2000

# Assessing the impact of sustained professional development on middle school mathematics teachers

Joanne E Goodell, *Cleveland State University*
Lesley H Parker, *Curtin University of Technology*
Jane Butler Kahle

# Assessing the Impact of Sustained Professional Development on Middle-School Mathematics Teachers

Dr. Joanne E. Goodell

Joanne Goodell is an Assistant Professor of Mathematics Education at Cleveland State University. Her research interests focus on equity and reform issues for teaching and learning in mathematics and related disciplines in high schools and universities. She has authored over 20 conference papers and has two chapters in progress from her recent Ph.D. dissertation entitled "Equity and reform in mathematics education."

Professor Lesley H. Parker

Professor Lesley Parker is Professor of Higher Education and Senior Deputy Vice Chancellor of Curtin University in Perth Western Australia. She has published widely on equity and social justice issues as they relate to teaching and learning. Her recent publications include "Equitable assessment strategies" in the *International Handbook of Science Education*, Kluwer Academic Publishers.

Professor Jane Butler Kahle

Jane Butler Kahle, Condit Professor of Science Education, Miami University, is an international scholar in gender differences in science education and in the systemic reform of science and mathematics education. She has recently been appointed Director of the Division of Elementary, Secondary, and Informal Education (ESIE) at the National Science Foundation after having served as Principal Investigator of both Ohio's Systemic Initiative, *Discovery*, and of a research project to evaluate systemic reform. Her recent publications include a Research Monograph for the National Institute for Science Education entitled "Reaching equity in systemic reform: How do we assess progress and problems?"

## ABSTRACT

The study reported in this paper examines the impact of the Ohio Statewide Systemic Initiative (SSI) on participating mathematics teachers. Quantitative data from 90 SSI-trained teachers and 400 teachers without training, along with qualitative data collected from seven SSI teachers who were visited in their classrooms are presented. Analysis of the quantitative data showed that SSI and Non-SSI teachers reported significantly different frequencies of reformed teaching practices and held significantly different views about the nature and pedagogy of mathematics. Qualitative data from the interviews highlighted that the SSI professional development experience, the ability to find creative ways to overcome lack of resources, and the teacher support networks formed as a result of their participation in the SSI were three major factors which enabled the SSI teachers to make significant changes to their teaching practices, and to sustain those changes.

## ACKNOWLEDGEMENTS

An earlier version of this paper was presented at the Annual Meeting of the American Educational Research Association, San Diego, CA, April 1998.

All names used in this paper are fictitious.

The preparation of this study was sponsored in part by the National Science Foundation, Grant # OSR-92500 (J. B. Kahle and K. G. Wilson, co-principal investigators). The opinions expressed are those of the author and do not necessarily reflect the position of NSF.

Analysis of the data was carried out with the assistance of an Australian Postgraduate Award at the Science and Mathematics Education Centre, Curtin University of Technology, Western Australia.

## Introduction

The Statewide Systemic Initiative (SSI) in the state of Ohio known as *Project Discovery* began in 1991 and continued into 1999. It focused on sustained professional development programs for middle-school mathematics and science teachers. This paper presents the results of a study designed to determine the impact of *Project Discovery* on participating mathematics teachers. The data on which this paper is based were collected during the large evaluation study known as *The Landscape Study,* which covered all aspects of *Project Discovery*. Only the teacher questionnaire and teacher interview data for mathematics teachers are explored here.

Other findings of *The Landscape Study* have been reported elsewhere (Kahle & Rogg, 1996; Kahle & Rogg, 1997).

## Background

The reasons for the failure of many teacher professional development activities to produce long term change are well-documented (Goertz, Floden, & O'Day, 1996). Summarizing these reasons, Miles (1995) strongly criticized traditional one-shot professional development courses, characterizing them as

> … radically under-resourced, brief, not sustained, designed for "one size fits all", imposed rather than owned, lacking any intellectual coherence, treated as special add-on rather than as part of a natural process, and trapped in the constraints of the bureaucratic system we have come to call "school" (p. vii).

The past decade has seen changes in approaches to teacher professional development which have addressed such criticisms, with systematic attempts to identify the characteristics of effective models in this regard. For example, Crowther and Gaffney (1993), working with over 200 people involved with the planning and delivery of professional development for teachers, identified 30 characteristics of best practice. They clustered these characteristics around the themes of implementation, facilitation and application. The implementation theme included providing opportunities for active engagement, being able to demonstrate a link between theory and practice, including time for reflection, and modeling exemplary practice. The facilitation theme included ensuring the materials were high quality and "user-friendly" and that networking

was facilitated. The application theme included ensuring the activities were followed up with support from the planners, and that teachers were motivated and empowered as a result of the experience.

