Using Action Research and Provincial Test Results to Improve Student Learning, 6(20)

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Abstract

During the 1999/2000 school year, seventeen elementary school teachers and five consultants, from two Ontario school boards, conducted action research based on the 1999 EQAO provincial test results for Grades 3 and 6 and used feedback/corrective action to improve those results. Paired with a "critical friend," individual teachers analyzed their schools' results and identified areas for improvement. They developed action research questions, investigated the questions in their own classrooms, collected data to evaluate the impact of their work, and recorded their investigations. The teachers' own assessments and the 2000 EQAO test results indicated substantial success. Teachers began to see provincial test results as friendly data that schools can use to improve student learning and action research and feedback/corrective action as powerful methods to do so. The study contributes to understanding how provincial testing can be used to improve student learning and what constitutes effective teacher in-service education. It shows how professional teachers can play a leading role in school improvement by taking charge of their own professional learning.

Introduction

This paper reports findings of a research study that investigated teachers' use of provincially supervised testing, action research, and feedback/corrective action to improve student learning . It shows how professional teachers can play a leading role in school improvement by taking charge of their own professional learning.

The teachers who participated in the study analyzed their 1999 EQAO (Education Quality and Accountability Office, 2002) Grades 3 and 6 provincial test results , identified areas for improvement and developed related research questions about how to improve their teaching practice. They applied varying elements of the feedback/corrective action strategy to address these questions, and they collected and analyzed data to assess the impact on student learning of the changes they had made.

The research was conducted during the 1999-2000 school year and included teachers in the Grand Erie District School Board and the Nipissing-Parry Sound Catholic District School Board in Ontario. The study was funded and conducted by the two school boards and Nipissing University with additional funding supplied by the Ontario Education Quality and Accountability Office (EQAO). The resulting research report (Wideman, Delong, & Hallett, in press) was presented to EQAO in January 2001.

Action research is an ontologically rooted, inquiry-based approach to professional growth and school improvement (Boomer, 1987; Wideman, 1992, 1995). The action research methodology in this study was based on the work of Jack Whitehead at the University of Bath (Whitehead, 1989, 1993, 1999) because of its potential to affect teacher and student learning. The process starts with the individual teacher reviewing data about his/her students' performance and developing a question of the kind, "How can I improve my practice?" The teacher then works through cycles of

action, reflection, and sharing of findings to develop, implement, and evaluate possible solutions to his/her question. Throughout this process, teachers theorize about their learning and create knowledge about teaching and learning which can be shared with their colleagues.

Feedback/corrective action applies systematic formative evaluation to operationalize outcomes-based teaching and learning. The feedback/corrective action methodology in this study was based on the work of consultant Ruth Sutton (1995, 1997). The teacher repeats cycles of identifying learning expectations, making the expectations clear to the students, teaching to the expectations, assessing results, analyzing and reflecting on the assessment, providing anecdotal feedback to students on how to improve, and developing new intentions for teaching. Feedback/corrective action amalgamates a number of teaching, learning, and assessment strategies with which many teachers are already familiar. These include the use of modeling, rubrics, exemplars, anecdotal feedback, and conferencing.

In both action research and feedback/corrective action, teachers assess student learning to see if and how it improves in relation to identified learning expectations. A key feature of this study was to test the validity of teachers' own assessments by comparing each school's Grade 3 and 6 provincial test results at the beginning of the project with those at the end of the project.

Significance of the Study

To effect meaningful change and improvement in student learning, we need to focus on the teacher's actions in the classroom. Black and Wiliam (1998) indicated that there is a focus on input into schools, in terms of curriculum, and on output, in terms of testing, but that there has been a lack of attention in the research to "the black box" of the classroom itself. This study taught teachers how to analyze and interpret their provincial test data, to make appropriate decisions based on the information, to implement those decisions, and to evaluate the results of these changes in practice.

