Impact of Changes in Literacy Course Content in Teacher Education Programs on Pre-service Teachers’ Knowledge

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It is fairly well accepted that what schools do matters and that what teachers do matters the most (Haycock, 2001; Nye, Konstantopoulus & Hedges, 2004; Rivkin, Hanushek, & Kain, 2005; Rockoff, 2004). Indeed, this premise has driven many school improvement and teacher professional development efforts and a great deal of research, especially research related to primary grade reading instruction. As a result, a good deal is now known about how to promote success in early literacy learning and how to reduce the incidence of early reading difficulties (Snow, Burns & Griffin, 1998; Snow, Griffin & Burns, 2005). However, there is little evidence that this research base is being translated into teacher preparation programs on a large scale (Steiner & Rosen, 2004; Walsh, Glaser & Wilcox, 2006).

It is critical to take steps to improve the preparation of novice teachers for several reasons including: 1) the impact of elementary teachers on student success, in general, is well documented (e.g., Borman & Kimball, 2005; Coleman, 1966; Darling-Hammond, 2000; Hanushek, 1992; Sanders & Rivers, 1996; Tivnan & Hemphill, 2005); 2) teacher effects on student achievement are much larger in low-SES than high-SES schools (Nye, Konstantopoulos & Hedges, 2004); and 3) beginning teachers are often hired to teach in the most challenging/challenged schools (those that are characterized by high poverty rates and low performance levels). In the current project, we built on the success demonstrated by Scanlon, Gelzheiser, Vellutino, Schatschneider, & Sweeney (2008), who found that in-service early
primary grade teachers working in high poverty school districts who participated in a professional development (PD) program based on the Interactive Strategies Approach (ISA, Scanlon, Anderson & Sweeney, 2010; Vellutino & Scanlon, 2002) were able to substantially reduce the number of children in their classrooms who experienced reading difficulties. Teachers who participated in that study often made comments such as “I wish I understood these things when I first started teaching” and asked questions such as “Is this what new teachers are learning? They should be!”

Such comments prompted an investigation of the literature regarding pre-service teacher preparation in reading and, in general, we found that there was little evidence that the research on early literacy instruction had impacted the instruction offered in pre-service settings. For example, Steiner & Rosen (2004) analyzed course syllabi from top-ranked schools of education, including the reading courses required in undergraduate pre-service teacher education programs. They compared the reading knowledge base identified as critical by the National Reading Panel (2000) and the National Research Council (Snow et al., 1998) with the readings required in these courses and found little agreement. Further, they noted that it was rare for acquisition of this knowledge to be assessed through assignments that would require demonstration or even recall. Similarly, a study of 72 randomly selected teacher preparation schools undertaken by the National Council on Teacher Quality (Walsh, Glaser, & Wilcox, 2006) revealed that only 15 percent of the schools provided even minimal instruction in the core components of the science of reading. And, in a national survey of faculty in pre-service teacher education programs, teacher educators rated coursework in the structure of the English language as important, but

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1 Note that the ISA has also been found to be effective in reducing the incidence of reading difficulties when implemented in small group and one-to-one tutoring contexts (Scanlon et al., 2008; Scanlon Vellutino, Small, Fanuele, & Sweeney, 2005; Vellutino et al., 1996). Detailed descriptions of the ISA and the ISA professional development can be found in paper #1(Scanlon) associated with this symposium.
indicated that their programs had limited offerings in this area (Hoffman, Roller, & the National Commission on Excellence in Elementary Teacher Preparation for Reading Instruction, 2001).

Based on the success of the ISA professional development program and on the emerging concerns with the adequacies of elementary teacher preparation programs, we undertook a pre-service teacher education project which was funded by a development grant from the Institute of Education Sciences at the U.S. Department of Education. Funded as a development project, the purpose was to transform the professional development program that had been validated with in-service teachers (Scanlon et al., 2008) into a format that could be utilized in pre-service language arts methods courses to help future teachers learn to identify and address the instructional needs of struggling literacy learners. A second purpose was to determine whether the use of these materials in language arts methods courses influenced changes in pre-service teachers’ knowledge related to early literacy instruction from the beginning to the end of their first language arts methods course. (Discussion of a third purpose, development of a measure of teacher knowledge of literacy instruction, is beyond the scope of the present paper.)

