they implemented a technology component as part of their instructional practices, focusing particularly on how they conceived computers as part of the daily instructional stream, and the ways they saw machines as being supportive of the learning communities they engineered in general, and the instructional routines they employed through and around computers in particular.

In order to compare and contrast the thinking and talk of these expert practitioners, interview data were also compiled from five novice teachers during their first experiences as public school teachers in a technologies-centered after school program. This group also kept a daily reflective journal. These five novice teachers had completed at least one graduate course in the use of media and technologies in the classroom as well as intensive courses in instructional theory and practice. Finally, a "transitional expert" provided a third set of interview data that tracked her real and conceptual transition from an expert, veteran teacher who abhorred the idea of using computers, to one who embraced and valued their use as language and literacy tools.

Interviews were semi-structured and probed uses, experiences, and beliefs. These were tape-recorded and transcribed. Novices kept daily journals on their uses, experiences, and reflections on their teaching with computers. Interview length averaged 1.5 to 2 hours. Interview transcripts and journal entries served as the study's dataset. Using a thematic coding approach, journals and transcripts were reviewed and coded by categories of discourse about technologies use by the four researchers in cycles of independent and collaborative coding. Coding and recoding took place during eight cycles of revision during which categories were proposed, data were reviewed accordingly, and, if contradictory or inconsistent data were located by the group, the category was rejected and/or revised to be explanatory of all interview data. Codes were continually added, rejected, retooled, and redefined as the data was repeatedly revisited. Comparisons and contrasts between discourse trends of the groups were then made under those categories that emerged directly from our data.

Teacher Participants

The five novices who agreed to participate in this study were pre-service teachers in a Teaching English to Speakers of Other Languages (TESOL) masters program leading to a permanent New York State teaching certificate. Through a local district's efforts, a small implementation grant had been acquired to support a newly conceived after school program for elementary school children who are English Language Learners (ELLs). Through collaboration with the University's masters program, the five were hired as instructors on the grant. All five had clinic class experiences with adult learners of English as a second language and one of the five had classroom teaching experience but at the college, not elementary level. Apart from having undertaken two or three observational visits to ESOL classrooms in the community, four of the five had neither worked in nor spent an extended period in an elementary school. One had completed a 10-week student teaching practicum in the same district as the after school program and knew several of the participating children. All five had completed the bulk of their coursework which included a 3-credit, semester-long course in using instructional technologies for language teaching.

The two expert teachers were the focus of an earlier study (Meskill, Mossop, & Bates, 1999). Both were long-time teaching professionals (8-10 years) who had successfully integrated a technologies component into the everyday stream of their language and literacy instruction. Some of their knowledge of computers developed through formal in-service training, but more, they claim, came out of being experienced teachers who saw computers as yet another tool to exploit for instructional purposes.

I think the fact that the interaction with the students is so important and that computers do enable this to happen in a very natural way and it's not like they're sitting at a desk and they're afraid that somebody's going to call on them and they're going to have the right answer. It's just a much more relaxed atmosphere when they're sitting back there by the computer and it does encourage the conversation. I think that's an important part of it too. (Expert 2)

Our third subject, the transitional expert, is an ESOL teacher with 27 years of classroom experience. Up until recently, she saw absolutely no role for computers in either her professional or her personal life.

It was a burden to me to learn how to use the computer. I couldn't see the utility of it.
(Transitional Expert)

However, through direct, active participation in a district-procured grant that put computers and an expert helper in her classroom, over a 1.5 year period she came to not only embrace technologies as tools for learning, but to see her teaching incomplete without them:

I look forward to using the computer with the kids. I do. I absolutely love having a computer in the room. It's a wonderful tool...I don't know. I can't explain it. I think it's magical, it just works now. (Transitional Expert)

We hoped that the inclusion of this transitional expert would provide an additional perspective that would enrich our understanding of the conceptual issues related to technologies use in language and literacy instruction.