Provincial testing provides a potentially rich source of data that, if analyzed and acted upon, may have an impact on improving classroom practice and therefore student learning. But who is to conduct this analysis and to act on it? Top-down change initiatives in which provincial or school board officials mandate teaching practices and attempt to implement them on teachers have been shown to have only limited effect in changing teachers' classroom practices. (Fullan, Estabrook, & Biss, 1977; McLaughlin & Marsh, 1978, Fullan, 1982) The difficulty of transforming organizational policy initiatives into practice in the workplace is widely recognized, not solely within the teaching profession but also in other professions and occupations in the public and private sectors (Brinkerhoff & Montesino, 1995; Belcourt & Saks, 1998).

Alternatives to top-down change initiatives and training-based professional development activities need to be investigated. One such alternative is for teachers to take the lead in school improvement by using provincial test results as data to inform their own efforts to improve practice. This kind of alternative is supported by recognition in the literature on education of the importance of the individual teacher in the change process (Fullen, 1993; Hargreaves, 1994) and by a long-recognized tradition in the professions of inquiry-based learning that results in substantial changes in practice (Houle, 1980; Schon, 1983).

There is a body of literature suggesting that the use of action research by teachers results in development of teachers' "living educational theories," and perceived improvements in student learning (Black, Clausen, Delong & Wideman, 2002; Whitehead, 2002). However, there have been few studies that use the results of systematic testing by educational jurisdictions to test the validity of the teacher's own assessments of improvements in student learning resulting from the use of action research.

Methodology

Twenty-five teachers from the two school boards volunteered to begin the project in the autumn of 1999. Twenty-one were classroom teachers from ten different schools. Four of the teachers were consultants who conducted their action research on how to improve their own abilities to assist teachers to conduct action research.

As far as possible, teachers worked in teams of two per school acting as each other's critical friends (Whitehead, 1993). One school had four teachers participating. Another school had a single teacher. In that school, the vice-principal, who was not a participant in the project, acted as a critical friend for the participant.

During the autumn, the two-teacher team from one of the schools left the project due to other priorities and time pressures. Another teacher left the project to begin a leave of absence. One other teacher accepted a consultant

position and continued to participate in the study in that capacity. Consequently, seventeen teachers from nine schools and five teacher consultants completed the project and submitted action research reports. These participants taught grades from 2 to 8. All except one were female. This gender balance is largely explained by the predominance of females teaching in the elementary grades.

Monthly meetings of participants were held in each school board during the 1999/2000 school year. As the project progressed, the meetings became increasingly grounded in the participants' own experience with their action research. Substantial time was provided for participants to talk and write individually, with their critical friends, and with participants from other schools.

Meetings also included presentations, workshops, and discussion about action research and feedback/corrective action. Diane Morgan, a consultant from the Grand Erie District School Board, provided expertise in action research and feedback/corrective action in both school boards. In addition, Ruth Sutton led one full-day meeting in each school board on feedback/corrective action.

The principal researchers collected a wide variety of data to maximize the teachers' voice and the validity of the findings. The data included: tape recordings or notes of the meetings; participants' journal entries; participants' responses to a questionnaire about their reactions to the project; and each participant's action research report.

The principal researchers conducted informal data analysis as the meetings progressed in the school boards. These draft findings, which were held lightly, served as a starting point for the formal analysis stage. Formal data analysis began in June 2000 after the bulk of the data collection was completed. The analysis focused initially on the participants' research reports and questionnaires. Meeting transcripts and summaries and participants' journal entries were then reviewed to further develop the findings and to provide anecdotal examples.

The findings were validated in four distinct ways. Firstly, the experiences of the participants in the two school boards were compared for similarities and differences. Secondly, analysis conducted by one or two of the principal researchers was reviewed and revised again as a group of three. Thirdly, participants reviewed and discussed the draft report, and their comments shaped the final document. Finally, the schools' 2000 Grade 3 and 6 provincial test results were compared to their 1999 results to test teachers' perceptions that student learning had improved.

Findings

Findings are presented regarding the participants' experiences using provincial test results, action research, and feedback/corrective action to improve student learning.