The project involved experienced teacher educators from several universities and colleges across New York State who agreed to collaborate on the project (Teacher Educator Collaborators [TECs]). TECs participated in the project by 1) collaborating in an iterative process of development and revision of the materials (which include PowerPoint presentations, instructional activities, exemplary videos, etc.) for use in pre-service courses, and 2) utilizing the materials while teaching the first language arts methods course in their institutions’ literacy sequence. Throughout the development process, we focused on the needs of contingent and new language arts methods instructors who might well have limited time to prepare for their classes (owing to other professional obligations) and who might not have on the same level of experience as the
full-time teacher educators. Thus, this development project was intended to draw on the
depth of several experienced teacher educators to re-design the materials to both educate the
teacher educators who would eventually use them and to serve as a resource for them to use in
their language arts methods courses.

As a preliminary test of the impact of the instructional materials, a causal comparative
design was used in which changes in knowledge related to early literacy instruction (pre to post
course) were evaluated across several successive cohorts of students taking the targeted methods
courses. Baseline data was collected during the semester in which the materials were being
developed, before the TECs began using the instructional materials in their pre-service courses.

On each participating campus, performance on the measure of teacher knowledge for the TECs’
students was compared to the performance of students taking the same methods course with an
instructor who was not involved in the development or implementation of the materials.

Methods across the Study

Participants

College Faculty. Two or four faculty members from each of 10 New York State institutions that
prepare elementary level teachers volunteered for the study (two additional institutions were
originally involved in the study but withdrew due to illnesses and job changes). All participants
from an institution taught the same introductory language arts methods course and all were full-
time faculty. Within each institution, one faculty member served as the TEC and was involved
throughout the project in the development and implementation of the pre-service instructional
materials (see Project 2 below); the other faculty member served as the Comparison Teacher
Educator (CTE) and taught their course as usual. Since participating as a TEC required a
considerable time investment across three years, it was generally not possible to recruit two faculty members from a single institution who were equally willing and able to participate in that capacity. As such, TECs for all but two of the institutions were self-selected; TECs at the remaining two institutions were randomly assigned.

**Pre-Service Teachers.** Each semester, all pre-service students taking their first language arts methods course taught by participating faculty were recruited to take the Knowledge of Literacy Instruction (KOLI) Survey at the beginning and end of the course. More than 1000 pre-service students participated in the study.

**Procedures and Results for each Project**

This section describes the procedures involved in carrying out two primary projects in the study. First, procedures for developing the instructional materials to be used in pre-service courses (Project 1) are described. This is followed by procedures for the evaluation of the effects of use of the instructional materials on pre-service teachers’ knowledge of early literacy instruction (Project 2).

**Project 1 – Development of instructional materials to be used by pre-service teacher educators**

Procedures for Project 1

Instructional materials developed for this project were based on a combination of PowerPoint presentations and print-based resources used for professional development with in-service teachers and used in past research on the ISA. (Please see paper #1 from this symposium for a description of the ISA professional development.)

To insure that the instructional materials used for this project were appropriate for pre-service teachers, we undertook a revision process to address differences in background knowledge and student characteristics (e.g., motivation, maturity) between pre-service and in-service teachers. We also made changes designed to adapt to differences in learning contexts.
Readings, activities, slides and videos needed to be organized into a more course-friendly format and we needed to break the material into different instructional components, to provide a level of flexibility that would accommodate differences across teacher preparation institutions in the way that language arts methods courses are structured and integrated into the broader teacher education program. To accomplish our goals, we enlisted extensive assistance from the TECs. Much like a focus group, these individuals brought extensive knowledge of the needs of their pre-service teacher education students, their teacher certification programs, and their institutions to the task of adapting the ISA professional development program.

