

Novice and Expert Teachers' Use of a Hypermedia Learning Environment for Developing Classroom Observation Skills

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Theoretical Framework

It has been known for some time that novice and expert teachers perceive classroom information differently. Explanations for these differences are based on a long line of research which compares problem solving by novices vs. experts (Bruer, 1993) and structural knowledge differences between novices and experts (Jonassen, 1993). One area of problem solving is observing and interpreting children's behavior. In the area of classroom discipline, studies suggest that expert teachers form more elaborate representations regarding classroom interactions while novice teachers focus more on literal or surface elements (Adelson, 1983; Swanson, 1990). Studies based on "quick looks" of behavior in classroom environments reveal that novices provide literal and accurate descriptions of behavior while experts provide inferences about what is viewed, thus, demonstrating greater depth of understanding (Carter et al, 1988; Gonzalez & Carter, 1996).

Interactive multimedia has proven to be an effective and efficient method of teaching classroom observation skills by displaying children's behavior, allowing for coded input, and providing instant corrective feedback (Fitzgerald, 1995). No studies to date have investigated differences in novice and experienced teachers when learning to observe and code behavior using interactive multimedia. Because teachers construct unique views of classroom interactions and develop biases from direct contact with children in classrooms, prior experience may be an important determinant in the success of learning observation skills. Two primary concerns in collecting observational data are the reliability of the data across multiple observers and objectivity, e.g., the avoidance of observer bias.

If prior teaching experiences affect the interpretation of classroom events as reported in novice vs. expert literature, then differences in learning patterns and outcomes may emerge among users in hypermedia learning environments where learner control and self-pacing are provided through the design of the materials. A well-designed hypermedia program can standardize training to facilitate development of coding reliability and reduction in observer bias. A critical factor in its effectiveness, however, may relate to the impact of prior differences of the users and the personal schemata and biases that they bring to the learning environment. These are interesting questions for designers of hypermedia-based training materials for teacher education.

Purpose of the Study and Research Questions

The purpose of this study was to examine the performance of novice and expert teachers in a hypermedia learning environment. The training program was delivered through an interactive videodisc format which offered systematic skill development in a complex, classroom observation code and observational procedure. Performance measures included a coding knowledge test and reliability testing following training. Usage patterns and engagement time were gathered from user logs to examine differential patterns of engagement while using the training program. To date, there are no reports in the literature which compare performance outcomes or usage of hypermedia learning systems by novice vs. expert teachers.

The specific research questions for this study were as follows:

- (1) What is the effect of a hypermedia training program in classroom observation skills on knowledge of codes for novice vs. expert teachers?
- (2) What is the effect of a hypermedia training program in classroom observation skills on coding reliability for novice vs. expert teachers?
- (3) How do expert and novice teachers differ in the use of a hypermedia learning system when developing classroom observation skills?

The Context of the Study: The Hypermedia Program

The participants in this study learned to code children's classroom behavior using *The Classroom Behavior Record: School Version Code* (Fitzgerald, Nichols, & Whittaker, 1992) through a Level III interactive, videodisc program. In the *Classroom Behavior Record (CBR) Observation Training Program*, video and audio scenes of children in classrooms/playgroups and instructional narrations are stored on three videodiscs. The seven-module computer program delivers instruction; provides feedback on practice activities; and controls delivery speeds (Fitzgerald, Semrau, Nichols, & Nichols, 1997).

CBR was developed at The University of Iowa Hospitals and Clinics by the educational staff in the Child Psychiatry Service Unit (Nichols, Robinson, & Fitzgerald, 1979). Its purpose is to provide a method of systematic observation to document children's behaviors in naturalistic settings for use in diagnosis and treatment. The original CBR code was comprised of 38 positive and negative behavior codes to provide a detailed and specific description of behavior. The coding procedure involves coding the behavior of a target child in six-second intervals, while coding the behavior of peers in the same situations on alternating six-second intervals. Thus, the data provide a comparison of the target child to his/her peers under the same situational expectations. Results provide a clinical method to evaluate treatment effects through the use of normative peer data (Walker & Hops, 1976). CBR data are used to understand youngsters' difficulties as they occur in natural settings, to establish treatment goals, and to monitor treatment effects, particularly medication. Using the prevalent, apprentice-based model of training, it typically took 40-60 hours of one-on-one training time to bring a new observer to necessary reliability levels to implement the CBR data collection procedure.