Provincial Testing

Participants found the provincial test results to be a strong catalyst for action research. In some cases, the test results were unexpected, challenging the teacher's belief that their students were learning. In other cases, the results confirmed the teacher's suspicion that the students were not achieving.

At the beginning of the study, participants viewed EQAO test results as "unfriendly data." Consequently, they tended to take a defensive stance explaining unfavourable test results on the basis of things the teachers could not control such as the background of the students, the lack of resources in the school, or the perceived shortcomings of the testing itself.

However, as the study progressed, participants began to feel less threatened. They found that they could readily identify in the test results causes for both celebration and concern. They began to see connections between the provincial test results, Ontario Ministry of Education learning expectations, and their own day-to-day work in the classroom. And they began to be able to identify areas of focus for their own professional growth that were both personally meaningful and manageable.

During the project, many teachers saw evidence of improvement in students' performance as measured by the Ontario Levels of Achievement. To effect movement between levels of achievement, participants found that both the teacher and the students had to have a very clear idea of the difference between the levels and be able to describe what work at the higher level looked like in comparison to the lower level. Participants also found that they had to plan carefully not only what to teach but also how to teach it. Some found that improving competence in one subject increased competence in others and that the key to improvement was to get students actively involved in assessing their own work.

A number of participants found that it was easier to effect movement between higher levels of achievement than between lower levels. Trying to improve the learning of lower achieving students was often frustrating because the students had not internalized fundamental academic, inquiry, and work skills in earlier grades. Deeply rooted underlying problems were encountered in some students' attitudes and beliefs. For example, in some cases, lower-achieving students' attitudes about the value of learning, their own ability to improve, and the safety of participating in class seemed to hamper their progress. Significantly improving results for lower-achieving students required increased individual attention and support from the teacher and other adults in the classroom.

By spring 2000, the participants in the study indicated that they would continue to use provincial test results as one source of data about the effectiveness of their teaching. The ongoing cycle of annual provincial testing was seen as valuable to help teachers and schools focus on what they can control and choose common goals for improvement. Teachers came to see testing as a tool that can provide information on the strengths and weaknesses of their practice; however, they continued to be concerned about the many variables that influence test results and the misuse of the data in the public reporting process.

Action Research

Participants' responses to action research were overwhelmingly positive. Initial concerns about workload evaporated as teachers began to see positive impacts on their students. As the school year progressed, participants' energy levels did not decline but in fact seemed to increase as they wrote their research reports.

In reflecting on their experience with this project, participants saw how action research affected their basic and fundamental beliefs about teaching and learning. It helped some to clarify and confirm such values and others to rethink and better incorporate them into their practice. For some teachers, action research enabled them to resolve longstanding value conflict about their professional roles and responsibilities.

When teachers began to analyze their provincial test results, they were easily able to identify general areas of concern from the data. For example, when one teacher analyzed the data, she was concerned because far more of her students scored at Level 1 or 2 in Mathematics than in Reading or Writing. She wondered why students scored more poorly in Mathematics than Language and decided to focus on analyzing the Mathematics results. In doing so, she found that larger numbers of students scored Level 1 or 2 in problem solving, understanding of concepts, and communication of required knowledge than in the application of mathematical procedures.

By identifying a general area of concern in the data, teachers came to see discrepancies between the expectations they had for student success and the actual results of their teaching. This led them to try to find explanations for the discrepancies. Their attention turned to their own teaching practice and how it might be contributing to the problem they identified. They began to ask, "What am I doing or not doing?" and this led each of them to formulate a measurable and manageable research question.

The process of working from a teacher's general area of concern to produce a research question took time, effort, and support to accomplish. Long conversations with critical friends, during and apart from project meetings, played a critical role in the process.

There was a great deal of commonality among the research questions teachers asked. This may be because there were similar kinds of patterns of provincial test results between the two school boards. However, the teachers looked for research questions that gave them maximum leverage on a number of different areas of concern. For example, many participants focused on improving writing skills because improving those skills would benefit students not only in reading and writing but also in explaining their mathematical problem solving.