More recently, Swafford, Jones, Thornton, Stump and Miller (1999), in their project with middle-grades mathematics teachers in central Illinois, demonstrated that it was possible to significantly influence the teaching practices of those teachers in their project by including elements of content knowledge, reformed teaching practices, and time for reflection and collaboration.

The Ohio SSI had anticipated most of these features. The model of professional development adopted focused on the role of the teacher as change agent, and provided sustained professional development and follow-up with opportunities for networking. Six-week summer institutes for middle-school mathematics and science teachers were offered. Sessions were content based and taught in an inquiry mode, and instructors modeled inquiry teaching throughout the institute. Six follow-up, one-day workshops throughout the next academic year focused on the pedagogy of inquiry teaching. On-going support was provided through classroom visits by expert teachers known as *Teacher Leaders*, as well through an electronic communication network, known as *DiscoveryNet*. All teachers who took part in the SSI were given access to this network, which included an e-mail account and a "discussion room" where they could communicate on-line with other teachers about their experiences implementing inquiry teaching.

In late 1994, *The Landscape Study* was initiated to evaluate how this model of professional development had impacted the teaching of mathematics and science in middle schools in Ohio. (Other aspects had been evaluated throughout the SSI.) *The Landscape Study* was a mixed

qualitative and quantitative multi-level study. Quantitative components included questionnaires for teachers and principals from a random sample of schools in which at least one teacher had participated in the SSI. In a small subset of these schools, students were given achievement tests and questionnaires, and researchers conducted site visits to collect qualitative data.

## Purpose of this Paper

The purpose of this paper is to describe the impact, on participating mathematics teachers, of those specific aspects of *Project Discovery* which concerned their views of mathematics, their pedagogy, and the involvement of their school principal and students' parents with their work as mathematics teachers. In addition, this paper provides insights into some of the facilitators and barriers which these teachers saw themselves encountering when trying to implement inquiry teaching in their mathematics classrooms. This paper builds on earlier evaluative research (Supovitz, 1996) which suggested that *Project Discovery* teachers made considerable changes to their teaching practices after their participation in the SSI, and that these changes were sustained over time. It also complements research by Tims Goodell, Kelly, Damnjanovic and Kahle (1997) who demonstrated that the mathematics performance of students in SSI groups was significantly higher than that of their Non-SSI counterparts across all racial and gender groups.

## Data Sources and Instruments

Quantitative Data

The quantitative data analyzed in this study were collected in 1995 from 91 mathematics teachers who had participated in the SSI summer institutes (SSI teachers) and 442 mathematics teachers who had not participated (Non-SSI teachers). These teachers were from a random sample of 126 schools across Ohio in which one or more teachers had participated in the SSI.

A team of researchers, both internal and external to Ohio, designed and field-tested the instruments used in this study. The Landscape Teacher Questionnaire (LTQ) was developed by the research team to reflect those principles of inquiry and equity that had been the focus of the SSI since its inception. The analysis presented in this study addresses the first five sections of the LTQ, entitled *How I teach*, *What my students do*, *My school principal's involvement*, *Parental involvement* and *My views about mathematics*.

The first four sections of the LTQ were similar in structure, in that participants were asked to respond twice for each statement—once about the frequency of that event or behavior, and once about the importance of that event or behavior occurring in their classroom. The frequency response consisted of five choices: Almost Never (AN), Seldom (Se), Sometimes (So), Often (O) and Very Often (VO). The importance response consisted of four choices: Very Unimportant (VU), Unimportant (U), Important (I), and Very Important (VI).

The fifth section, *My views about mathematics,* had two four-point Likert scales. The first response had choices of Strongly Disagree (SD), Disagree (D), Agree (A), and Strongly Agree (SA). The importance response used the same response scale as in the first four sections.

Qualitative Data

After the questionnaires were complete, site visits were made to four schools in 1995 and three more in 1996. Two criteria were used in selecting the sites: there had to be at least 30% minority enrollment at the school and the schools had to represent as diverse a geographic area as possible. An SSI teacher at each site was chosen as the "focus teacher." During the site visit, the researcher observed the focus teacher in her classroom, interviewed the focus teacher, the school principal, and some students from one of the focus teacher's classes. This study presents the results of the analysis of the data obtained by interviewing the focus teacher at each of the seven sites visited.