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Figure 1 displays the behavior codes used in the CBR-School Version Code.

<u>Positive Behavior Codes</u>		<u>Negative Behavior Codes</u>	
AT	Attend/ On-task	FA	Fail to Attend/ Off-task
IM	Incidental Motor	PL	Play with Object
II	Instructional Interaction	MN	Motor/ Noise Obtrusive
PP	Positive with Peer	DD	Disruptive, Destructive
PT	Positive with Teacher	NP	Negative with Peer
CO	Comply	NT	Negative with Teacher
AG	Approval Received	FC	Fail to Comply
V1-V2	Open Positive Variables	DG	Disapproval Gained
		V3-V4	Open Negative Variables

Figure 1. CBR Behavior Codes

The overall design of the training program is based on the *Stages of Learning Model* as initially described by Gagne (1974) and adapted to computer-based instruction (CBI) by Criswell (1989). According to this direct instruction model, effective instruction requires a match between CBI design and learner objectives as reflected in progressive, changing performance. Learning is viewed as a systematic, developmental process with the learner progressing through stages of

acquisition, fluency, generalization, and maintenance. Similarly, Anderson (1980) described stages in skill acquisition as being a cognitive stage to learn about the skill, an associative stage in which a learner practices the skill, and an autonomous stage when a learner improves skill performance.

The program is delivered through a hypermedia format with advisement to guide knowledge construction (Nelson, 1994) as users master learning objectives at each stage in the hierarchy. Training activities include tutorials to learn the codes and procedures, timed drills to build fluency in coding, and application of the skills through coding authentic classroom scenes. The instructional progression moves from demonstrations of the codes to progressively more complex and realistic coding practices, thus increasing the fidelity of the practice experience (Alessi, 1988).

Despite an overall high level of organization and structure, the modules in the training program can be accessed in a nonlinear manner to meet different learner preferences. Movement across learning activities is easily executed by opening different modules. To facilitate learner control within the modules, the program frequently stops and allows the learner to repeat segments, advance or restart drills, and check scores. In the tutorial modules, all topics are listed on a pull-down menu which can be accessed at any time. Advisement on suggested levels of proficiency for each of the drills is inserted into user feedback. In previous research with this program, differences were observed in users' sequences through the materials, although most users follow the organizational pattern and embedded structure within the training program (Fitzgerald, 1995).

Methods

Sample

The participants in this study were 44 graduate students enrolled in special education training programs at a major mid-Atlantic university. The students were enrolled in one of these three programs: (1) initial certification in behavioral disorders, (2) second-area certification in special education, or (3) doctoral study in special education. Data were collected over a three-year period. Students in the certification programs learned the observation procedure so they could utilize it in required assignments carried out in their practicum teaching situations. Students in the doctoral program learned the observation procedure in order to collect behavioral observation data on children as a part of a guided research project. Students were not approved for using the procedure in teaching practicum or for collecting research data until they met the reliability standards set for the training program.

Experimental Procedure

Following a general demonstration of the *Classroom Behavior Record (CBR) Observation Training Program* and an overview of the coding categories, students proceeded to utilize the training program semi-independently. In some sections of the class, the instructor guided students through the tutorial portions of the program and then required independent study and practice. In other sections, students learned the observational procedure as a self-study assignment. All students had access to instructors for assistance and clarification. All students determined their own training sequences and schedules and kept training logs during their practice sessions.

Proficiency tests were scheduled approximately six weeks after training started. Two tests were administered—one measured mastery of the observation codes and the other measured reliability, e.g., speed and accuracy in coding. Reliability standards were set which required students to achieve a minimum combination of scores of 80% on one test and 72% on the alternate test. If required reliability levels were not achieved during the initial test session, additional practice and re-testing were required until standards were met. Individualized assistance was provided when students requested explanations or failed to pass the initial reliability tests.

Independent Variable

The independent variable was the status of the user as a novice or an expert teacher. Participants were categorized as "novices" or "experts" based on the following criteria: experts had salaried teaching experience in regular or special education classrooms for a minimum of two years and preparation in two or more certification areas; novices had no salaried teaching experience and were working on their first special education certification area. All participants had some teaching experience as student teachers or practicum students engaged in field experiences built into their graduate programs. Based on these criteria, 23 students were categorized as novices and 21 participants were categorized as experts.