THE CONTINUA

Talk and concepts concerning technologies and their uses in instruction varied markedly among these three diverse groups of language and literacy educators. The following novice-expert continua emerged from the talk and writing of these three groups. We use these to frame, present, and point to practical training application of these contrasts. Contrasting talk lies along four teacher-development continua:

Locus:	Machine	↔	Learners
Focus:	Self	↔	Student Learning
Practice:	Managing Students	↔	Empowering Students
Emphasis:	Product	↔	Process

Locus: Machine/Learners

The first of these, *locus of learning*, represents one salient point of contrast. Where the expert practitioners saw the machine as merely a tool with all agency for teaching and learning residing in teachers and students, novice discourse (both spoken and written) is replete with references to computers as being *the* locus of agency in the instructional process.

The conceptual continuum for agency begins at the most naïve end with the locus of learning residing with the machine, and extends to the expert end where computers are referred to as *tools* with the locus of learning residing in the sociocollaborative tasks and contexts orchestrated around them.

locus of learning = machine



locus of learning = learners

For the novices, the notion of machine agency was particularly pronounced in instances where they encountered technical difficulties. Comments like the following from a novice interview were not uncommon:

One of the computers **refused** to indent, then two more **refused** to let the students type! (Novice 2)

Rather than shifting gears and applying contingency plans as did the more experienced teachers, novices reported "freezing" along with the machines they were helping their students use. Rather than seeking contingencies, they dwelt instead on the machine as thwarting their efforts to carry out specific plans. This reaction is in keeping with other studies where derailment from a plan is a serious source of difficulty for new teachers (Allwright & Bailey, 1991). When computers are involved, this sense of helplessness appears even more striking as does the subsequent blame aimed at the machine. Novices also reported surrendering their own agency as teachers to the machine. This was evidenced in several reported instances where novices expressed relief that they could "put the kids on the computer."

I let them spend the remaining time on the Arthur¹ program. It was not like they are just playing games, they still learn using this software. (Novice 4)

Not only did the machine take over responsibility for holding children's attention, the rationale for doing so was attributed to the machine's capacity to directly "teach." Indeed, in many instances, it appeared the novices had more confidence in the machine/software than in their own abilities to teach.

Once I felt their attention begin to waiver, I placed them on the computer, which they were happy to do. (Novice 3)

In terms of learning outcomes, novices used language that attributes learning to the machine, not to the learner:

The [Claris Works] software we used **worked** fairly well in inspiring and encouraging the children to write. (Novice 1)

This is in keeping with an earlier study that saw even experienced classroom teachers who were new to technology attributing the "doing" and "learning" to the machine, not to themselves nor to their students (Meskill & Swan, 1999). It is also in keeping with more blatant attributions of human agency typical of the novice discourse:

The printer was not **behaving**/ being **temperamental**. (Novice 3)

By contrast, expert teachers' discourse is devoid of anthropomorphic references to the machine. Agency is clearly and consistently expressed and referred to as residing in students and teachers. Rather than talk about what machines do, the expert teachers' discourse clearly reflects a conceptual locus for learning as residing in the learner, not the computer.

We did a lot **with** [emphasis added] the computer with making posters and writing thank you notes and that type of thing. (Expert 2)

Where they **can** select, they **can** take a risk. . .It was almost as if that arrow moved from left to right, the words would come right out. (Expert 1)

Where the spoken and written discourse of the novices was replete with references to computers as having agency, the experienced teachers referred to machines only as the inanimate objects that they are.

It's a wonderful tool. (Transitional Expert)

With the assistance of a University mentor, our transitional expert made this conceptual change quickly. At the outset of her technologies adaptation process, she, like the novice teachers, was somewhat mystified by what computers were actually supposed to "do" to affect learning. Where she began was by thinking along the lines of the machines taking over some of the vital social aspects of the teaching and learning experience:

I really thought that language is such a vital thing, is such an alive thing, that why would this machine have anything to do with imparting communicative skills. (Transitional Expert)

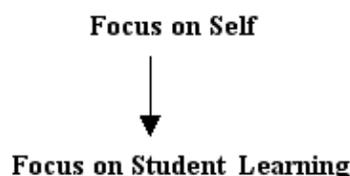
However, she very soon discovered the merit of the tools conception of technologies:

It's a tool at the end of the lesson. It's not really the way to always introduce something, to teach a concept on its own...it's a reinforcer. (Transitional Expert)

This was by far more in keeping with her extensive, humanistic grounding and rich experience as a professional educator than was the machine-as-transmitter-of-learning conception common among the novice teachers.