## Data Collection

Quantitative Data

The quantitative data collection occurred through a lengthy sequence of mailed requests and responses, the aim of which was to ensure as high a return rate as possible. A contact person was established at each site, and all correspondence was directed through that person. A personalized cover letter and address label was produced for every teacher. Envelopes were provided so that teachers could seal their responses if so desired. Follow-up letters and replacement LTQs were sent to teachers who had not returned them. There were 126 schools in the final sample, and the number of teachers at each school ranged from one to six.

Qualitative Data

Members of the research team observed the focus teacher's classes and interviewed the focus teacher for up to three hours over the three-day site visits, or for one hour on the one-day site visits. Researchers focused their interviews around the teacher's LTQ responses. The teacher was given a copy of their completed LTQ and asked to comment on any item in the questionnaire that was important to them. Other issues that arose from these discussions were pursued. Because all researchers were using the same instrument as a prompt for interview questions, there was no need to have a formal interview protocol. Researchers were encouraged to ensure that interviews remained focused on the factors influencing teachers' attempts to implement the suggested reforms. All interviews were taped and subsequently transcribed.

## Data Analysis

Quantitative Data

A principal-components rotated-varimax method of Factor Analysis was employed twice: once for the frequency responses and once for the importance responses in the questionnaire. Cattell's Scree test was applied to determine the optimum number of factors for each analysis. For the frequency components, the Scree test identified four factors as the best solution. For the importance components, the Scree test identified five factors as the best solution. Following the Factor Analysis, the internal consistencies of the factors were determined using Coefficient Alpha. Effect sizes were used to investigate differences in the reporting of these factors by SSI and Non-SSI teachers. The effect size statistic was selected because this statistic is not affected by the size of the sample in the way that a t-test would be. The effect size is a standardized

measure of the difference between two means and provides a measure of the magnitude of the differences (Robinson & Levin, 1997). On the other hand, a t-test estimates the likelihood of an observed difference occurring. With large sample sizes, even a very small difference becomes unlikely and is reported as statistically significant, which may be misleading, especially when trying to determine the practical implications of a difference between means.

Qualitative Data

A qualitative data-analysis software package was sought that would make the analysis of the qualitative data as manageable and meaningful as possible. A comparison of all qualitative data-analysis software packages available at the time (Miles & Weitzman, 1994), indicated that NUD•IST by Qualitative Solutions and Research (QSR) was the best package available for the Macintosh computer at the time the study commenced.

All interview transcripts were entered into the software, and "codes" which described specific things that teachers talked about were attached to appropriate segments of text. The codes were based on Rossman's (1993) conceptual framework for synthesizing case studies located within the practice of systemic reform. The four dimensions of this framework are:

Technical: Professional knowledge and skills, and the means by which they are acquired.

Political: Matters of authority, power and influence, including the negotiation and resolution of conflicts.

Cultural: Values, beliefs and school norms—both in terms of a general ethos and competing perspectives that contend with each other.

Moral: Matters of justice and fairness.

Those codes which were relevant to this particular study came from the technical dimension and were about the professional development experience, the provision of resources to support the suggested reforms, and the establishment and maintenance of teacher support networks. (See Goodell, 1998, for a complete description of the remaining three dimensions.)

## Results

### Quantitative Data

#### Frequency scales

The names of the four factors with their means, standard deviations, effect sizes and reliabilities are given in Table 1.

Insert Table 1 here

The first factor, CLASSTCH, concerned reformed classroom teaching practices, and comprised almost all of the items from the sections of the LTQ entitled *How I teach* and *What my students do*. The second factor contained all of the items from the section *My school principal's involvement* and is named PRINSUPP. The third factor included all of the items from the section *Parental involvement* and is named HOME. The fourth factor contained all of the items from the section *My views about mathematics* and is named NATMATH. To determine whether there were any differences in the way SSI and Non-SSI teachers responded to these factors, effect sizes were calculated. These data are shown graphically in Figure 1 below.

Insert figure 1 here

Given that an effect size of greater than 0.2 is generally accepted as being of educational significance (Keeves, 1992), it is clear from the data presented that SSI teachers responded very differently than Non-SSI teachers in terms of their classroom teaching practices and their views about the nature of mathematics, although they reported the same levels of principal and home support as their Non-SSI counterparts.