Once a research question had been developed, the teacher used the scientific method informally, repeatedly, and with many variations to pursue the question. The process was fluid with false starts, blind alleys, frustrations, and with many variations, as would be expected of a creative process. It required hard thinking, ongoing discussion with critical friends, and the injection of ideas about feedback/corrective action during workshop sessions. In the following passage, a participant summarizes an hour-long discussion with critical friends in which they explored possible hypotheses that might provide starting points for investigating their research question:

So far, this is our question, "How can I improve my teaching practice to help create more effective writers?" Our students need a lot of work in the writing area and particularly in the organization of ideas so we thought of different strategies, some that I've never used before, that we've learned today like "teach and re-teach." We listed a couple –

four or five actually – of different strategies but we decided to start with one and work on that and journal on it and see the effectiveness of it, and then move on to another.

As teachers planned how to begin their studies, they were encouraged to think how they would collect evidence to show the impact of their work. Participants took the collection of data seriously. To assess student learning related to the learning expectations, teachers collected student work such as notebooks, tests, homework, and assignments. Many also used their own observations of students, their own journal entries, and communications they received from students and parents. A few used photographs and video of students working together and with the teacher.

The evidence that teachers collected was used to make ongoing decisions about how to proceed with the investigation. When the first experiments were successful, teachers used them as a basis for further development. When the initial experiments were unsuccessful, the teacher cast about for other strategies to try. The result in some cases was a number of alternative ways to address the same problem, one of which eventually got the results the teacher wanted.

Six participants experienced substantial frustration at particular points in the project. Frustration occurred when teachers could not see evidence that their changes in practice resulted in improvements in students' learning. During the project, all but one of these participants resolved their difficulties often with substantial support from their critical friends. One felt that her research question was still unresolved by June and intended to continue it during the next school year.

Participants analyzed their data in a variety of ways to judge the impact of the changes in practice they were making. Their analysis methods included comparing: student work to the school's 1999 provincial test results; report card results to 1999 provincial test results; student work to earlier report card results; student work to earlier work by the same student; student work to provincial exemplars and exemplar rubrics; and their own practices with the literature on education.

The responses of others to the same data helped teachers validate their action research findings. These "fresh eyes" helped them see things they might have missed working alone. All participants asked critical friends to review their data and talk through their findings with them. In addition, all participants discussed their data, findings, and conclusions at action research project meetings. Some asked colleagues to review their analysis of EQAO test results or their marking of students' work.

Teachers drew conclusions from their studies about what teaching methods they would continue to use and what action research topic they would subsequently pursue. Their conclusions often exhibited a tremendous sense of optimism and excitement. For example, one teacher wrote:

I am sure that my class's attitude toward math has improved. On the whole they are eager learners, always willing to try and displaying both confidence and competence in their approach to math. For myself, I am excited about this way of teaching math problem solving. I can see results clearly in the written responses that the children give. I focus more on the process the children use rather than the product. I give them much more corrective feedback, both oral and written. Seeing a child smile when you tell her what a great answer she has certainly is a wonderful reward. Some teachers expressed genuine surprise at what they found. Such feelings are a good indicator that the researcher has found something new and important rather than just what they expected. For example, a teacher wrote:

At the beginning of my reflective teaching journey, I perceived my goal as creating a climate where the learners demonstrated effective results in their daily writing and ultimately on the Grade 3 assessment. The biggest surprise that has captured my heart was the change it made in me. My corrective action has been an awakening of responsible teaching. The results will continue to grow and shape as I encounter new students each year. Initially, many participants expressed concern about having to write their research reports because they were unaccustomed to this kind of writing and thought of research writing as the purview of the academic. In addition, teachers have not generally made it a practice to explain what they do, why they do it, and what the results are. By the time they had finished their studies, however, participants felt a strong desire to communicate their findings. Their written reports were more comprehensive than they anticipated and included examples of data used to evaluate the results of the their work. A number of the participants have now published their research reports in the peer-reviewed Ontario Action Researcher electronic journal (Black, Clausen, Delong, & Wideman, 2002).