Focus: Self/Student Learning

Consistent with a number of studies of teacher development, our data reveal sharp contrasts in the ways novices and experts discuss their craft on what Kagan (1992) terms the self/other continuum. Beginning teachers typically focus on themselves as teachers, not on student learning as do more experienced teachers. This shortsighted view of teaching is explicit in novice teacher comments regarding technologies which, in the novice discourse, get cast as being in primary relationship with teachers and their plans, not the learners and their learning. This is also in keeping with teacher education research that found that novice teachers reflect on and analyze their craft on intuitive rather than empirical grounds as do experts (Reynolds, 1992).



Self-reference is evidenced in repeated allusions to self-initiated actions, or a kind of listing of actions novices took without incorporating learner actions or learning:

I began the lesson...I had them read their work again...I allowed one student to print out her work...I went to the computer...I printed out the sentences...I let them play with the Arthur software. (Novice 5)

I began using Microsoft Power Point. I used it to create story prompts. I would choose a picture... (Novice 4)

There were times when novices expressed an adversarial stance toward computers within their heavily self-referenced thinking, planning, undertaking, and reflecting. Overall the machine was seen as either thwarting personal plans and efforts (see [Locus](#) above), or as something offering a reprieve from the pressures of being the central focus (see [Practice](#) below).

Where self-referential language used to discuss teaching is prevalent in novice talk and writing, it is completely absent in the expert data. For the experts, learning/meaning construction happens in the social space around (not through) the machine. This is clearly one of the most marked aspects of the two experts' teaching around computers: the diffusion and redistribution of roles and authority. These teachers allow and support their students in taking ownership of the computer, the processes they undertake in consorting with it, and the products they create with it. As one expert put it:

...they can start typing stories immediately and it's their own work. They can print it out, take it home, read it to their parents, read it to brothers and sisters. So it's like creating their own books that they have that they can read and it's their work. (Expert 1)

The experts consistently framed their responses to classroom activities in terms of the learner, not themselves. They referenced the activity, the attempts, and accomplishments of their students in terms of their learning objectives and instruction:

He would be using the visual cue and another time perhaps I could take it a step further and cover up the animation and have him just look at the sentence from those phrases he chooses. (Expert 1)

I can click on multiplication or division and it's a fun way for him to actually do that math and let me see what he can do rather than just giving him a test. (Expert 2)

Where our transitional expert was at first intimidated and of a novice-like mind regarding herself in relation to the riskiness of the machine, this was quickly overcome through gentle mentoring -- mentoring that continually highlighted her tremendous strengths and vast expertise as a professional educator and pointed out how her goals and style could be in complementary relation to what the computers in her classroom had to offer. When this experienced educator employed "I statements" in relation to computers, they were used to express her actions as integral, rather than primary, to learning activity.

I'm the one who's keyboarding but on the other hand to be practical, I don't know how else to handle that. So but it's fun, everybody takes a turn, they're all around me, I sit down, I've got five kids round me. They tell me what to say. (Transitional Expert)

A preoccupation with self, accompanied by the misconception of machine agency (locus) can also exacerbate beginning teachers' lack of confidence in that, along with agency comes a sense of the unpredictable and risk and, as we will see in the next section, more chance for their plans to be derailed.

Practice: Managing/Empowering

For the novices, classroom management can be an overwhelming obstacle to what they see as their primary mission -- affecting and enacting their plan. The novices in this study reported that their focus was oftentimes more on controlling learners than on the language and literacy development of their

students. Kagan (1992) finds that until novices have established standard routines, they will be preoccupied with issues of classroom control. Processes of student learning take a back seat to working out these management issues.



