The Efficacy of IRIS STAR Legacy Modules Under Different Instructional Conditions

Kristin L. Sayeski¹, Bethany Hamilton-Jones¹, and Susan Oh¹

Abstract
The vast majority of special education teacher preparation programs in the United States incorporate the IRIS Center’s STAR Legacy modules into their coursework. Given the diversity of module content and ways in which the modules are employed, the purpose of this study was to explore the potential mediating effects of instructional context on learner outcomes. Using an experimental, pretest-posttest-maintenance design, 115 participants experienced three different IRIS modules (Peer-Assisted Learning Strategies [PALS], Accommodations, and Classroom Management) under three instructional conditions (i.e., homework, instructor facilitated, and “flipped classroom”). Strong effect sizes from pretest to posttest were found across all three modules across all conditions. Instructional condition has a significant effect on learning for the PALS module only. Differences in participants’ perceptions of topic importance, module quality, and knowledge gained, however, were found for the Classroom Management module. Implications for teacher education are discussed.

Keywords
teacher education, special education, STAR Legacy modules, IRIS Center, instructional conditions

Providing teacher candidates access to information and training on evidence-based practices (EBP) is paramount (Cook & Odom, 2013). One promising approach in teacher education is the use of the IRIS Center’s STAR Legacy modules for teaching EBPs. Housed at Vanderbilt University and Claremont Graduate University, the IRIS Center is funded by the U.S. Department of Education’s Office of Special Education Programs (OSEP) and provides free, online resources such as the STAR Legacy modules, case studies, and information briefs on topics related to improving outcomes of students with disabilities (see http://iris.peabody.vanderbilt.edu/iris-resource-locator/). The IRIS Center’s STAR Legacy modules are one of its most popular tools (Montrosse, 2012), and previous research has demonstrated the potential of the modules for increasing teacher candidates’ knowledge and skills-related evidence-based practice in special education (Smith & Bryant, 2014).

In recent years, different models of instructional delivery in higher education have been widely discussed and debated. From online-only instruction to “flipped” classrooms—which combine the delivery of online instruction prior to class with in-class, hands-on activities—to enhancements to the in-class lecture, research has demonstrated the merits of a variety of different conditions for learning (Dahlstrom, Walker, & Dziuban, 2013; Gilboy, Heinerichs, & Pazzaglia, 2015; Love, Hodge, Grandgenett, 2015).

¹University of Georgia, Athens, USA

Corresponding Author:
Kristin L. Sayeski, Department of Communication Sciences and Special Education, University of Georgia, 517 Aderhold Hall, Athens, GA 30602, USA.
Email: ksayeski@uga.edu
The diversity of these instructional delivery models reflects the variability of use of the IRIS STAR Legacy modules. That is, differences exist in how IRIS modules are used across teacher preparation programs and even across different classes or instructors (Montrosse, 2012). Some instructors may assign a module to be completed independently as a homework assignment, others may have students work in pairs in a computer lab, and others may use a module as a presentation tool for interactive lecture delivery. Given this variability, there is a need to evaluate the effectiveness of the modules under different instructional conditions. The purpose of this study was to examine the efficacy of three IRIS STAR Legacy modules under three different instructional conditions: (a) independent, online; (b) flipped classroom; and (c) instructor facilitated (i.e., enhanced lecture). Specifically, the study explored the potential mediating effects of instructional context on participants’ learning and perceptions of quality.

Review of the Literature

Several bodies of research informed the development of the study. First, research on the IRIS STAR Legacy modules and similar multimedia instructional tools indicate the efficacy of such approaches in teacher education. Second, research on instructional conditions—specifically, online instruction, flipped classroom instruction, and enhanced-lecture instruction—has demonstrated the power of those models for supporting students’ learning. Taken together, this research suggests that although much is known about how to create successful conditions for learning in higher education, the relative effectiveness or possible content-interaction effects have not been extensively explored.

IRIS Modules and Other Multimedia Instructional Tools

During 2014, 97.9% of colleges and universities that received OSEP funding for personnel development used IRIS resources (Smith, Lewis, Montrosse-Moorhead, & Brown, 2014). Similarly, 75.3% of all colleges and universities that offer special education teacher preparation programs in the United States used IRIS tools with their candidates (Smith & Bryant, 2014; Smith et al., 2014). In 2012, Montrosse conducted a survey on the use of IRIS modules for teacher preparation and professional development. In the survey, 90% of faculty reported using the IRIS STAR Legacy modules, and 82.8% of those who used them rated them as “very useful.” In terms of how the modules are used in teacher preparation, the majority of faculty (87.1%) assign the modules to be completed independently outside of class. Thus, the IRIS STAR Legacy modules are widely used and valued by special education teacher preparation programs.