Feedback/Corrective Action

At the beginning of the study, many participants wondered how they would find time to include more intensive assessing, responding, conferencing, and goal-setting in their programs. However, they discovered ways to make significant aspects of feedback/corrective action a regular part of their practice. They also became increasingly enthusiastic about feedback/corrective action as they used the approach and saw students improving their skills and taking more responsibility for their learning.

At the conclusion of the study, all participants said that they would continue to use feedback/corrective action. Participants found that they had changed their evaluation processes to include more formative evaluation and more provision of second chances for students to upgrade results. Teach, assess, set goals, reteach, and retest became a formula for improved results. Teachers found that effective formative evaluation had to provide very specific feedback to students on how to improve. This enabled students to take responsibility for their learning and enabled parents to contribute to their children's progress.

During the study, project meetings and conversations with critical friends helped participants begin to use the language of feedback/corrective action. Using associated terms, like rubric, modeling, scaffolding, and feed-forward, helped improve teachers' understanding of the innovation.

Participants felt that feedback/corrective action honoured their current professional knowledge and that the approach helped them improve that knowledge and to use it more effectively. They saw that feedback/corrective action included assessment and teaching strategies which they already used but that it integrated these strategies in new ways and with new strategies. The process enabled teachers to amalgamate new and existing methods under a paradigm that they found got results.

One of the participants described how her understanding of planning and teaching had changed:

Ruth Sutton states that in order to make assessment efficient and useful, we must use it in our teaching…. The crucial stages are analysis, reflection, and "feeding forward" to develop the next intentions for teaching and learning. Personally, I fell down when it came to analyzing the results [of my teaching] and using them to start the cycle anew. Another teacher described the benefits of feedback/corrective action this way:
It gives students ownership or responsibility for their actions. It gives them a clear direction as to where I, as the teacher, want them to go. It gives me evidence to use with parents when I need to prove my "accountability." It gives parents a chance to help their children reach a desired level and it gives students additional opportunities to reach their goals.
Teachers found that if students knew clearly what was required, they were better able to work toward the expected results. Beginning from the learning expectations and levels of achievement in the Ontario Curriculum and the EQAO test results, exemplars, and anchor booklets, teachers developed rubrics, discussed them with the students, and used them consistently for assessment, feedback, and goal setting. The use of rubrics not only clarified the learning expectations but also enabled students to assess their own work and take responsibility for their own improvement.

Participants relearned the power of modeling as a teaching approach. Once expectations were established, teachers used direct instruction to model the skills, demonstrate practices, and clarify processes related to the levels of achievement in the rubrics. Exemplars were drawn from published work, EQAO anchor booklets, and students' own written and videotaped work. Teachers used modeling in full class, small group, and individual settings and during their conferences with students.

Teachers also provided "scaffolding" to support students' learning. Scaffolding was in the form of detailed step-by-step directions or graphic organizers for a skill. Once students begin to grasp that skill, the teacher gradually removed the scaffolding by providing progressively less-detailed instructions. In this way, students could become more independent and able to add their own personality and creativity to the process.

In assessing students' work, teachers provided constructive, anecdotal feedback based on the rubrics. Feedback was provided in writing on the rubric itself and orally through student/teacher conferencing. As students learned to use the rubrics, they were more able to conduct self and peer assessment effectively. Essentially the feedback showed why students scored at a particular level of achievement and gave direction on how to revise the work to reach the next level.

Once students had received feedback, teachers gave students opportunities to revise and resubmit the work for re-evaluation at a higher level. In testing, teachers would mark and provide feedback on the test, reteach key skills or

content as necessary, and then retest the students, recording the second mark for report card purposes. This process enabled students to see the benefit of improving their work and allowed them to demonstrate increasing mastery.