Novice teachers using technology are subject to the typical classroom behavioral and organizational tensions coupled with those that arise when children have access to expensive and potentially sensitive equipment. Bundled with the misconception of machine as locus of learning (see [previous discussion](#)), this tension can be quite absorbing. Novices reported being preoccupied with the belief (sometimes for good reason) that the children would harm the machines in some way:

I really cannot leave them at the computers alone for a second because they begin erasing programs, banging the keyboard or pounding on the mouse. (Novice 1)

I had to constantly be watching them. Turning away from them for only a moment normally prompted them to start "playing" with the computer, attempting to drag programs off the desktop or even delete them into the Trash. (Novice 5)

Such preoccupation with managing learner behavior appeared to take precedence over attending to and supporting student learning processes.

Additionally, the misconception of agency led novices to see children's computer work as something that placed less demand on them -- something that was *easy* for them:

So I figured that this would be an easy task. All I would have to do is have the girls word process the sentences and read the sentences back to me. And they wouldn't even have to share a computer. There was one for each of them. It seemed simple enough. But it was a disaster. The girls just didn't know their alphabet, or the sounds of the letters... It was just downright awful (Novice 3)

An experienced teacher would not have a) planned so narrowly so as to depend on the computer *doing* something (see [Locus](#) above); nor b) been derailed, blind to the teaching and learning opportunities that learners' lack of knowledge and the presence of letters on the computer screen represent.

Our transitional expert, who has worked with student teachers in her classroom for many years, put it nicely:

[New teachers] will prepare a lesson, whether it be for using the computers, using whatever, if it doesn't work they kind of fall apart over it. Experienced teachers will go, well OK, and this happens to me all the time, the computers don't work for some reason, well I have lots of other activities I can pull out just like that [snaps fingers], to do with the kids. Why? Because I've done it 27 years. I just know what every book contains in the room. I just know what the material is and I know what works and what doesn't.

A recent study reported in *Education Week* ([Trotter, 1999](#)), indicates that where experienced teachers carefully integrate technologies to complement and enhance existing curricula, novice teachers use computers as a means of reward and punishment. Novice teachers participating in our study likewise reported their "putting the children on the computer" as form of reward for cooperative behavior (see [Focus](#) above) and denied them use of the machine as a way of punishing uncooperative behaviors.

Sammi and Pheadra² have very clear discipline problems -- they do not respond well to direction, and are apathetic about the materials and subject matter ... in this session I finally let Sammi play with one of the computers -- both he and his sister do like to use them. (Novice 4)

More experienced teachers saw the computer as an additional opportunity to teach, rather than to punish.

Yeah, that's right. There were mouse fights. There were. But in anything you have to teach the kids, when we play a game, that was very typical. (Transitional Expert)

In contrast to the novice tendency to seize up, the expert teachers seized every opportunity to enhance the language and literacy potential of working with computers, focusing on student process and learning rather than on a single plan:

Today we had a really good example because we had a couple kids that they click on the computer and then they are impatient when the little hand is up and they click again and they click again and pretty soon the computer is freezing on them and their screens are changing. So I put one of the boys up [front] in the room and I said well let me show you why some of you are having this problem. So I said Tony go to the blackboard, no, go to the waste basket and you know, I just kept giving him commands that were totally contradictory of each other he just looked at me like I was crazy and I said, well every time you click on the mouse you tell it to do something and if you don't give it a chance to do what you told it and you give it another command and another command they're like all stacking up and the computer gets crazy too. So that's like just showing them why they don't get what they want right away or why some of the things that are coming up on their screen are crazy because they've already clicked on it. (Expert 2)

Emphasis: Product/Process

For this continuum, we noted the difference in instructional emphasis between novices and experts. For the novices, what appears to matter most when learners use computers is what gets done -- some *product* is anticipated. For the expert teachers, what counts most, what gets emphasized in tasks and their management, is the learning that gets engaged in -- the learning *process*.



Of note throughout the novice journal entries and interviews is their perception that working at the computer is what is important: students "get on" and "get off" the machine. They emphasize their need for learners to produce rather than be engaged in processes whereby language and literacy skills are developing in an ongoing fashion.