Despite their popularity and extensive use, no peer-reviewed research has been published on the efficacy of the modules. Two self-published reports, however, provide information on both learner outcomes and instructional conditions associated with implementation of select IRIS STAR Legacy modules. One study, conducted during the 2005-2006 academic year, compared learner outcomes associated with instructor-facilitated, in-class delivery of an IRIS module in comparison with an independent, homework instructional delivery condition (The IRIS Center, n.d.). For the study, students enrolled in an introductory class on special education either viewed the IRIS module on teaching self-regulation strategies as homework (i.e., independent instructional condition) or received the enhanced-lecture condition, in which instructors would include key portions of the module during a lecture and lead an interactive discussion on the topic. Gains in learning across both conditions were statistically significant, but there were no differences in learning between the two conditions. A second, self-published report provided findings related to two research studies (Smith & Bryant, 2014). In the first study, learner outcomes of two groups of students were compared. Students received either textbook plus lecture information on accommodations or received accommodations information via the IRIS module. Posttest results demonstrated significant differences, favoring the module condition, between the lecture and module conditions. In
the second study, one group of students completed the IRIS module on functional behavioral assessments and a second group of students received a lecture on the same topic. Students who completed the IRIS module scored significantly higher on the posttest (effect size, $d = 1.41$). Although findings from the self-published reports are promising, the data are difficult to interpret due to (a) a lack of information regarding assignment of participants to condition and (b) limited information on the procedures and analyses. In addition, given the wide variation in content of the IRIS STAR Legacy modules, research on the potential mediating effects of different instructional conditions may highlight interaction effects between module content and instructional condition on learner outcomes.

**Models of Instructional Delivery**

The quest to optimize instructional delivery in higher education is an enduring challenge. As some individuals forecast a shift to online-only delivery as both inevitable and beneficial, others see hybrid delivery options as ideal, and finally, others hold dearly to the important interaction effect that can occur during face-to-face instruction—particularly when “instructional enhancements” that increase engagement and enhance content presentation are provided. Research that compares these models of instructional delivery, on the whole, has demonstrated the equivalency of the models. Nuanced examination of the models, however, can reveal insights into their unique benefits and limitations.

**Online-only instructional delivery.** Since 2004, the Educause Center for Analysis and Research (ECAR) has annually surveyed undergraduate university students to gain insight into their experiences and expectations in regard to technology use for academic learning. Although vast changes in technology and the availability of portable technology have occurred over the past decade (e.g., the advent of YouTube, increases in mobile device ownership, the arrival of massive open online courses [MOOCs]), ECAR has consistently found students possess only a “moderate preference” for technology (Dahlstrom et al., 2013; Kvavik & Caruso, 2005). Specifically, researchers found students valued technology when it allowed them to meet their academic goals (Dahlstrom et al., 2013). Yet students reported that they preferred and learned most in blended environments, reflecting students’ desire for face-to-face instruction with faculty. That is, a universal preference for technology is not present; rather, students make case-by-case decisions about the utility of a particular technology in regard the perceived capacity of it to facilitate learning and their own level of experience with the particular technology.

Despite students reported preferences, research on the efficacy of the delivery of online-only instruction, however, has consistently demonstrated no differences in student-learning outcomes when comparing online and face-to-face delivery options (Lack, 2013; Larson & Chung-Hsien, 2009). That is, online instruction is not significantly more or significantly less effective than face-to-face instruction. Given the flexibility, ease of accessibility, and capacity for students to control elements of their learning, online instruction will continue to grow as a viable, desirable instructional delivery option (Means, Toyama, Murphy, & Baki, 2013). Research, particularly on issues related to working memory capacity and long-term retention of content, continues to inform the development of instructional design techniques that increase the efficacy of online instruction (Kalyuga, 2007). Although this research has yielded promising recommendations, these recommendations have yet to be implemented widely. For this study, the use of modules in the “online” condition reflected the business-as-usual condition wherein a module would be assigned for homework and participants would engage with the modules without instructor mediation.

Indeed, “stand-alone” content modules can have a distinct advantage over an instructor lecture. One example of this is when the digital content supplants limitations in instructor knowledge. For example, in the comprehensive survey conducted by Montrosse (2012), many instructors reported using IRIS modules
for content with which they were less familiar. This advantage, however, reflects an advantage of the digital content and not the mode of delivery. Thus, several studies have examined enhanced-lecture models of instructional delivery wherein multimedia tools are used in face-to-face contexts.

**Enhanced-lecture (instructor-facilitated) instructional delivery.** Enhanced lectures can involve a wide range of tools and techniques that instructors may employ to increase clarity of presentation, student engagement, and the overall likelihood that students will remember and retain course information. A review of all possible techniques used to “enhance” traditional, didactic instruction goes beyond the scope of this article; instead, specific research that reflects techniques similar to how the IRIS STAR Legacy modules can be used within lecture environments is provided.