Our collaboration with the TECs began with a 5-day meeting in January of 2007 and continued throughout the next two and a half years. As a result of that first meeting, during which the materials that had been in use with in-service teachers were shared, the TECs provided a great deal of input that informed the revision of the ISA goals into pre-service components (which eventually came to be called modules). Following the workshop, the TECs and project staff met on two more occasions throughout the spring semester to discuss, evaluate, and revise the evolving materials. In the interim between meetings, project staff made the suggested modifications and gathered additional resources that were requested. Many revisions during the first year focused on strengthening the video portions of the materials, since many of the pre-service teachers in the targeted courses would have not yet had much classroom experience. For each of the ISA goals, project staff analyzed all available video that might be used to illustrate targeted areas of instruction. The TECs then selected the clips which they felt would be most useful for their classes. Newly selected video clips were integrated into the PowerPoint presentations developed for each goal. Other suggested revisions, both to content and format, were made and discussed with the TECs at the subsequent 2 to 3 day meetings.
The resulting product was a set of early literacy modules designed to be integrated into a pre-service language arts course. For each module, there was a printed text which could be distributed to the students, supplementary readings which the instructor could choose to assign, PowerPoint slides, video clips, and suggestions for teaching activities and discussion questions. Each module was designed so that the pre-service teacher educator could choose the materials and activities that were most appropriate to his/her students and program. A total of six modules were developed as a result of the first year collaboration with the TECs. These included Phonemic Awareness, Alphabet Knowledge, Strategic Word Learning, High Frequency Sight Words, Vocabulary and Oral Language, and Comprehension and General Knowledge. The Alphabetic Knowledge module included sections on letter names, letter sounds, the alphabetic principle, and extending decoding and encoding through the use of larger orthographic units; these sections could be used separately or as a unit, depending upon time constraints, course requirements, and student needs.

At the final meeting of the initial year, the TECs participated in small groups to work through each of the modules as though they were using them in class. The TECs also collaborated with research staff on the development of data collection forms which would be used to document their use of and reactions to individual modules. The materials were distributed to the TECs in mid-July, in time for inclusion in their fall courses.

Beginning in Fall 2007, the Teacher Educator Coordinator provided support to the TECs as they began to implement the materials in their classes. Some of the TECs were visited on-site as they used the materials in their pre-service classrooms; others corresponded by phone and/or e-mail to discuss the materials and to resolve technical difficulties associated with their use. Each semester, the TECs provided detailed feedback on each of the modules they used by responding
to both a general questionnaire on the module content and its usefulness in their particular course and to a mini-questionnaire on each of the slides in the PowerPoint modules (see Figure 1). This feedback served the dual purposes of informing ongoing revisions to the materials and documenting implementation of the modules, which was needed for the intervention dose-response comparison (see Project 2). While the feedback provided on the questionnaires was explicitly intended to be shared with the group, TECs also had an opportunity to provide feedback on the modules and to share their thoughts on their own participation in the project through two anonymous online surveys, conducted at the end of the second and third years of the project.

Figure 1. Sample mini-questionnaire on PowerPoint presentation

<table>
<thead>
<tr>
<th>Slide 39</th>
<th>Used</th>
<th>Slide</th>
<th>Link</th>
<th>Notes</th>
<th>Video</th>
<th>Ho</th>
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</tbody>
</table>

Great activity.

Students enjoyed trying to figure out the words. No one got HRH and they were amazed at how the child used the sounds in letter name of h.

Students love the discussion!

Students suddenly realized that what I had been talking about was real. Some even got church!

Good examples. My students are into this 😊
At the end of the first implementation semester, there was substantial agreement among the TECs that it was a challenge to fit the new materials into their existing course structures. However, they also indicated that they felt that their students benefitted from the modules that were presented. Because of their struggles with implementation during the first semester, the TECs requested that we refrain from making major modifications to the modules before their second implementation. Therefore, changes to the modules were limited primarily to tasks such as collecting, editing, and adding videos to illustrate particular points, as the TECs uniformly agreed that their pre-service students both enjoyed and benefitted from the opportunity to view and discuss expert instruction. Changes of a more technical nature (e.g., audio that was too low, PowerPoint slides that didn’t animate properly) were ongoing throughout the project.

A second round of modifications to the modules, aimed at streamlining the materials so that they could be more easily incorporated into the pre-service courses, was undertaken beginning in the summer of 2008. Working together in small groups, the TECs and research staff worked through each of the modules, deciding on content to be eliminated and, in some cases, identifying content to be used with more or less experienced student groups (several of the TECs were, at this point, using the modules with their graduate level classes as well). The module feedback forms were shared with the group and used to inform decisions about changes to the PowerPoint presentations. While modifications and clarifications were undertaken, there was ultimately very little content that was removed; everyone agreed that there was too much content, yet virtually all of the content was seen as important and was being used by at least some of the TECs.