Teachers held conferences with individual students to analyze their progress in relation to the rubrics and to develop goals for further growth. Through this "feed-forward" process of goal setting, teachers saw students became more able to take responsibility for their learning by becoming aware of their strengths and of needs for improvement.

Focusing students' attention on their progress rather than their mark enabled them to take responsibility for improving their own learning. When students and teachers could see progress, success bred success. However, students had to know what constituted progress – where they were; where they were going, and; what steps they needed to get there.

Improved Provincial Test Results

The comparison of 1999 and 2000 provincial test results at the conclusion of the study determined that, in six of the seven schools in which participating teachers taught Grade 3 or 6, improvements in test scores substantially exceeded the school boards' improvement averages in the areas of the participants' action research.

For example, in one school, where the participating teacher was focusing on improving students' writing skills, the number of students performing in Levels 3 and 4 in writing on the EQAO test increased by 28% (from 55% to 82%), whereas the board's improvement average in writing was 10%. In another school, where the participating teacher was focusing on problem solving in mathematics, the number of students performing at Level 3 and 4 increased by 56% (from 21% to 77%), whereas the board's overall improvement average in mathematics was 7%.

It was appropriate to use school results in the comparison of 1999 and 2000 test performance because the participating schools were small enough that the Grade 3 and 6 participants in the study constituted the full complement of teachers in those grades in each school.

This analysis helps validate the teachers' assessments that their changes in practice were contributing to improvements in students' performance. It is recognized that there are many factors that affect test results and it may not be possible to claim that the teachers' actions caused changes in performance. The comparison of the 1999 and 2000 test results is encouraging, however, because it supports the teachers' own judgments of the impact of their efforts.

Conclusions

This study helps us to see how professional teachers can play a powerful role in school improvement by conducting personal investigations of how to improve learning in their own classrooms. The study contributes to the literature both on what constitutes effective in-service education and effective teaching practice. Conclusions are presented regarding action research, feedback/corrective action, and the use of provincial testing to improve student learning.

Action Research

The study supports research indicating that inquiry is a fundamental adult learning strategy (Tough, 1971; Knowles, 1973) and that reflective practice is a means of professional improvement (Schon, 1983). It also supports research indicating that self-study and action research contribute to professional development (Auger & Wideman, 2000; Delong & Wideman, 1998; Ghaye & Ghaye, 1998; Hamilton, 1998; Whitehead, 1989; Wideman 1992, 1995). There is ample evidence that inquiry is a learning strategy professionals, including teachers, use effectively to improve their practice.

Educational literature, presentations, and workshops inform but cannot replace teachers' personal investigations of how to improve learning in their own classrooms. Consistent with the Constructivist paradigm, each individual does have to "reinvent the wheel" in order to reconstruct, integrate, and extend knowledge. Teachers must share what they know so others can take it into account and use that knowledge as a starting point. However, improving one's own teaching is, at its heart, a process of individual investigation and discovery.

Action research provides powerful support for teachers who are working to improve their own practice through inquiry. The research orientation and supportive critical friends help the teacher in the often difficult and sometimes anxious self-reflection that is part of the change process (Wideman, 1992).

The study shows that when teachers themselves identify a meaningful problem with their practice, they take responsibility for resolving it and therefore become directors of their own professional growth. Under supportive circumstances, EQAO test results can stimulate this kind of questioning by validating concerns of which teachers are aware or by raising discrepancies between teachers' expectations and the performance of their students.

Allan Thomas (1980) used the term "learning occasions" to describe situations of this kind in which the professional realizes that habitual practices require revision. Under such circumstances, the teacher moves away from what he/she formerly believed to be "tried and true" and ventures into learning through "tests and trials." Action research enables participants to enlarge their repertoire of practices by experimenting with new teaching and assessment methods in a systematic and constructive way.