Many studies, across a variety of disciplines, have demonstrated the power of integrating technology (e.g., videos, podcasts, computer-based simulations) within traditional lectures (Han, Eom, & Shin, 2008; Neumann, Neumann, & Hood, 2011; Rutz et al., 2003). Neumann et al. (2011), for example, examined the application of technology during a lecture to enhance learning outcomes. They employed computer-based simulations within introductory statistics course. Results demonstrated the positive regard students had for technology integration; participants in the study felt that the integration of technology increased interest, engagement, and learning. Han et al. (2008) compared in-class delivery of multimedia cases with traditional lecture delivery of the same content. Participants who received the enhanced lecture that included multimedia cases reported higher levels of perceived learning. In both of these studies, however, students’ perception of learning was assessed rather than acquisition of knowledge and skills. Thus, more research is warranted to identify difference in actual learning outcomes.

**Flipped-classroom instructional delivery.** Finally, the latest trend in mode of instructional delivery is the flipped classroom. Flipped-classroom instruction allows students to access digital content such as prerecorded lectures or collections of instructional materials prior to in-class discussion, problem solving, and/or application activities (Arnaud, 2013; Bergmann & Sams, 2012). Although the concept of flipped instruction has received a great deal of attention in the popular press in recent years, limited empirical research has been conducted on its application in higher education.

Gilboy et al. (2015) explored the effects of flipped classroom instruction with 142 students enrolled in undergraduate nutrition courses. Students in their study reported a preference for the flipped method of instructional delivery compared with the traditional lecture. Similarly, Love et al. (2014) examined learning outcomes associated with flipped classroom instruction in a college algebra course. Participants who received the flipped instruction also reported a preference for this type of instructional delivery, but no differences between lecture and flipped condition were found on final exam scores. Finally, Wilson (2014) transformed a traditional undergraduate statistics course into a “flipped” delivery model. Overall, the flipped delivery resulted in higher course evaluations and, when compared with students’ scores in previous semesters, higher levels of student performance. In contrast to the general positive regard demonstrated across studies, however, Wilson did note some dissatisfaction from students due to increased personal responsibility for learning (e.g., “I feel as though I have to teach myself”; p. 198). Although these studies on flipped instruction demonstrate the promise of the approach, lack of experimental control and scant data on students’ performance limit the power of the findings.

Given potential of each mode of instructional delivery and the potential use of IRIS STAR Legacy modules for each of these delivery options, in this study, we examined the efficacy of IRIS STAR Legacy modules under each of these instructional conditions. Research questions addressed were as follows:
Research question 1: To what extent do IRIS modules increase candidates’ knowledge of special-education-related content?  

Research question 2: Is there a relation between instructional condition and learning outcomes for select IRIS modules?  

Research question 3: Does the instructional condition influence participants’ perception of the overall importance of the content addressed by the module and degree to which the content was learned?  

Research question 4: When provided instruction under three different instructional conditions, do candidates express a clear preference for one condition?  

**Method**

**Setting and Participants**

The study took place at a large public university in the Southeast of the United States. One hundred fifteen students enrolled in one of four different sections of an introductory special education course participated in the study. The majority of participants were undergraduates (n = 112), and 3 were graduate students. Five of the participants were male, and 110 participants were female. Participants’ majors included elementary education (n = 46), communication sciences (n = 43), special education (n = 6), secondary education (n = 4), and noneducation majors (n = 16). The following race and ethnicities were represented: Hispanic or Latino (n = 2), American Indian or Alaskan Native (n = 2), Asian (n = 3), Black or African American (n = 8), Native Hawaiian or Other Pacific Islander (n = 1), and White (n = 105). Participants selected all race or ethnicity categories that applied to them; thus, some participants selected more than one category. The majority of participants were between the ages of 20 and 22 (n = 62), with 48 between the ages of 17 and 19, 3 between the ages of 23 and 25, and 2 were 25 years or older. Finally, 96 (83%) of the participants planned to work in the schools at some point in their careers, post-graduation.

**Intervention Materials and Measures**

Three modules developed by the IRIS Center (http://iris.peabody.vanderbilt.edu/) were used in the study: (a) Peer-Assisted Learning Strategies (PALS)—A Reading Strategy for Grades 2 to 6 (http://iris.peabody.vanderbilt.edu/module/pals26/), (b) Classroom Management (Part 1): Learning the Components of a Comprehensive Behavior Management Plan (http://iris.peabody.vanderbilt.edu/module/beh1/), and (c) Accommodations: Instructional and Testing Supports for Students With Disabilities (http://iris.peabody.vanderbilt.edu/module/acc/). IRIS modules have a standard structure, the STAR Legacy format, which includes the following five stages: (a) presentation of a challenge, (b) initial thoughts, (c) perspectives and resources, (d) wrap up, and (e) assessment. The STAR Legacy format is based on guidelines established by the Cognition and Technology Group at Vanderbilt (1996) for using problem- or case-based materials. The STAR Legacy framework allows for multiple opportunities for learning and assessment as users engage with a module.