Dependent Variables

Codes Test. This untimed test includes 30 six-second interval video segments displaying behavior by 18 different children in classroom settings. Following each six-second interval, students decide on the best code to represent the displayed behavior and mark their answer sheet. This test was administered only once. Since this test is untimed, it measures knowledge of the observation codes and the rules of precedence which must be followed when making coding decisions.

Reliability Test. This timed test simulates an authentic classroom coding procedure. A five-minute video segment is used which shows four junior high students. It runs with a six-second beeper marking the end of each interval. The student must code each interval in realtime. The test pauses each 10 intervals (one minute) to allow the user to re-orient to the coding sheet. The test was administered twice to allow the user to check his/her codes and make changes if desired. This test yields a reliability score based on a sample of 50 consecutive intervals of coding. Since this test is timed, it is a cumulative measure of proficiency with the code and observational routines under rigorous, timed conditions.

User Engagement Data. Each student kept a training log during training which included the date and engagement time for each training activity. The training logs had to be submitted at the time of testing for the student to receive full credit for the observation training assignment. The data from these logs were compiled to provide the following dependent measures: (1) total training time and (2) engagement time in each of the instructional components: (a) tutorials, (b) fluency-building, and (c) application.

Analysis of Data

To answer the research questions, unpaired t-tests were conducted. For each of the three research questions, differences in the dependent variables were examined for the participants blocked into the independent variable groups of novices vs. experts. Performance outcomes were analyzed for 44 participants; training time data were analyzed for 40 participants (4 participants did not submit complete training logs).

Results

Effects on Knowledge of Codes and Coding Reliability

Significant differences were found for both dependent variables favoring the performance of novice teachers. Novices demonstrated greater accuracy in making coding judgments when compared to experts (79.57% vs. 73.91%) and a higher level of observer reliability in applying the coding procedures to classroom scenes (81.65% vs. 77.95%). As shown in Table 1, these differences were significant ($p < .05$).

Dependent Measures	Novices (n = 23)		Experts (n = 21)		<i>t</i> (42)	<i>p</i>
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)		
Codes Test	79.57	(6.95)	73.91	(9.85)	2.170	.0321 *
Reliability Test	81.65	(6.08)	77.95	(5.24)	2.152	.0372 *

* significant at $p = .05$ level

Table 1. Performance Outcomes for Novice and Expert Teachers

Usage Patterns for the Hypermedia Training Program

No significant differences were revealed between the two groups of students. Novices and experts spent approximately the same amount of time learning the codes and practicing the observation procedures (14.90 hours for novices vs. 16.63 hours for experts). Novices and experts distributed their efforts within the program's training activities in equivalent proportions of total engagement time: tutorials (30.65% vs. 29.23%); fluency-building (23.93% vs. 26.51%); and application practice (45.51% vs. 44.24%). As seen in Table 2, these comparisons failed to reach significance ($p > .05$).

	Novices (n=22)		Experts (n=18)		<i>t</i> (38)	<i>p</i>
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)		
Time Using Program in Hours	14.90	(4.34)	16.63	(7.45)	.917	.3648
<u>Proportion of Time Spent in:</u>						
• Acquisition Phase	30.65	(10.23)	29.23	(13.16)	.383	.7041
• Fluency-Building	23.93	(8.47)	26.51	(11.21)	.830	.4119
• Application Phase	45.51	(10.82)	44.24	(14.97)	.310	.7583

Table 2. Training Time Data for Novice and Expert Teachers

Discussion

In spite of the fact that novice and expert teachers spent approximately the same amount of time in training with the hypermedia program and utilized the program similarly, novices outperformed experienced teachers in learning classroom observation skills through the hypermedia program. Novice teachers demonstrated higher levels of proficiency on their mastery of the behavioral codes and on their reliability scores when coding behavior in classroom scenes. Overall, novices met training standards at higher levels and with less training time than the expert teachers. Both groups spent approximately 30% of their time in the cognitive, acquisition stage of learning the codes and procedures; approximately 25% of their time practicing coding to achieve and accuracy; and approximately 45% of their time applying their coding skills to a wide variety of classroom scenarios.

Conclusion

Differences in coding proficiency emerged between novice and expert teachers in this study. One hypothesis to explain the differences which were found in proficiency between novice and experienced teachers relates to differences in motivation for learning. Initial certification students who lack teaching experience may be more motivated to master the skills of observation, perhaps due to their commitment to becoming teachers. Students working on additional certifications who already have teaching experience may be motivated to secure course credits for a job change, and thus, have less investment in skill mastery. The doctoral students were largely self-motivated as they designed the research study requiring their mastery of observational methodologies. It is likely that these motivational differences were mediated by additional individual differences and efforts within the groups as well as between the groups. Certainly, motivation for learning is one factor which needs careful attention in studying the impact of hypermediated learning.