In an effort to make it easier for the TECs to customize their use of the PowerPoint presentations, a module overview was developed for each module and included on an ISA
Supplementary Materials DVD. The purpose of the overviews was to give the instructor an “at a glance” sense of the instructional content, videos, activities, discussion questions and handouts that were included in each module. In the event that the TEC did not have the time to use all of the slides in any given module, the overview could serve as a guide in deciding which slides to use. Toward this end, consecutive sets of slides and videos were labeled according to sub-topic. The sub-topics were designed to assist the TECs in their instructional planning and in making on-the-spot decisions during class if they needed to modify their plans.

Results for Project 1

TEC Responses to the Online Surveys

The first anonymous survey was conducted in the Spring of 2008 using the online service SurveyMonkey (www.surveymonkey.com). The TECs unanimously indicated that their own thinking about early literacy instruction had been enhanced by the project and that their participation in the project during that first year had been helpful to them in meeting the needs of their pre-service students. Highlighting the importance of collegial interactions in the support of new learning, the presentations and discussions that took place at the Child Research and Study Center and the TECs’ interactions with one another were rated as the aspects of the project that the TECs considered to be most influential. The PowerPoint modules were also rated very favorably, while the ISA book that accompanied the modules was seen as somewhat less useful. Unfortunately, many of the TECs did not even realize that they had an accompanying book to be used by their students until midway through the second implementation (an apparent case of information overload).

For many of the TECs, using PowerPoint presentations as a primary means of sharing content in class was a departure from their typical routines and, in some cases, required learning
how to use the technology in addition to becoming familiar with the module content and integrating the new content into their existing class structure. Most of the TECs (75%) reported that they were at least “Somewhat Comfortable” with the changes they had made in their teaching during that first year. When commenting on their comfort level, several of the TECs noted that “time management” and “finding the right balance” between the new content and what they were already doing in their courses were the major issues. There was general agreement that the modules were too long to all be used within the confines of their existing course, as well as some concern that use of the PowerPoint presentations needed to be interspersed with other instructional approaches to keep their pre-service teachers engaged.

Since the focus of the project was on the development of course materials that could be used by adjunct instructors, the TECs were asked, based on their first year in the project, their thoughts on how to best extend the knowledge base of adjuncts with respect to the module content. Almost uniformly, the TECs cautioned against just providing the set of materials to a newly hired instructor. Their responses regarding adjuncts focused on collegial support, with such suggestions as: mentoring of adjuncts by regular faculty who have used the materials, use of a group leader and “book club” approach for working through the modules with new adjuncts, an online course focused on the module content that adjuncts could take prior to using the materials in their own teaching, training in how to incorporate the materials into an existing course structure, and participation in group discussions focused on the content, similar to the discussions in which the TECs themselves had been participating.

A second anonymous survey was conducted in the Spring of 2009, again using Survey Monkey. This survey addressed the TECs intentions with regard to continuing to use the modules after their participation in the project ended, focused more specifically on the different
resources that were provided to the TECs for use in their courses, and, once again, asked the TECs to reflect on their use of the course materials and to think about what might be done to facilitate success with new users, particularly adjunct professors. When asked about their continued use of the materials after the project has ended, almost all of the TECs (90%) indicated that they would continue to make use of the phonological awareness module, followed closely by alphabetic principle, strategic word learning, and comprehension and general knowledge (all at 80%). Intended use of the remaining modules ranged from 40% to 70%. In the comment section for this question, several of the TECs commented that they would not use all of the materials associated with each module. One suggested that she would prefer to use the modules across two classes; another indicated that, as she became more familiar with the modules, she made adjustments in which slides she used in class and which ones she posted online to help her students prepare for class. With respect to the modules that they didn’t use, comments, again, focused primarily on the sheer volume of information and the limited amount of time within their current course structures. Individual TECs indicated that they selected different modules each semester, based on student needs, that some modules were not considered to be part of the targeted course, and that they already had materials for certain content areas that they felt were very effective.