To assess participants’ knowledge and experiences with the modules under the various learning conditions, the following measures were developed: (a) knowledge assessments for each module (n = 3) that were employed as pretest, posttest, and maintenance assessments; (b) perception assessments that participants responded to immediately following completion of the module; and (c) a final questionnaire to assess participants’ overall experience with the modules under the different learning conditions. All assessments were conducted using Qualtrics (http://www.qualtrics.com/), an online survey management system.

**Knowledge assessments.** For each module, a multiple-choice knowledge assessment was developed (PALS = 24 questions, Classroom Management = 25 questions, and Accommodations = 25 questions). To develop these assessments, the research team selected key
terms, concepts, and procedures from each module. The following principles for effective question construction were applied when developing the assessments: (a) response options were kept as short as possible and of equal length, (b) material that was common to all options was left in the question stem, (c) grammatical tip-offs were avoided, (d) implausible options were avoided, and (d) only one option was correct (Salvia, Ysseldyke, & Bolt, 2013). In addition, items were written as either knowledge-based questions, which demanded recall of specific information, or application-based questions, which placed the information within a classroom context; therefore, the questions represented varied levels of difficulty. No interdependent questions were used where one correct answer to a previous question would determine the likelihood of a second right answer on a follow-up question. Finally, the position of the correct response was varied. These assessments were used for pretest, posttest, and maintenance data collection.

Perception assessments. To assess the value participants assigned to the modules, five perception questions were developed. Immediately following the completion of the learning condition, participants rated the following questions on a 5-point rating scale:

1. Of what priority do you think it is for teacher to know about [PALS, Classroom Management, Accommodations]?
2. How would you rate the IRIS module in terms of quality of presentation of [PALS, Classroom Management, Accommodations]?
3. To what degree do you feel that you learned the content presented in the module?
4. Based on your experiences with this module, how comfortable would you feel DEVELOPING [a PALS lesson, a comprehensive classroom management plan, accommodations and modifications for a student with a disability]?
5. Based on your experiences with this module, how comfortable would you feel IMPLEMENTING [a PALS lesson, a comprehensive classroom management plan, accommodations and modifications for a student with a disability]?

Social validity assessment. The final survey included one forced-choice item related to participants’ preferred instructional condition and several open-ended items related to participants’ perceived advantages and disadvantages of each instructional format. The forced-choice item was “For this study, my preferred instructional condition was (a) independent, (b) facilitated, (c) flipped, or (d) the conditions all seemed somewhat equivalent in terms of my learning.” For the open-ended items, participants were asked to identify the potential advantages and disadvantages for the combination of both a module and the learning condition.

Research Design and Procedures

The study employed an experimental pretest-posttest-maintenance across three instructional conditions design (see Table 1). Three weeks prior to the intervention, participants took the 74-question pretest. Participants in each section were randomly assigned to one of three different groups (Group 1, Group 2, and Group 3). As demonstrated in Table 1, learning conditions were counterbalanced across groups and modules. On completion of the study, all participants experienced each learning condition and completed all three IRIS modules.

Each week for the 3-week duration of the study, during their assigned class time, participants reported to a specific classroom based on their group assignment. That is, participants in Group 1 reported to one classroom, whereas participants in Group 2 reported to a different classroom, and so forth. Three different instructors were assigned to each condition. For the independent condition, participants completed the modules online, independently prior to class that required them to answer the IRIS-assessment section prior to the study-related posttest; on the day of class, one instructor showed a non-IRIS-content-related
film. For the flipped condition, a second instructor (the first author) provided the application activity and discussion of the module; participants in this group also had completed the module independently prior to class. The application activity involved role-playing of the evidence-based practice addressed in the module. Finally, a third instructor (the second author) facilitated completion of the modules in class; participants in this group did not preview the module prior to the in-class instruction. For this condition, the module was displayed on a large screen in the front of the class, and participants watched and discussed aspects of the module as the instructor selected module elements and prompted discussion. Participants in this condition did not independently interact with the module.

For the posttest, participants would take the module-specific assessment immediately following the completion of the learning condition. Three weeks after the completion of the intervention, all participants completed the maintenance assessment. Participants completed the social validity assessment at this time as well.

Results

Both quantitative and qualitative data were analyzed to assess the efficacy of the modules and understand participants’ experiences with the modules and learning conditions. To answer the first research question, the extent to which the modules were effective for teaching special-education-related content, a three-way repeated measures ANOVA was conducted for each of the modules. For the second research question, to determine if a relation between learning condition and outcomes exist, post hoc analyses were conducted. To determine whether instructional condition influenced participants’ perception of module quality and learning, the third research question, data from the perception assessments (the five-scaled items participants responded to immediately following their assigned learning condition) were assessed using the chi-square test for independence. Finally, data from social validity survey were analyzed through a thematic analysis method (Ezzy, 2002) to determine participants’ preferences.