Although they sometimes seemed to have more interest in playing with the format than in composing texts, they did produce a substantial amount of writing. (Novice 2)

All three groups of teachers uniformly praised the medium for its motivational aspect. A startling difference, though, lies in the concepts associated with that enthusiasm. Novice reports were nominal, superficial, with the locus of motivation lying solely with the machine and, as such, being a one-time "product" of interaction with it:

They had a blast with it.
It worked well.
I think the computer activity was effective.

Experts, on the other hand, went more deeply into the connections between the motivational aspects of the medium and how they supported the *processes* of student learning:

Where he can select he can take a risk ... it's a non-threatening way for him to get into reading ... the speed, the ease for a lot of these students struggling with handwriting is difficult too whereas the computer it's always neat, which is something most of them are really proud of. (Expert 1)

Part and parcel of an emphasis on process is an educator's ability to notice what is important in the learning processes and to act on it in ways that support and enhance the learning (Berliner, 1988). Where novice teachers appeared more occupied by the machine, their own teaching, class management, and products, the experts were highly attuned to what it was learners were doing and were proactive in responding to teachable moments as they continually arose:

That was amazing to see the conversation that took place between the kids you know ... once we got the right formula ... and they really, really worked. (Transitional Expert)

DISCUSSION

An expert not only knows more terms and facts about a domain than a novice, but also has developed a conceptualization of how those terms, facts, and concepts fit together into an overall schema (Walker, 1987). This connection to teaching extends well beyond matters of curriculum to encompass a larger conceptual composite of craft knowledge. Teachers need to learn to *see* and seize opportunities to observe, enact, and support learning in highly complex social settings. This is an aspect of teaching that sharply distinguishes novices from experts. Novice preoccupation with new technologies can potentially undermine their evolution to an expert's fine-tuned noticing ability unless, perhaps, these risks are made explicit. Understanding conceptual differences and how these translate into such practical, procedural risk-taking may help further professional development efforts for technology-using language educators.

Although these findings are limited due to the small number of participating teachers, our attempt to distinguish the salient conceptual, and corresponding practical differences between novice, expert, and transitional expert technology-using educators evolved four major points of contrast. Clearly more such contrasts exist and many more may emerge as the nature of schooling evolves along with the technologies used there. What is immediately relevant is that our participant accounts make it very clear how these conceptual differences get played out in actual instructional practices with technology. Study of classroom processes with computers, then, can be informed by these basic conceptual differences. Likewise, teacher training can acknowledge these conceptual starting and end points in considering and designing professional development sequences and assessments.

CONCLUSION

In considering differences in the discourse and practice of novice versus expert teachers as regards technology, it becomes clear that training may not be sufficient for the needed conceptual development that leads to the kind of ease and repertoire characteristic of expert users. Indeed, those novice teachers who had received "state of the art" training in classroom technologies use were far less comfortable in their implementations than the more experienced teacher who had no formal training with computers but a great deal of classroom experience. Understanding the conceptual and discourse differences of pre-service and newly practicing teachers is a critical starting point in developing the instructional materials, experiences, and guidance that can support growth in understanding the power and potential of the medium. Further, it is by increasing awareness of these differences in thought, action, and talk that the teacher training and administrative communities can reconsider a) the processes involved in technologies and teacher training; b) the inclusion of experienced and expert teachers as models of discourse and practice; and c) the notion of technologies as sidestepping the human expertise required for powerful learning.

Teaching craft more closely resembles practical wisdom than it does a fixed set of scientifically-derived principles. This study indicates that as far as technologies in education are concerned, part of that practical wisdom is to attain and maintain a particular conceptual frame or set of frames as regards the potential role of technologies for language and literacy development. Rather than "tinkering around the edges of their practice" (Stein, Smith, & Silver, 1999), educating novice teachers in thoughtful technologies use needs to begin with the development of concepts - a complex process of implementation and reflection that can be greatly informed by the voices of experienced practitioners.

NOTES

[1.](#) Part of Broderbund's Living Books series, the *Arthur* books are the multimedia version of the popular children's book series.