Importance Scales

The items from the importance scale did not form the same factors as those from the frequency scale. This could have been because the respondents tended to use the Important or Very Important response a great deal, and thus there was a ceiling effect. The items from the *How I teach* and *What my students do* sections were split between the second and third factors, but the other three factors remained as they had for the frequency scales. The names of the five factors identified by the factor analysis with their means, standard deviations, effect sizes and reliabilities are given in Table 2.

Insert table 2 here

The first factor, IMPPRIN, was concerned with the importance of principal support. The second factor, IMPACTVT, was concerned with the importance of students being actively involved in the classroom. The third factor, IMPCOMM, was concerned with the importance of teachers and students communicating with each other in the classroom. The fourth factor,

IMPPAREN, was concerned with the importance of parental support. The last factor, IMPVIEW, was concerned with the importance of the teachers' views about the nature of mathematics being reflected in their teaching practices. These data from Table 2 are presented graphically in Figure 2 below.

Insert Figure 2 here

Again, there were clear and significant differences between SSI and Non-SSI teachers in the way they responded about their perceived importance of all factors investigated in this study.

## Qualitative Data

Only technical (Rossman, 1993) issues that pertained directly to the implementation of the SSI reforms were included in this analysis. These were the professional development experience itself, the availability of resources to support the new style of teaching advocated by the SSI during the professional development activities, and the importance of teacher support networks in helping teachers to make and sustain changes in their teaching.

### The Professional Development Experience

All teachers interviewed said that the professional development they had participated in through their involvement with the SSI had caused them to profoundly change not only their teaching practices, but also the way they thought about teaching. Barb Arnold encapsulated this sentiment as follows:

> I look at everything I teach now—every lesson that I have—wondering how I can do this in an inquiry method. I look at things and think about it each time I have a new lesson that I'm coming up with, thinking about how I could do this inquiry. It kind of sets the seeds going, and all of a sudden it kind of comes together, (Barb Arnold, May 1995).

For another teacher, Kathy, the standards by which she judged her classroom were quite different after her involvement with the SSI: "I think I was a pretty good teacher pre-*Project Discovery*, too. According to the standards of pre-*Project Discovery*" (Kathy Straub, May 1995). She indicated that, although she had always used group work in her classes, she had not previously required her students to demonstrate their understanding in the way they now did.

> They actually have to show an understanding as opposed to just being able to do it. I think that is the difference. Before maybe there wasn't an extreme understanding, just being able to do the problems, (Kathy Straub, May 1995).

For some teachers, the SSI experience was one of several major influences on their teaching practices. Ms. Michaels, previously a Special Education teacher, was experienced in using cooperative groups. She acknowledged, however, that her SSI experience had helped her make the transition into mainstream teaching and become student centered in her classroom. She indicated that she had not really changed her teaching style a great deal, but that she had changed the focus of some of her activities to make them more inquiry oriented. She also expected her students to have a deeper conceptual understanding than before.

Resources to Support Reformed Teaching Practices

All of the schools visited in *The Landscape Study* were struggling financially. However, the problem of lack of manipulatives was overcome to a some extent in this SSI by providing all teachers who participated in the summer institutes with materials for their own classes. However, because these materials were not sufficient for every situation, some teachers found creative ways to cater for their students. Ms. Arnold was ingenious in her use of resources, utilizing everyday objects rather than relying on expensive equipment. Ms. Michaels had access to a wide range of equipment, but, being department head, was concerned at the lack of equipment for the rest of her staff if she was always using it. She seemed to use the equipment infrequently, relying instead on group work and interactive questioning to involve her students. Ms. Golf felt guilty asking for tightly-managed money, particularly when she thought she was virtually the only person requesting money for extra equipment. Ms. Fisher, however, had a room full of equipment that she never used, and, not surprisingly, did not think that she needed any more. Her teaching style and classroom environment was the least reformed of all those visited as part of this study. So, for her, having a room full of equipment did not mean that she was able or willing to utilize it.

Some teachers mentioned that their students were unable to supply their own calculators. To overcome this, Ms. Arnold had a box of mathematical equipment including a ruler, compass, and calculator, available at all times on each group of desks. Items were rarely lost or stolen from these boxes. Students respected the trust she showed them. Ms. Michaels had one class set of calculators that she used quite often, but when another teacher required them for a test, she had to go without.