Knowledge Assessment Findings

For the PALS module, first, differences from pretest to posttest to maintenance were examined. Mauchly’s test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 7.55, p = .023$, and therefore the degrees of freedom were corrected using Huynh–Feldt estimates of sphericity ($\varepsilon = .93$). Results demonstrated a significant effect for time, $F(1.94, 203.49) = 378.67, p < .001$, with an effect size of $d = 3.27$. Post hoc tests using the Bonferroni correction revealed significant difference between the pretest and posttest (12.50 to 20.03, respectively) for all conditions. In addition there were significant differences between posttest and maintenance (20.03 to 17.99, respectively). Then, differences among instructional conditions (independent, facilitated, and flipped) were examined. Results demonstrated a significant effect for condition, $F(2) = 6.90$,
Post hoc tests using the Bonferroni correction revealed a significant difference between the independent and flipped conditions, \( p = .001 \), with participants’ scores in the flipped condition higher than the scores from participants in the independent condition with an effect size of \( d = 1.10 \) for that pairwise comparison.

Similarly, for the Classroom Management module, differences from pretest to posttest to maintenance were examined. Results demonstrated a significant effect for time, \( F(2) = 55.80, p < .001 \), with an effect size of \( d = 1.22 \). Post hoc tests using the Bonferroni correction revealed significant difference between the pretest and posttest (16.14 to 19.47, respectively) for all conditions. In addition there were significant differences between posttest and maintenance (22.32 to 20.47, respectively). Then, differences among instructional conditions (independent, facilitated, and flipped) were examined. No significant effect for condition was found for the Accommodations module.

The means across modules and conditions from pretest to posttest to maintenance are presented in Table 2. These data reflect the gains from pretest to posttest across all modules and conditions. In addition, maintenance of participant knowledge scores reflects the degree to which knowledge was retained 3 weeks postintervention.

### Perception Assessment Findings

A chi-square test of independence was performed to examine the relation between learning condition (independent, facilitated, or flipped) and participants’ perceptions of topic importance, module quality, and knowledge gained for each of three IRIS STAR Legacy modules. For each module, participants rated their responses to five questions using a 5-point scale.

**PALS module.** In regard to the importance of PALS knowledge for teachers, there were no significant differences across learning conditions, \( \chi^2(8) = 6.74, p = .57 \). The majority of
participants in all learning conditions indicated that learning PALS was a “high priority” topic for teachers to know. Similarly, there was no significant difference in terms of participants’ assessment of quality, $\chi^2(8) = 13.56, p = .094$. There was, however, a significance in regard to participants’ perception of degree the content was learned, $\chi^2(4) = 11.60, p = .021$, with more participants in the flipped and facilitated conditions reporting that they “learned the majority of key content.” No significant differences were found, though, across conditions for ability to plan and implement PALS, $\chi^2(8) = 9.96, p = .268$, and $\chi^2(8) = 14.95, p = .060$, respectively.

Classroom management module. Significant differences across instructional condition were found on all five perception questions for the Classroom Management module. Significant differences were found between learning condition and participants’ ratings of topic importance, $\chi^2(4) = 11.88, p = .018$, with lower ratings by participants in the independent condition. Similarly, significance was found between learning condition and participants’ ratings of module quality, $\chi^2(6) = 15.61, p = .016$, with participants in the independent condition rating the module of lower quality. For degree learned, significant differences, $\chi^2(4) = 13.83, p = .008$, demonstrated differences in perceived learning by participants in the flipped condition. Specifically, only one participant selected “learned some content” with the rest of the participants in the flipped condition selecting the two highest ratings for degree learned. In contrast, 30% and 24% of participants in the independent and facilitated (respectively) selected the lower rating of “learned some content.” In terms of planning for classroom management, significant differences were found, $\chi^2(8) = 40.00, p < .0001$, with more participants in the flipped condition reporting higher levels of comfort in terms of planning for classroom management. Finally, significance was found in terms of participants’ perceived capacity for implementing classroom management skills, $\chi^2(8) = 15.84, p = .045$, with no participants in the flipped condition indicating the lowest levels—not at all comfortable and slightly comfortable.

Accommodations module. For the Accommodations module, the relation between instructional condition and perceptions of priority were significant, $\chi^2(2) = 10.39, p = .006$, with the vast majority participants in the flipped and facilitated conditions indicating knowledge of accommodations was “essential” in contrast to 32% of participants in the independent condition who indicated that the knowledge should be “a high priority.” No significant differences were found in regard to assessments of quality, $\chi^2(6) = 4.84, p = .564$; degree learned, $\chi^2(4) = 7.80, p = .099$; capacity for planning, $\chi^2(6) = 3.38, p = .760$; and comfort level for implementing, $\chi^2(6) = 7.44, p = .282$.