[2.](#) Pseudonyms.

ACKNOWLEDGMENTS

This paper was originally presented at the American Educational Research Association Conference, April, 2000, New Orleans, LA.

This project was supported in part by the National Center on English Learning and Achievement (CELA). The Center is supported by the U.S. Department of Education's Office of Educational Research and Improvement (Award #R305A60005). Partial support was also provided by The Language Advocacy Project, University at Albany, a language and literacy training project funded through the Office for Bilingual Education and Minority Language Affairs (OBEMLA), U.S. Department of Education (Award #T195A970024-99). The views expressed herein are those of the authors and do not necessarily represent the views of the Department.

ABOUT THE AUTHORS

Carla Meskill is an Associate Professor of the Department of Educational Theory and Practice, University at Albany.

E-mail: cmeskill@uamail.albany.edu

Jonathan Mossop currently teaches English as a second language at the University at Albany and the Emma Willard School.

E-mail: jmossop@emmawillard.org

Stephen DiAngelo is an English teacher in Japan.

E-mail: stephen_diangelo@hotmail.com

Rosalie Pasquale lives in New York and Berlin, Germany where she teaches teachers of Business English.

E-mail: rkpasquale@hotmail.com

REFERENCES

Allwright, D., & Bailey, K. (1991). *Focus on the language classroom: An introduction to classroom research for language teachers*. Cambridge, England: Cambridge University Press.

Bailey, K. (1996). The best laid plans: Teachers' in-class decisions to depart from their lesson plans. In K. Bailey & D. Nunan (Eds.), *Voices from the language classroom* (pp. 15-40). Cambridge, England: Cambridge University Press.

- Berg, S., Benz, C., Lasley, T., & Raisch, C. (1998). Exemplary technology use in elementary classrooms. *Journal of Research on Computing in Education*, 31(2), 111-122.
- Berliner, D. (1988). Implications of studies of expertise in pedagogy for teacher education and evaluation. In *New directions for teacher assessment* (Proceedings of the 1988 ETS Invitational Conference; pp. 38-68). Princeton, NJ: Educational Testing Service.
- Freeman, D. (1989). Teacher training, development, and decision making: A model of teaching and related strategies for language teacher education. *TESOL Quarterly*, 23(1), 27-45.
- Garner, R., & Gillingham, M. (1996). *Internet communication in six classrooms: Conversations across time, space, and culture*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Goodman, S. (1996). Media, technology & education reform. *Video and Learning, Fall/Winter*, 1-2.
- Johnson, K. (1992). The instructional decisions of pre-service ESL teachers: New directions for teacher preparation programs. In J. Flowerdew, M. Brock, & S. Hsia (Eds.), *Perspectives on second language teacher education* (pp. 115-134). Hong Kong: City Polytechnic of Hong Kong.
- Johnson, K. (1996). The vision versus the reality: The tensions of the TESOL practicum. In D. Freeman & J. Richards (Eds.), *Teacher learning in language teaching* (pp. 30-49). Cambridge, England: Cambridge University Press.
- Kagan, D. (1992). Professional growth among preservice and beginning teachers. *Review of Educational Research*, 62(2), 129-169.
- Leinhardt, G., & Greeno, J. (1986). The cognitive skill of teaching. *Journal of Educational Psychology*, 78(2), 75-95.
- Meskill, C., & Swan, K. (1999). Response-based multimedia: A pilot study of Kidspac in four elementary classrooms. *Journal of Educational Computing Research*, 18(4), 339-367.
- Meskill, C. (1999) 20 minutes into the future. In J. Egbert & E. Hanson-Smith (Eds.), *CALL environments: Research, Practice, and Critical Issues* (pp. 459-469). Washington, DC: TESOL, Inc.
- Meskill, C., Mossop, J., & Bates, R. (1999). *Electronic texts and learners of English as a second language: Optimal contexts for language and literacy*. Albany, NY: National Research Center on English Learning and Achievement. Retrieved August 27, 2002, from <http://cela.albany.edu/esl/index.html>
- Norton, P., & Gonzales, C. (1998). Regional educational technology assistance initiative-phase II: Evaluating a model for statewide professional development. *Journal of Research on Computing in Education*, 31(1), 25-48.
- Nunan, D. (1992). The teacher as decision-maker. In J. Flowerdew, M. Brock, & S. Hsia (Eds.), *Perspectives on second language teacher education* (pp. 135-165). Hong Kong: City Polytechnic of Hong Kong.
- Nunan, D. (1996). Hidden voices: Insiders' perspectives on classroom interaction. In K. Bailey & D. Nunan (Eds.), *Voices from the language classroom* (pp. 41-56). Cambridge: Cambridge University Press.
- Papert, S. (1993). *The children's machine: Rethinking school in the age of the computer*. NY: Basic Books.
- Peterson, P., & Clark, C. (1978). Teachers' reports of their cognitive processes. *American Educational Research Journal*, 15(4), 555-565.
- Reynolds, A. (1992). What is competent beginning teaching? A review of the literature. *Review of Educational Research*, 62(1), 1-35.