An alternate hypothesis to explain these differing training results relates to differences in perceptions between observations of novices and experts. Because novices in this study demonstrated higher levels of accuracy in coding children's behavior, the results seem to confirm earlier findings that novice teachers report literal and accurate descriptions of classroom behavior while teachers with more experience focus on interpreting behavior with less objectivity (Swanson, 1990; Gonzalez & Carter, 1996). The literature suggests that expert teachers tend to elaborate their observations and search for meaningful patterns in understanding children's behavior. This approach may introduce biases based on previous experience which interfere with their ability to master observational procedures. The results in this study support this hypothesis. The results indicate that experienced teachers do not code as accurately or as reliably as novice teachers. The fact that both groups of teachers utilized the hypermedia program similarly for training suggests that differences in their coding proficiency were not related to training or practice time, but rather, to other factors within the learners.

If this is true, the implications of this finding would extend beyond comparisons of novice and expert teachers. The prior knowledge and experience that users bring to a learning environment may make them better problem solvers (Bruer, 1993) but also, may create the need to confront misinformation and biases to enable them to develop new knowledge structures. Kommers, Grabinger, and Dunlap describe one of the problems in human-computer interface design as assimilation bias in which users fail to assimilate new methods because of preconceptions from prior learning (1996). Because of misinformation, users may develop incorrect theories that affect use of the system. Kommers, Grabinger, and Dunlap recommend correcting information and errors as soon as possible (1996). The immediacy of the feedback within this hypermedia program should have corrected coding errors. Because of the complexity of the coding process and the amount of observer judgment which enters into coding decisions, subjectivity will always be an inherent part of behavior coding. Thus, preconceptions and biases are difficult to change.

This study is important in studying how novice vs. experienced teachers utilize a hypermedia learning environment for observation skills instruction. The outcomes demonstrate that an effectively-designed hypermedia program can facilitate observation skills in novices which exceed those of experts. From the standpoint of instructional design, the remaining challenge is to design a learning environment which enables experts to put aside prior views and biases in order to accurately learn a new skill. The results of this study should instruct hypermedia designers of the need to consider prior experience as a determinant of success and develop procedures to assess and change preconceptions of learners to the extent possible. With our present focus in hypermedia design on situated learning and anchored instruction, we as designers may fail to recognize that prior knowledge is neither accurate nor adequate in establishing a foundation for assimilating new information and skills.

References

- Adelson, B. (1983). When novices surpass experts: The difficulties of a task may increase with expertise. Journal of Experimental Psychology: Learning, Memory and Cognition, 10, 483-433.
- Anderson, J. R. (1980). Cognitive science and its implications. San Francisco: W.H. Freeman.
- Bruer, J. (1993). Schools for thought: A science of learning in the classroom. Cambridge, MA: The MIT Press.
- 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.
- Fitzgerald, G. (1995). The effects of an interactive videodisc training program on classroom observation skills used as a teaching tool and as a learning tool. Computers in Human Behavior, 11, 467-479.
- Fitzgerald, G., Nichols, P., & Whittaker, J. (1992). Classroom Behavior Record: Student manual (2nd ed.).
- Fitzgerald, G., Semrau, L., Nichols, P., & Nichols, S. (1997). The Classroom Behavior Record: School Version (1997 revision) [Computer Software] and [Training Manual]. State University, AR: Arkansas State University.
- Gonzalez, L. & Carter, K. (1996). Correspondence in cooperating teachers' and student teachers' interpretations of classroom events. Teaching and Teacher Education, 12, 39-47.
- Jonassen, D.H., Beissner, K. & Yacci, M. (1993). Structural knowledge: Techniques for representing, conveying, and acquiring structural knowledge. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Kagan, D. (1992). Professional growth among preservice and beginning teachers. Review of Educational Research, 62, 129-169.
- Kommers, P.A., Grabinger, S., & Dunlap, J. (1996). Hypermedia learning environments: Instructional design and integration. Lawrence Erlbaum Associates, Mahwah, New Jersey.
- Swanson, H.L. (1990). An information processing analysis of expert and novice teachers' problem solving. American Educational Research Journal, 27, 533-555.