In summary, financial resources, or the lack of them, was not always a barrier to implementing reform. Individual teachers came up with creative ways of overcoming many difficulties imposed on the provision of equipment by financial constraints.

One further issue related to resources was important at a number of sites. This concerned the availability of appropriate written curriculum materials to support inquiry-based teaching. It was a particularly important issue for Ms. Arnold. During the first visit in 1995, she stated that she did not use the text book her school district had adopted, relying instead on photocopying worksheets from a wide range of curriculum-support books. This was time consuming and expensive; so in 1996, she joined a national program known as Mathline, which she describes in the following interview segment.

> Mathline provided us with the video tapes that had three lessons on them and an overview. The activities were similar to types we did with *Project Discovery*: they're inquiry type activities. They're actually done in a classroom and were videotaped. They provided the paper work to support it. It describes the activity and what materials you need and what lesson, what's being taught in it, what's being met in it, whether its probability or whatever and any kind of, if you need a game board or something. It gives you the master to duplicate for that so then you can present it in your class exactly the way it was done there or you can modify for whatever your needs are (Barb Arnold, May 1996).

During the second visit, Ms. Arnold used the Mathline resources in a number of lessons observed, and indicated that she had made extensive use of these resources throughout the year because she thought that the materials were very appropriate to inquiry methods of teaching. The issue of availability of appropriate inquiry-style teaching resources was also raised at a number

of other sites visited, although none of the focus teachers at those sites were using Mathline. Clearly Ms. Arnold was convinced of the need to continue teaching in an inquiry mode and was motivated to find new resources to support this.

Teacher support networks

The model of change followed by the SSI concentrated on the individual teacher as the change agent, but recognized the need to provide teachers with continuing support. All participants were given an *e-mail* address and access to an electronic discussion group and other services. Since some teachers came from schools where there had been no other teachers previously involved with the SSI, the electronic network known as *DiscoveryNet*, established just for SSI teachers, proved to be an important element in facilitating the change process, as shown by the following comments made by Betty Michaels during an interview.

I: Do you use *DiscoveryNet* very much?

B: Actually I do. I check the lounge a lot and see what's going on. Right now my system is down but I check it at home and see what's going on and talk to people.

I: Is that an important thing to you?

B: I think it's good because, especially now, here I have other people in my building who are *Discovery*. I have Joan, who is math, and I'm math. And then we have Debra with science. And there are two sixth grade teachers who did *Discovery* science. We can talk to each other about "what are you doing." But in a building when you are the only one, I thing that's very important to be able to communicate and ask, you know, "gee I'm trying this, what ideas do you have." Or when you are trying to make changes, that at least you have some other people

> behind you that can say, look, you know, here are all these people out here that are doing this and how can we get involved here. And the instructors that we had were excellent and have been very supportive and I feel that I can contact them on *DiscoveryNet* when I've needed something—I need the address to this or how do I find out about that—and they have responded. It's been good (Betty Michaels, May 1996).

In some cases, the support network was the main reason some teachers were able to sustain the changes they were making.

> I: What would you say are the most important things that you are taking from *Discovery*?
>
> D: Well, I think some of the things we did in the follow-up, where we shared ideas with other teachers from other parts of the state. You know, "I tried this in my classroom, and it worked, but you might want to try it this way." Or, "This failed." It's like, gee, other people fail at things. This is how you can build on it and go from there. You try, you fail, you have a tendency not to try it again. But you could improve on it, and try again.
>
> I: How would it change things if you didn't have that support network?
>
> D: I think that you get back into the same old routine, the same old rut, get discouraged. With that, you're more likely to have a fresh outlook (Diane Young, May 1995).

## Conclusions and Implications

The study described in this paper has demonstrated significant differences between SSI and Non-SSI teachers in terms of their views of mathematics and their pedagogy, with SSI teachers reporting practices and perceptions more consistent with the reforms espoused *by Project Discovery*. The study has also shown that there was little difference between the two groups in terms of their perceptions of the involvement of their school principal and students' parents with their work as mathematics teachers, although SSI teachers considered these dimensions to be more important than Non-SSI teachers did. In addition, the qualitative data obtained from the site visits has provided some insight into those factors which seemed to assist SSI teachers in implementing reforms. These were the professional development experience itself, the willingness to find creative ways to overcome lack of resources, and the establishment and maintenance of teacher networks. Without these three aspects, it is doubtful whether SSI teachers would have been empowered to sustain the changes they made to their teaching beyond one or two years after their participation in the summer institutes.