For each module that they had used, the TECs were asked to rate the usefulness of the various resources that were provided (see Table 1). While all of the resources were rated as being at least “somewhat useful,” all but one of the TECs added a comment to this question to address ways in which they had modified the materials as they used them with their pre-service students. Most of the comments referred to choosing a limited number of slides and video demonstrations, in order to make time for other course topics. One TEC indicated that her editing
took the information down to “introduction of a few key concepts and instructional ideas, with limited reference to underlying theories.” Another reported deleting some module information because it was “more than students were ready for” at the time. One TEC reported using some of the video demonstrations outside the context of the modules, to provide her pre-service teachers with opportunities to script lesson plans in preparation for writing their own.

Table 1. TECs Ratings of the Usefulness of Materials Provided

| Question: For the modules that you have continued to use (or plan to use in the future), how useful have you found the following materials to be? | % of TECs Choosing Each Response |
|---|---|---|---|---|---|
| | n | Very Useful | Somewhat Useful | Not Very Useful | Not at All Useful |
| PowerPoint Slides | 10 | 60 | 40 | 0 | 0 |
| Video Demonstrations | 10 | 80 | 20 | 0 | 0 |
| Activities and Discussion Questions | 10 | 50 | 50 | 0 | 0 |
| ISA Book | 10 | 70 | 30 | 0 | 0 |
| Module Overviews | 10 | 40 | 60 | 0 | 0 |

While many of the TECs felt that the content and materials could be utilized across pre-service and in-service audiences, some indicated that pre-service students lacked the background knowledge needed to fully benefit from the materials in their present form (see Figure 2). One TEC indicated that the course modules would be perfect for literacy candidates; another indicated that the full version might be used with in-service students and a more streamlined version could be used with pre-service teachers; still another suggested that the students would benefit from being able to use the materials as undergraduates and then again as graduates.
Despite their concerns regarding the sophistication and volume of information included in the modules, most of the TECs who responded after the second full year of implementation identified positive differences in their students that they attributed to involvement with the project. Specifically, individual TECs noted that their students: appeared to be more aware of the strategies children use to problem solve, seemed to know more of the needed vocabulary surrounding emergent literacy, especially language around the development of alphabetic knowledge, were more aware of the complexity of the reading process, and had a better understanding of phonological awareness and the alphabetic principle. One TEC noted that the more familiar she became with the modules, the better her students responded to them.

Figure 2. TECs Ratings of Appropriateness of the Content and Materials for Various Audiences

Finally, the survey addressed the issue of new users of the materials, particularly adjuncts and early career instructors. As in the previous year, the TECs noted the importance of both expert and collegial support as new users become familiar with the materials. One TEC
suggested a study group format, in which experienced teacher educators and adjuncts get together to discuss what they are learning. Another suggested follow-up meetings and discussion after new users began to use the modules. Three TECs suggested the use of online technologies to support initial learning of the module content as well as ongoing opportunities for collaboration and answering questions.

Project 2—Evaluate the effects of use of the instructional materials on pre-service teachers’ knowledge of early literacy instruction.

Procedures for Project 2

The KOLI survey which was explicitly developed to be sensitive to changes in teacher knowledge related to the ISA instructional content was used to evaluate the impact of use of the instructional materials on pre-service teachers’ knowledge of early literacy instruction. Each semester, beginning with baseline (Spring 2007) and continuing across up to four implementation semesters, the pre-service students of participating TECs and CTEs were recruited to take the KOLI. The assessment was administered during the first week or two of the semester and during the last week or during finals week.

Results for Project 2

The first major question of interest for this project was whether gain scores on the KOLI would be different for students taking courses taught by the TECs before they had access to the instructional materials (baseline) as opposed to students who took the same course once the TECs began to utilize the materials. Unfortunately, student participation rate was variable and particularly poor during the baseline semester with only 36 valid cases being available across all 10 institutions (many cases were eliminated owing to the students’ failure to finish the survey). Therefore, baseline—implementation comparisons within the TEC group are problematic as it
seems possible that the stronger students (those able to more quickly respond to the questions) may have been over-represented in the baseline group. However, with this in mind, it is nevertheless informative to explore the patterns of difference scores (post test minus pre test) across implementation as depicted in Table 2. It is clear that from the Baseline to the first and then second implementations there was a gradual increase in the magnitude of the difference score. However, this trend reversed itself for the third and fourth implementations and, in fact, a smaller difference score was observed during the third implementation than during the baseline semester. The decline in difference scores during the third and, to a lesser extent, the fourth implementations was evident in all but one of the participating institutions. We have been unable to identify any factors that may account for this decline and, it should be noted that TECs did not all implement for the third time during the same academic semester. That is, some TECs implemented the materials for the third time during the Fall of 2008 while others implemented for the third time during the Spring of 2009.