To provide an overall indication of participants’ ratings of their experience in relation to each module, the percentages of participants’ ratings across modules are provided in Table 3. These data provide a picture of participants’ experience across the three different IRIS modules. In addition, the data reflect the overall positive experiences, regardless of instructional condition, of participants.

Social Validity Assessment Findings

For the social validity assessment, participants identified perceived advantages and disadvantages of the instructional conditions. One hundred six of the 115 participants completed the social validity assessment. First, the data were reviewed using open coding procedures that preclude the use of predetermined codes (Strauss & Corbin, 1990). Next, the open coding was reviewed using constant comparison methods that identified similarities and differences within the data. Codes were then grouped into themes that expressed a “typology of responses” from participants (Ezzy, 2002, p. 89). In addition, when drawing inductive conclusions, frequency counts of open codes within the 18 responses from each participant were considered. Analyst triangulation was used to enhance the rigor of the analysis and provide consideration for alternative themes (Patton, 2002). Multiple
researchers coded approximately 50% of the data to strengthen creditability of the findings with an overall agreement of 85%. Themes are presented in Table 4.

**Independent learning condition.** For the independent learning condition, participants identified on my own terms as an advantage. This included the ability for participants to work at their own pace and at a convenient time when completing the module. For example, “I like how I was able to look at the module on my own time and at my own pace.” Coding reflected at my convenience as another advantage. Participants stated that working independently meant the ability to interact with the content in preferred ways such as reviewing information and investigating personal interests—“We have the ability to take our time and really focus on what we deem important without possibly feeling pressure from any other students or instructors in the room.” Overwhelmingly, participants reported having to learn all on their own as the disadvantage to this condition. In addition, participants identified not being able to ask questions about the content, having difficulty sustaining attention to the module, and gaining minimal understanding of the content as shortcomings of the condition.

### Table 3. Percentage of Participants’ Ratings of Importance, Quality, and Learning Across Modules.

<table>
<thead>
<tr>
<th>Response anchors</th>
<th>Not a priority</th>
<th>Low priority</th>
<th>Medium priority</th>
<th>High priority</th>
<th>Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topic priority</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PALS</td>
<td>1%</td>
<td>1%</td>
<td>7%</td>
<td>72%</td>
<td>19%</td>
</tr>
<tr>
<td>Management</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>15%</td>
<td>82%</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>11%</td>
<td>89%</td>
</tr>
<tr>
<td><strong>Module quality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PALS</td>
<td>1%</td>
<td>4%</td>
<td>26%</td>
<td>45%</td>
<td>24%</td>
</tr>
<tr>
<td>Management</td>
<td>0%</td>
<td>5%</td>
<td>21%</td>
<td>48%</td>
<td>26%</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>1%</td>
<td>12%</td>
<td>50%</td>
<td>37%</td>
</tr>
<tr>
<td><strong>Knowledge gained</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PALS</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>60%</td>
<td>34%</td>
</tr>
<tr>
<td>Management</td>
<td>0%</td>
<td>0%</td>
<td>20%</td>
<td>50%</td>
<td>30%</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>0%</td>
<td>7%</td>
<td>51%</td>
<td>41%</td>
</tr>
<tr>
<td><strong>Planning comfort level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PALS</td>
<td>1%</td>
<td>5%</td>
<td>46%</td>
<td>45%</td>
<td>3%</td>
</tr>
<tr>
<td>Management</td>
<td>1%</td>
<td>8%</td>
<td>46%</td>
<td>38%</td>
<td>6%</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>9%</td>
<td>47%</td>
<td>37%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Implementing comfort level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PALS</td>
<td>1%</td>
<td>12%</td>
<td>57%</td>
<td>24%</td>
<td>6%</td>
</tr>
<tr>
<td>Management</td>
<td>4%</td>
<td>15%</td>
<td>45%</td>
<td>30%</td>
<td>6%</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>8%</td>
<td>44%</td>
<td>40%</td>
<td>7%</td>
</tr>
</tbody>
</table>

*Note. PALS = Peer-Assisted Learning Strategies.*
Participants identified the primary advantage of the facilitated learning condition as *value of instructor and peer input*. Participants noted that the ability to ask questions of the instructor, hearing of professional experience, and the knowledge base of the instructor as being extremely valuable to their learning—"I could ask my teacher any question that came up when she was teaching us the material which really helped clarify the material." Participants stated that better understanding was accomplished not only through the support of the instructor but also from discussion with peers—"Being able to work through the module as a class made sure that I grasped every concept . . . and that I understood my peers [sic] perspectives." Participants identified *timing* as a disadvantage. Participants felt that content coverage was constrained by the duration of the class session and therefore, the materials were not presented in-depth. For example, "If you didn’t understand something discussed in class, then you couldn’t spend extra time with it because you went at the group’s pace." In addition, other participants noted that covering the module in class took up too much time and led to a boring class.