- Richards, J., & Crookes, G. (1988). The practicum in TESOL. *TESOL Quarterly*, 22(1), 9-27.
- Stein, M., Smith, M., & Silver, E. (1999). The development of professional developers: Learning to assist teachers in new settings in new ways. *Harvard Educational Review*, 69(3), 237-269.
- Trotter, A. (1999, September 23). Preparing teachers for the digital age. *Education Week*, 19(4), 37-42. Available online at <http://www.edweek.org/sreports/tc99/articles/teach.htm>
- alker, C. (1987). Relative importance of domain knowledge and overall aptitude on acquisition of domain-related information. *Cognition and Instruction*, 4(1), 25-42.
- Watson, D., Blakeley, B., & Abbot, C. (1998). Researching the use of communication technologies in teacher education. *Computers in Education*, 10(1-2), 15-21.
- Westerman, D. (1991). Expert and novice teacher decision making. *Journal of Teacher Education*, 42(4), 292-305.

If the teacher talks for half the time in a 60 minute lesson with 15 students, each student gets only 2 minutes to speak. A large amount of TTT results in long stretches of time in teacher-to-class (T/class) mode and a monotonous pace. Student under-involvement inevitably leads to loss of concentration, boredom and reduced learning. Simple concept questions should be asked to check understanding. If explanations are clear and concept checking is effective, there should be no need for re-explanation or interrupting an activity to reteach or re-instruct. Tolerating silence. Inexperienced teachers in particular tend to fill silences by unnecessary talking. When describing teachers' adoption of new technology, existing conceptual models tend to focus on a single dimension, either quantitative, such as the frequency or amount of technology use, or... Expert and novice teachers talking technology: Precepts, concepts, and misconcepts. *Language Learning & Technology*, 6(3), 46-57. Google Scholar. Mishra, P., & Koehler, M. J. (2006). Meskill, C., Mossop, J., DiAngelo, S. and Pasquale, R. K. (2002) Expert and Novice Teachers Talking Technology: Precepts, Concepts and Misconcepts. *Language Learning & Technology*, 6(3): 46-57. Google Scholar. Meskill, C., Anthony, N., Hilliker, S., Tseng, C. and You, J. (2006) Expert-novice teacher mentoring in language learning technology. In: Hubbard, P. and Levy, M. (eds.), *Teacher Education in CALL*. Amsterdam: John Benjamins, 283-298. CrossRef Google Scholar. Li, Guofang Sun, Zhuo and Jee, Youngeun 2019. The more technology the better? A comparison of teacher-student interaction in high and low technology use elementary EFL classrooms in China. *System*, Vol. 84, Issue. , p. 24. CrossRef. Expert and novice teachers talking technology: Precepts, concepts, and misconcepts. C Meskill, J Mossop, S DiAngelo, RK Pasquale. *Language Learning & Technology* 6 (3), 46-57, 2002. 160. 2002. Foreign language learning with CMC: Forms of online instructional discourse in a hybrid Russian class. C Meskill, N Anthony. *System* 33 (1), 89-105, 2005. 130.