Table 2. KOLI difference scores by Implementation semester for the Treatment Group.

<table>
<thead>
<tr>
<th>IMPLEMENTATION</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
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<tr>
<td>0</td>
<td>36</td>
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<td>33</td>
<td>4.89</td>
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<tr>
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<tr>
<td>4</td>
<td>73</td>
<td>-21</td>
<td>36</td>
<td>6.30</td>
<td>10.998</td>
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</table>

The second major question was whether, during implementation semesters, KOLI difference scores would be greater for students taught by TECs or for students taught by
Comparison group instructors. Table 3 presents means and standard deviations for difference scores for students in each condition collapsed across the 4 implementation cohorts. Data for the raw scores on the pre and post tests are also presented. These data indicate that pretest performance for the students in the two conditions was quite similar and that the students in the Treatment condition showed greater gains from pre to post test than did their peers in the Comparison group. The effect size for the comparison of the difference scores is small to moderate in size \((d = .36)\).

Table 3. Means and standard deviations for difference scores in each condition collapsed across four implementation cohorts.

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
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<tr>
<td>Difference Score</td>
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<td></td>
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<tr>
<td>Treatment</td>
<td>314</td>
<td>7.35</td>
<td>12.190</td>
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<tr>
<td>Comparison</td>
<td>281</td>
<td>3.36</td>
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<tr>
<td>Pre test</td>
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<tr>
<td>Treatment</td>
<td>314</td>
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<td>14.295</td>
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<tr>
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<td>13.789</td>
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<td>Post test</td>
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<tr>
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<td>103.12</td>
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<tr>
<td>Comparison</td>
<td>281</td>
<td>98.35</td>
<td>16.586</td>
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For purposes of comparison, it should be noted that pre-post workshop difference scores for in-service teachers (data collected as part of the KOLI validation process) amounted to approximately 23 raw score points and an effect size of approximately 1.4 which suggests that the KOLI was sensitive to changes in teacher knowledge. In this regard, it is important to note that the in-service teachers participated in five full days of workshop, which covered all of the
ISA modules in depth and took the post test KOLI immediately after the last session of the workshop. On the other hand, pre-service teacher educators were variable with regard to the number of instructional modules they used in any given implementation semester and in terms of the proportion of a given module they employed, thus making it difficult to precisely determine pre-service teachers’ exposure to the ISA content. While we collected data on module usage by having instructors report on the number of modules they implemented, it was not possible to monitor the extent to which they spent time explicitly discussing module content. Therefore, analyses of the impact of module usage need to be interpreted with caution. Figure 3 illustrates difference scores for students of instructors who reported using 5 or more of the modules as compared to treatment group instructors who used fewer modules and instructors in the comparison group.

Figure 3. Difference scores by implementation semester for Treatment groups exposed to different numbers of modules and for the comparison group.
There is a clear trend for students to show greater gains when they are exposed to more of the content. Further, there is a suggestion that, at least during the first and second implementation semesters, there is a tendency for students who are exposed to fewer than 5 of the modules to also show greater gains than their peers in the comparison group. (Note that in the graph, Implementation 0 represents the baseline group. Note also that the large differences, favoring the students in the comparison condition during the baseline semester appear to be due to performance differences on Whole Word (sight word) and Vocabulary components of the KOLI. Note also, as indicated above, that we have been unable to explain the reduction in difference scores that occurred for the treatment groups during the third implementation semester.)

To further evaluate the relationships between module usage and change in student knowledge, and to account for the nested structure of the data, hierarchical linear modeling (HLM) analyses were utilized. In initial analyses, students were nested within institutions, and within conditions. However, institution proved to be a non-significant factor and was dropped from the analysis. For the analyses of the effect of the amount of module usage, we wished to account for the fact that students were nested within conditions and within instructors who utilized variable numbers of the modules (0 to 9 modules). KOLI difference scores served as the dependent measures. Table 4 provides the estimated coefficients and corresponding $t$-statistics for two models. Model I corresponds to the null model whereby only the levels are specified. Model II adds estimates for the fixed effects for treatment and module use (both level 2 variables). This analysis reveals that, as instructors implemented more of the modules, their students demonstrated greater gains on the KOLI.
Table 4. Coefficients and t-statistics for the impact of treatment condition and module usage on KOLI difference scores.