The findings presented in this paper need to be appreciated in the total context of evidence now available in relation to *Project Discovery* (e.g. Supovitz, 1996; Tims Goodell et al, 1997). Although a causal relationship cannot be established, all of the evidence, when taken together, provides a compelling argument for the effectiveness of the model of professional development adopted by *Project Discovery*. Overall, the findings of this research have significant implications for those trying to effect reform in middle-school mathematics classrooms. Although there were many aspects of this SSI that contributed to its long-term success, central to its effectiveness was the use of sustained professional development, with continued involvement and support through follow-up activities and networking opportunities.

References

Crowther, F., & Gaffney, M. (1993). *An analysis of teachers' professional development needs through a focus group strategy*. Canberra, Australia: The Department of Employment, Education and Training.

Goertz, M. E., Floden, R. F., & O'Day, J. (1996). *The bumpy road to education reform* (CPRE Policy Briefs No. RB-20). University of Pennsylvania, Graduate School of Education, Consortium for Policy Research in Education.

Goodell, J. E. (1998). *Equity and reform in mathematics education*. Unpublished doctoral thesis, Curtin University of Technology, Perth, Australia.

Kahle, J. B., & Rogg, S. R. (1996). *A pocket panorama of the Landscape Study*. Oxford, OH: Miami University.

Kahle, J. B., & Rogg, S. R. (1997). *A pocket panorama of the Landscape Study, 1996*. Oxford, OH: Miami University.

Keeves, J. P. (1992). The design and conduct of the Second Science Study. In J. P. Keeves (Eds.), *The IEA Study of Science III: Changes in science education and achievement: 1970 to 1984* (pp. 42-67). Oxford: Pergamon Press.

Miles, M. B. (1995). Foreword. In T. R. Guskey & M. Huberman (Eds.), *Professional development in education new paradigms and practices* (pp. vii-ix). New York: Teachers College Press.

Miles, M. B., & Weitzman, E. (1994). Choosing computer programs for qualitative data analysis. In M. B. Miles & A. M. Huberman (Eds.), *Qualitative data analysis* (pp. 311-317). Thousand Oaks, CA: Sage.

Robinson, D. L., & Levin, J. R. (1997). Reflections on statistical and substantive significance, with a slice of replication. *Educational Researcher*, *26*(5), 21-26.

Rossman, G. (1993). *Building explanations across case studies: A framework for synthesis,* (ERIC Document ED 373115). Boulder, CO: Colorado University School of Education.

Supovitz, J. (1996). *The impact over time of Project Discovery on teachers' attitudes, preparation and teaching practice*. Raleigh, NC: Horizon Research, Inc.

Swafford, J. O., Jones, G., Thornton, C. A., Stump, S. L., & Miller, D. R. (1999). The impact on instructional practice of a teacher change model. *Journal of Research and Development in Education*, *32*(2), 69-82.

Tims Goodell, J. E., Kelly, M. K., Damnjanovic, A., & Kahle, J. B. (1997, March). *Classroom factors associated with systemic reform in science and mathematics education*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Chicago, IL.

Tables

Table 1

Reliabilities, Means and Effect Sizes for LTQ Frequency Scale Factors

| FACTOR | Number of Items | Reli-ability | SSI Sample Size | SSI Mean | Std Dev | Non-SSI Sample Size | Non-SSI Mean | Std Dev | Effect Size |
|---|---|---|---|---|---|---|---|---|---|
| CLASSTCH | 24 | .89 | 81 | 3.44 | 0.49 | 364 | 3.15 | 0.47 | **0.61** |
| PRINSUPP | 17 | .88 | 74 | 3.51 | 0.68 | 351 | 3.54 | 0.61 | -0.09 |
| HOME | 13 | .87 | 76 | 2.98 | 0.55 | 374 | 2.99 | 0.61 | -0.08 |
| NATMATH | 7 | .87 | 79 | 3.20 | 0.44 | 395 | 3.02 | 0.37 | **0.47** |

NB: Significant effect sizes are shown in bold.