**Facilitated learning condition.** Participants noted the potential benefits of the facilitated learning condition. The ability to ask questions of the instructor, hearing of professional experience, and the knowledge base of the instructor were considered extremely valuable to their learning—"I could ask my teacher any question that came up when she was teaching us the material which really helped clarify the material." Participants stated that better understanding was accomplished not only through the support of the instructor but also from discussion with peers—"Being able to work through the module as a class made sure that I grasped every concept . . . and that I understood my peers [sic] perspectives." Participants identified *timing* as a disadvantage. Participants felt that content coverage was constrained by the duration of the class session and therefore, the materials were not presented in-depth. For example, "If you didn’t understand something discussed in class, then you couldn’t spend extra time with it because you went at the group’s pace." In addition, other participants noted that covering the module in class took up too much time and led to a boring class.

**Table 4. Perceived Advantages and Disadvantages of Instructional Condition.**

<table>
<thead>
<tr>
<th>Instructional condition</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>On my own terms At my own pace Based on my interest</td>
<td>All on my own Unable to ask questions Gain minimal understanding of content Distractions</td>
</tr>
<tr>
<td></td>
<td>Value of instructor and peer input Able to ask questions Instructor’s professional knowledge adds to the content Opportunity for classwide discussions</td>
<td>Timing across peers difficult (i.e., too fast for some; too slow for others) Limited by constraints of class duration</td>
</tr>
<tr>
<td>Facilitated</td>
<td>Allows for development of prior knowledge and application of knowledge Gain additional information via the in-class activity Gain understanding of how to apply the content</td>
<td>Less efficient than independent Boring Minimal No disadvantages Students may not complete module before activity; therefore diminish advantages</td>
</tr>
<tr>
<td>Flipped</td>
<td>Allows for development of prior knowledge and application of knowledge</td>
<td></td>
</tr>
</tbody>
</table>

**Flipped learning condition.** Participants noted that the flipped condition was the ideal way to learn the content provided via the IRIS *STAR Legacy* modules. The ability to come into class with prior knowledge on the content and then complete an application activity led to better learning—"Students could learn independently, but still get the opportunity to apply their knowledge to the classroom activity/environment." Participants reported that the flipped classroom method allowed them to gain additional important information on the content. That is, “[Flipped instruction] really reinforced the material in both environments, so I feel like I learned and will retain the most from that day.” Participants reported *minimal* disadvantages. One noted disadvantage identified was if a student failed to complete the module prior to class—"If a student did not take the time to learn the information at home, they [sic] may not perform as well in the classroom activity.”

Finally, in response to the forced-choice instructional condition preference question, 49.1% of the participants selected the flipped condition, 33% selected the facilitated condition, 11.3% selected the statement “Conditions were equivalent,” and 6.6% selected the
independent condition. Thus, the most popular condition was the flipped classroom condition. The least popular condition was the independent condition.

Discussion

Findings for the study demonstrate the efficacy of the IRIS STAR Legacy modules across all instructional delivery formats and a preference for the flipped instructional conditions. In addition, a significant effect for instructional condition was found for the PALS module. That is, although all participants made statistically significant gains from pretest to posttest on PALS, participants in the flipped instructional condition performed statistically significantly better than participants in the independent conditions. No statistically significant differences for instructional condition were found for the Classroom Management and Accommodations modules. Lack of differences across learning conditions on the multiple-choice assessments for the Classroom Management and Accommodations modules was a similar finding to the self-published study conducted by IRIS (The IRIS Center, n.d.).

In contrast to the learning outcomes associated with the multiple-choice knowledge assessments, participants’ ratings on the perception assessments highlight different interaction effects between module content and instructional condition. Specifically, the Classroom Management module yielded the greatest number of significant results. Participants in the independent condition provided lower ratings in regard to importance of the topic and module quality. In addition, participants in the flipped condition were more confident in the degree to which the content was learned, with all but one participant reporting learning key content or the majority of content; more participants in the facilitated and independent conditions reported only learning some content. Similarly, more participants in the flipped condition reported being very comfortable in terms of their ability to plan for Classroom Management. These findings echo survey results from ECAR that demonstrated students’ preference for blended learning and a belief that they learn better with opportunities for faculty interaction during the learning process (Dahlstrom et al., 2013).

The perception assessment findings may indicate participant learning not assessed by the multiple-choice knowledge assessments or a disconnect between perception and learning outcomes. That is, although the multiple-choice assessment demonstrated no difference in learning related to classroom management, the perception assessment speaks to a very different learning experience for students in the flipped classroom condition. After receiving flipped instruction, participants felt more strongly about the importance of classroom management and more confident in their ability to plan for and implement related strategies. Thus, learning not assessed by the multiple-choice assessment may have occurred. In contrast, participants may just believe that they learned more due to a positive in-class learning experience. Future research could explore knowledge associated with planning and skills related to implementation to determine if the flipped and facilitated condition produced learning not assessed by multiple-choice assessment.