<table>
<thead>
<tr>
<th></th>
<th>Model I</th>
<th></th>
<th>Model II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>t-statistic</td>
<td>Estimate</td>
<td>t-statistic</td>
</tr>
<tr>
<td>Intercept</td>
<td>6.30</td>
<td>7.66  ***</td>
<td>5.18</td>
<td>3.61  ***</td>
</tr>
<tr>
<td>Treatment</td>
<td>-0.91</td>
<td>-0.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modules</td>
<td>0.66</td>
<td>2.32  *</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional analyses were conducted to assess the impact of module usage on the various subcomponents of the KOLI. These analyses examined changes on relevant KOLI subtests as a function of condition (treatment or comparison) and, within the treatment condition, as a function of whether or not the instructional module was used. Analysis of each module make it clear that the greatest impact of the ISA modules occurred on the components of the KOLI that measured knowledge related to Alphabets and Phonological/Phonemic Skills, perhaps because the teacher educators’ participation in the project resulted in their placing greater emphasis on these areas than did their comparison group counterparts, with more limited impact on the remaining components. HLM analyses for the Alphabets and Phonemic Analysis difference scores indicated that use of the Alphabets and Phonemic Awareness modules, respectively, was a significant predictor of difference scores. Moreover, for the Alphabets subtest, treatment condition was a significant predictor (see Table 5).
Table 5. HLM Estimates and t-tests for the effects of treatment condition and module use.

<table>
<thead>
<tr>
<th></th>
<th>Model I</th>
<th>Model II</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>estimate</td>
<td>t-statistic</td>
</tr>
<tr>
<td>Alphabets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>1.36</td>
<td>6.86     ***</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modules</td>
<td></td>
<td></td>
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<tr>
<td>Phonemic Awareness</td>
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<td></td>
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<tr>
<td>Intercept</td>
<td>0.99</td>
<td>7.02     ***</td>
</tr>
<tr>
<td>Treatment</td>
<td>-.15</td>
<td>-.44</td>
</tr>
<tr>
<td>Modules</td>
<td>1.52</td>
<td>4.30     ***</td>
</tr>
</tbody>
</table>

Discussion – Across Projects

This study involved three inter-related projects, with two of those projects discussed here. The most important objective was to develop (through an iterative process of development, testing, and revision) instructional materials focused on early literacy development that could be used in pre-service teacher education settings (Project 1). The fact that many institutions of higher education rely heavily on adjunct instructors and graduate students to teach language arts and literacy methods courses provided the major motivation for this project as it was argued that adjuncts (as well as graduate assistants and new professors) may not have had the opportunity to develop the desired level of expertise in early literacy development nor the time to gather and integrate the kinds of instructional materials that would allow them to effectively communicate the current knowledge base. To evaluate changes in pre-service teachers’ knowledge as a factor of the condition in which they participated (treatment vs. comparison) and their degree of exposure to the instructional modules, teacher education students taking their first
literacy/language arts methods courses were assessed on a knowledge of literacy instruction survey at the beginning and end of the course (Project 2). Because the project involved a collaboration of multiple, experienced teacher educators from different universities and colleges across New York State, we also surveyed the collaborating teacher educators’ reactions to the process of materials development, their sense of the utility of the materials, and their perceptions of the influence of materials on their teaching and their students’ learning. Project 1 proved to be a largely successful, collaborative undertaking. A comprehensive package of instructional materials was developed that includes multiple PowerPoint presentations, an extensive set of illustrative videos, multiple instructional activities, etc. Further, each component of the packet is highly documented to facilitate ease of use on the part of both new and experienced users. Both materials and the documentation have benefitted from the test and revision cycles built into the development process. The teacher educators who served as collaborators were positive about the utility of the materials and most indicated that they planned to continue to use at least some of the materials at the conclusion of the project. However, all also agreed that the materials incorporated too much information to cover in the single undergraduate course which was targeted for this study; most of the collaborators did not use all of the modules in any given semester. Collaborative efforts to reduce the amount of information contained in the modules, however, were largely unsuccessful. The TECs felt that all of the information was important, but couldn’t be handled in a single course nor at the early stage of the students’ knowledge development (the first language arts methods course) which had been targeted in this project. This “information overload,” no doubt, accounts at least in part of the relatively weak impact of condition on changes in student knowledge (Project 2).