Table 2

Reliabilities, Means and Effect Sizes for LTQ Importance Scale Factors

| FACTOR | Number of Items | Reli-ability | SSI Pop | SSI Mean | SSI Std. Dev | Non-SSI Pop | Non-SSI Mean | Non-SSI Std. Dev | Effect Size |
|---|---|---|---|---|---|---|---|---|---|
| IMPPRIN | 17 | .90 | 76 | 3.34 | 0.37 | 353 | 3.21 | 0.39 | **0.36** |
| IMPACTVT | 12 | .86 | 86 | 3.50 | 0.32 | 392 | 3.29 | 0.33 | **0.63** |
| IMPCOMM | 12 | .82 | 69 | 2.86 | 0.39 | 350 | 2.59 | 0.49 | **0.62** |
| IMPPAREN | 11 | .86 | 78 | 3.33 | 0.36 | 375 | 3.28 | 0.40 | **0.29** |
| IMPVIEW | 8 | .87 | 71 | 3.07 | 0.47 | 373 | 2.97 | 0.44 | **0.24** |

NB: Significant effect sizes are shown in bold.

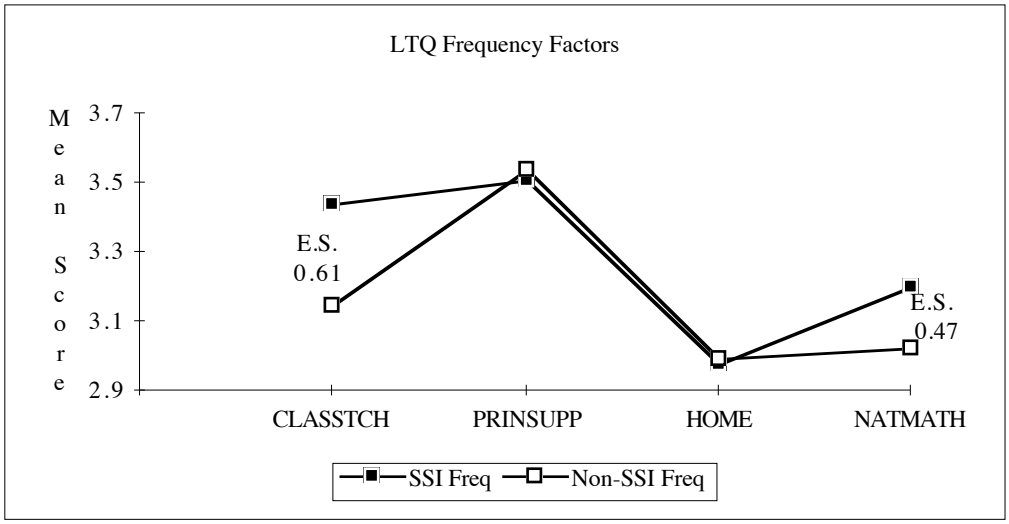


Figure 1 Means and Effect Sizes for LTQ Frequency Scale Factors

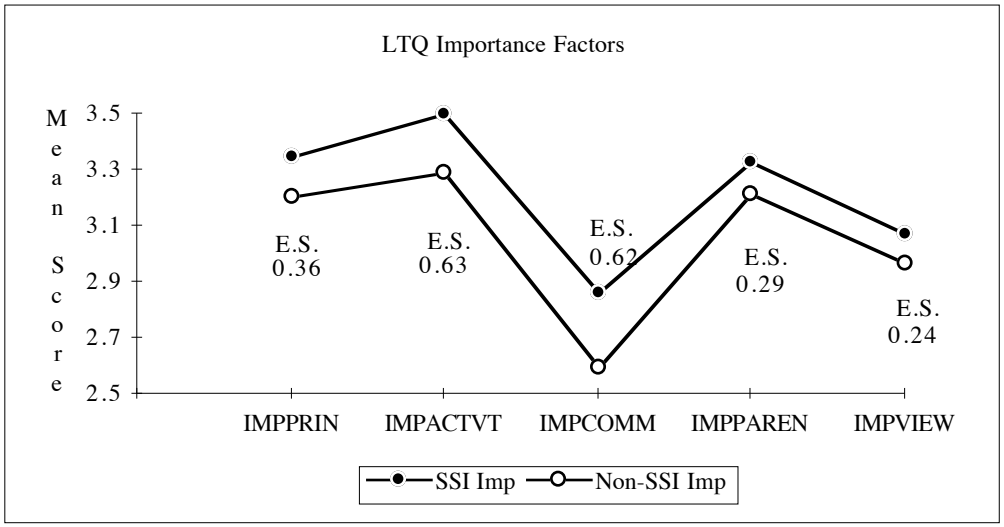


Figure 2 Means and Effect Sizes for SSI and Non-SSI Teachers on Importance Factors