The study suggests that, in today's hectic teaching climate, there is a need to enable teachers to slow down enough to think carefully about the effectiveness of what they do. Under supportive circumstances that reduce defensiveness, such activity opens the door to professional renewal, school-based school improvement, and more balanced attention to both the "what" and the "how" of teaching. Teachers develop a deeper level of understanding of sources of low achievement and a richer repertoire of teaching strategies.

\The study suggests that action research facilitates the transfer into actual classroom practice of learning from workshops and presentations. It enables the teacher to connect theory and practice. Identifying a research question and trying to solve it creates in participants a need for new strategies. Participants apply ideas from the workshops, evaluate them, and further develop them to fit their own circumstances.

Finally, action research honours teachers' professional knowledge by enabling them to reshape established practices into more effective forms and combinations. Teachers clarify and reflect on their own professional knowledge. They learn from successes and failures in an environment that fosters risk-taking.

Feedback/Corrective Action

The study reinforces the benefits of feedback/corrective action as a valuable tool for teachers. It provides useful directions for implementing effective formative evaluation and for integrating evaluation with teaching, learning, and reporting.

Feedback/corrective action operationalizes outcomes-based learning. Students can become responsible partners in their own learning when they understand the learning expectations and assessment criteria upon which their work will be evaluated. The use of rubrics and exemplars gives students clear, consistent direction for their learning and provides a foundation for developing skills in peer and self- evaluation. Over the long term, students can develop as autonomous learners able to identify and correct their own mistakes. Corrective feedback and feed-forward enables students to gradually master the concepts being taught and design goals for their own learning that result in higher achievement.

Feedback/corrective action demonstrates the importance of providing students with anecdotal reports on their progress rather than merely marks or grades. Despite public perceptions, the latter, by themselves, provide no pertinent information to students or parents about how to improve performance.

Provincial Testing

The study shows that teachers can use provincial test results as a source of information on student learning. While recognizing the many variables that affect students' results, the annual testing can, over a numbers of years, provide ongoing feedback to inform teachers' efforts to improve instruction.

\Given adequate encouragement and support, teachers can learn to analyze the test results, identify problem areas, and develop research questions about improving their own practice. They are also able to carry out research on these questions that results in improved student learning. Because students learn in different ways and at different rates, achieving learning expectations for all students is likely to increase when professional teachers conduct these kinds of investigations on an ongoing basis.

To improve results for lower achieving students, the study suggests that teachers need to use a rich repertoire of teaching and formative evaluation methods, to customize those methods to meet the specific needs of their students, and to provide intense individual support.

Teachers' morale improves when they focus on what they can do to improve student learning rather than on what is beyond their control. Professional confidence increases as teachers see that they can influence student learning and as they see their teaching methods validated through their analysis of data.

Implications

There is a need to encourage teachers to take the lead in school improvement activities. Teachers and schools can benefit from analyzing the results of provincial testing and using them as a basis for action research. Action research should be a part of the school improvement plan. It should also be recognized as a valuable form of professional development and should be included among the criteria for teacher re-certification and performance appraisal because it facilitates the integration of theory and results in changes in classroom practice.

Since action research and feedback/corrective action are relatively new in Canada, there is a need to provide teachers with ongoing opportunities to become proficient in their use. Conducting action research requires teachers' time and energy and is supported by strong collegial relationships. If provincial and school board officials are serious about school improvement, they need to find ways to slow the frantic pace of teachers' lives enough to incorporate this kind of activity in the daily and yearly schedule of school activities.

There is a concern that teachers may be reluctant to conduct action research because of erroneous perceptions that research is exclusively within the purview of the academic rather than the practitioner. While practitioner researcher is gaining more respect in the academic world (Anderson & Herr, 1999), ironically, it is slower to make its way into the world of the practitioner in the elementary and secondary education environments. There is a need, therefore, to provide encouragement and recognition for teachers' research activities. This includes opportunities to share the results of their investigations.

Teachers are central to educational change. The voices of professional teachers who investigate their own practice for the purpose of improving student learning must be listened to and respected if school improvement is to become reality and the knowledge about education further developed.

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