Project 2 involved an attempt to evaluate the impact of exposure to the instructional
modules on changes in student knowledge from the beginning to the end of the targeted course. The results of these analyses were, in general, favorable. Students taught by TECS during implementation semesters showed somewhat greater gains on the KOLI during the implementation semester than during the baseline semester although, as noted, we had only a limited amount of baseline data due to a poor response rate and to the failure of a number of students to complete the knowledge assessment within the timeframe provided. Comparisons of students taught by TECs versus those taught by comparison group teacher educators (CTEs) showed greater gains from pre to post test and students exposed to more of the content showed greater gains than students exposed to less of the content. These general patterns need to be interpreted with some caution, however, as there were some clear anomalies in the data including unusually high gains for the baseline group taught by CTEs and a nearly universal decline in difference scores for students taught by TECs during the third implementation semester. We were unable to explain these anomalies.

While we did see some promising patterns in the outcomes, we were, in general, somewhat disappointed in the rather limited impact that the use of the instructional materials had on students’ gains in the current project. In retrospect, we realize that our methodology did not provide the strongest test of the potential impact of the materials. We provided the TECs with a great deal of latitude with regard to which and how much of given modules they would utilize. This was necessary because we had targeted the first language arts methods course for research purposes and each participating institution had different demands for that course. As a result, the appropriateness of including given modules in the course varied by institution. Had all of the modules been implemented by all of the instructors, in a course appropriate context, we expect that we would have observed greater students gains. Additionally, while collaborating with
experienced teacher educators on the development of the instructional materials was important to the conduct of the research, the fact that they were an experienced group may have served to mitigate differences which might have emerged had the materials been piloted by the relatively novice teacher educators for whom they were designed.

Future Research

The promising patterns of outcomes obtained in Project 2 and the TECs’ interest in continuing to use the materials suggested that it was important to further evaluate the utility of these materials for the purpose of enhancing new teachers’ knowledge and skills related to early literacy instruction. To that end, during the past year, we applied for and received a grant from the Fund for the Improvement of Post Secondary Education (FIPSE) through the US Department of Education. The new project will utilize the instructional materials and the knowledge survey developed during the course of the present project, with a methodology that is specifically informed by feedback provided by the TECs and findings related to their preservice teachers’ knowledge as measured by the KOLI.

For example, rather than targeting the first language arts methods course in a preservice teacher education program, participating institutions in the new project will be given control over which modules are utilized in which courses and within which programs. Institutions may choose to utilize the materials in language arts methods classes within preservice and/or inservice programs that prepare elementary classroom teachers, as well as in masters level programs in literacy and/or special education. In this way, module content should be a better fit within a given course context and teacher educators will have fewer adjustments to make as they attempt to incorporate new resources into their already packed courses. Further, participating teacher educators will engage in a 40 hour webinar prior to utilizing the materials in their courses in
order to insure that they are very familiar and comfortable with the content and the technology (all resources will be web-based) before they attempt to utilize them in their own teaching. This is particularly important because, as in the pre-service teacher education project, our ultimate goal is to provide support for adjunct and new teacher educators who may not have had the time or opportunity to develop the level of expertise needed to teach their students about instructional practices that are informed by current research in early literacy development and intervention.

Multiple teacher educators from each institution will participate in the project together and will be encouraged to support one another in their use of the new resources. Also, in an attempt to evaluate the impact of exposure to the ISA content on students’ literacy teaching skills as observed during their fieldwork experiences, cooperating teachers and field supervisors will be asked to rate students’ knowledge and practice regarding literacy development and instruction. Going forward with this line of research is an ambitious project, and one which we could not be undertaking without the support of the initial development grant, the instructional materials and teacher knowledge survey produced as a result of that grant, or the many contributions of the collaborating and comparison teacher educators.

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