Findings from the study also raise other content-related instructional delivery considerations. Although the results demonstrate that IRIS modules are successful in teaching the content across all learning conditions, the significant effect for PALS under the flipped learning condition may point to a unique interaction effect. As the majority of content learned in the PALS module relates to how to implement this evidence-based approach, it can be inferred that the role-play activity for the flipped condition supported participants’ procedural knowledge of PALS implementation, thus contributing to higher scores. In contrast, the content provided in the Classroom Management and Accommodations modules was more fact-based than procedural, application based. Therefore, the application activity provided under the flipped condition for these modules may not have enhanced content learning.

Finally, participants reported a preference for the flipped and facilitated conditions. This
finding reflects the findings of Kaznowska, Rogers, and Usher (2011), who found that 79% of the university students surveyed in their comprehensive study of e-learning in Canada preferred face-to-face delivery over online delivery of instruction. Relatedly, Paechter and Maier’s (2010) study of Austrian students found that, although e-learning was highly valued, face-to-face instruction was particularly desired for gaining knowledge and skills in the subject matter, in scientific work routines, in the application of one’s knowledge, and when communication and cooperation are required. It is important to note, however, that neither the Kaznowska et al. (2011) nor the Paechter and Maier (2010) report indicates whether the “face-to-face” condition implies in-class instruction without any technology enhancement.

**Limitations**

Findings from this study underscore the efficacy of the IRIS modules, yet several limitations of the study should be considered. First, the knowledge assessment consisted of a limited number of multiple-choice format items (i.e., 24-25 items per module). Although the multiple-choice format is considered more objective than free-response items, limited types of knowledge can be assessed via this format. Specifically, the assessments designed for the study assessed participants’ knowledge of definitions, procedural considerations, and the application of principles to hypothetical scenarios. In contrast, the inclusion of free-response items may have (a) provided the opportunity for participants to share additional knowledge gained that was not prompted by the multiple-choice items or (b) allowed researchers to examine participants’ misconceptions, partial understanding, or deep understanding of the concepts presented in the modules. Thus, the free-form response would have allowed for a more nuanced understanding of the learning that occurred across modules and across learning conditions.

A second consideration is the age of the participants. The vast majority of participants were 17 to 22 years of age. Although this age range reflects the ages of traditional undergraduates, these participants were younger than many teacher education candidates—as many teacher candidates are enrolled in graduate programs. Therefore, older students may have a different experience with the modules and learning conditions than reflected in this study.

Finally, as the larger purpose of learning evidence-based practice is for the implementation of those practices, the current study assessed only knowledge of the practices. As noted previously, assessing participants’ planning and implementation skills would have provided a richer picture of the extent to which such multimedia, instructional tools, in general, and IRIS STAR Legacy modules, specifically, can be used for professional development. To this end, whereas the instructional conditions included in the study reflect instructionally feasible approaches in teacher preparation, future research could examine (a) differences associated with variations in instructor delivery, knowledge, and/or skill; (b) variations in instructional duration (i.e., providing instruction on the EBP over a longer period than one class session); or (c) the inclusion of other elements identified in the professional literature as important to professional development (e.g., intensive instructional delivery, ongoing training and/or coaching, interactive sessions that include modeling, role-playing, and practice; see Yoon, Duncan, Lee, Scarloss, & Shapley, 2007).

**Conclusion**

The IRIS Center modules are widely used in teacher education (Montrosse, 2012). Findings from the study indicate the efficacy of the modules for teaching concepts identified as important for meeting the needs of students with disabilities. Furthermore, outcomes associated with the modules were robust across learning conditions. Therefore, the modules can be employed as homework, facilitated by instructors during class, or employed under the flipped condition. Findings also point to several important implementation considerations. Specifically, candidate-learning outcomes in
relation to instructional condition may relate to the content of the IRIS module. Procedural-heavy modules, such as PALS, may be best employed using the flipped instructional condition. Finally, participants in the study expressed a preference for the flipped instructional condition. Therefore, students may have a more positive learning experience if the flipped instructional condition is employed. In sum, the IRIS STAR Legacy modules reflect a useful tool for teacher educators, but further research is needed to explore the relation between the modules and teacher candidates’ successful implementation of their content.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

References


**Author Biographies**

**Kristin L. Sayeski**, PhD, is an assistant professor in the Department of Communication Sciences and Special Education at the University of Georgia. Her professional and research interests include identifying exemplary practices in preservice and in-service teacher development and determining effective instructional practices for students with high-incidence disabilities, particularly in the area of literacy.

**Bethany Hamilton-Jones**, PhD, is a clinical assistant professor in the Department of Communication Sciences and Special Education at the University of Georgia. Her research foci include co-teaching and collaboration, teacher efficacy and teacher preparation, and inclusion.

**Susan Oh** is an undergraduate student in the General Curriculum program in the Department of Communication Sciences and Special Education at the University of Georgia.