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Supplemental Instruction and Embedded Tutoring Program Assessment: Problems and Opportunities

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ABSTRACT

Many scholars have sought to measure the effectiveness of diverse supplemental instruction programs. Nevertheless, it is difficult to generalize about supplemental instruction or compare data, given methodological and statistical incongruities and diverse approaches and student populations at various institutions. Quantitative and qualitative data suggest that supplemental instruction and embedded tutoring programs facilitate learning and success in all disciplines. We describe best practices for embedded tutoring and supplemental instruction across disciplines and course modalities, evaluate metrics used to assess community college embedded tutoring and supplemental instruction programs, and suggest mixed methods models for assessing these programs.

Introduction

In 1973, Deanna Martin of the University of Missouri: Kansas City developed what we call today supplemental instruction used widely by educational institutions throughout the United States and abroad. Although practices differ from institution to institution, many studies (Henry, Bruland, & Sano-Franchini, 2011; Yancy McGuire, 2006) described supplemental instruction similarly, namely as a form of tutoring in which a tutor/facilitator provides additional instruction and practice through activities and application of course material during sessions outside of a course's regular class time. Few studies or articles discuss embedded tutoring, a form of supplemental instruction in which a tutor attends some or all class sessions and participates in the class itself in addition to serving as a tutor in individual and group environments (Henry et al., 2011; Zamberlan & Wilson, 2015). In embedded tutor support environments, learning often occurs in a social context—with their classmates, with those who attend group tutoring sessions, and as a pair with the tutor, resembling the social interdependent learning model researched and proposed by Lev Vygotsky (1978).

Vygotsky's zone of proximal development is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Many studies "have highlighted the importance of balancing two key factors: academic challenge and supportive interactions with staff and other students" (Zamberlan & Wilson, 2015, p. 7). Students learn to do more than mimic the tutor but actually develop skills to engage in college-level study, which requires higher-order thinking skills and advanced communication skills (e.g., synthesizing readings in organized writing). These social learning aspects to embedded tutoring and supplemental instruction sessions are what make these approaches effective. A more competent or knowledgeable peer or professional tutor assists students who are on the verge of understanding and/or being able to apply skills to reach higher levels of understanding, analysis, and application.

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Many scholars have sought to measure the effectiveness of diverse supplemental instruction programs. Nevertheless, it is difficult to generalize about supplemental instruction or compare data, given methodological and statistical incongruities and diverse approaches and student populations at various institutions (Dawson, van der Meer, Skalicky, & Cowley, 2014; Drake, 2011; Grillo & Leist, 2013; Ning & Downing, 2010; Paloyo, 2015; Rabitoy, Hoffman, & Person, 2015; Terrion & Daoust, 2011). Quantitative and qualitative data suggest that supplemental instruction and embedded tutoring programs facilitate learning and success in all disciplines. However, many challenges come with measuring the effectiveness of these programs such as the extent to which self-selection basis plays a large role in studies' results (Paloyo, 2015), what metrics are the most useful, and to what ends may data be used to develop programmatic improvements. We seek to measure the effects of embedded tutoring and supplemental instruction on student success at a community college and to evaluate metrics traditionally used to do so. We will also identify potential sources of error in these metrics and examine ways to mitigate this error, including the use of mixed methods models for assessing embedded tutoring and supplemental instruction programs.

In case of this study, embedded tutoring and supplemental instruction models are practiced in the hybrid, online, laboratory, studio, and face-to-face classroom environments. For instance, embedded tutors in a face-to-face class often model asking important questions during a class lecture, assist students during group activities or independent practice time, and collaborate with the course instructor to support students during group and individual tutoring sessions outside of regular class time, or they may provide topic workshops, as identified with the course instructor, outside of the regular class time. Laboratory tutors help students to apply lecture material in labs as well as assist during laboratory activities. They may also facilitate additional outside regular lab time practice and time for study in the lab, using lab materials. Online embedded tutors participate in online discussions, modeling excellently composed posts and engagement with peers online; provide individual synchronous and asynchronous tutoring; and are available in person.

Method

We studied the embedded and supplemental instruction program at Truckee Meadows Community College (TMCC), which is a comprehensive, public, two-year community college located in Reno, Nevada, and is part of the Nevada System of Higher Education. Established in 1976 and accredited by the Northwest Commission on Colleges and Universities (NWCCU), the College serves more than 25,000 students each year in credit and non-credit programs at five educational sites and more than 20 community locations.

Collection of data and limitations

We tracked supplemental instruction usage data by having students sign in with their full names and student numbers for each supplemental session that they attended, and we tracked embedded tutoring usage data by recording the specific sections of classes to which a tutor was assigned to attend all or some class periods. At the end of each semester, we sent supplemental instruction sign-in data and a list of the class sections with embedded tutors to the Truckee Meadows Community College Institutional Research Office, where student success data (including class and term GPAs, retention rates, and completion rates) were measured with respect to supplemental instruction attendance and enrollment in a section with an embedded tutor. We sought these data to analyze a potential relationship between student success in traditional ways (grades, retention, and completion of a course) and engagement in supplemental instruction. However, we recognized that these data are not sufficient for a more holistic and authentic assessment of a supplemental instruction program.

In addition to learning more about faculty members' experiences during professional development sessions about supplemental instruction and embedded tutoring, we sought to gain information about students' experiences with supplemental instruction. Survey data were collected in the

tutoring center. Students were encouraged to fill out anonymous paper surveys no more than once per visit per tutor, which were then collected and recorded at the center's front desk.

Although these data, faculty feedback, and secondary research are useful in measuring programmatic success and suggesting ways centers can improve programs, our and other studies (Dawson et al., 2014) face methodological problems, including analyzing data from small populations, controlling and isolating variables, accounting for student motivation variables affecting data, and addressing self-selection bias. We have attempted to mitigate these effects in our assessments by observing supplemental instruction sessions, using qualitative and quantitative survey feedback, analyzing faculty feedback, comparing instructors' retention rates from sections where they utilize embedded tutoring versus sections where they do not utilize embedded tutoring, and analyzing outliers further.

Results

Although supplemental instruction has been in practice in various forms for over 40 years, embedded tutoring (a form of supplemental instruction) is a recent development in community colleges. Results are especially promising for our gateway English and math courses. For instance, we found in the Fall 2016 semester, students enrolled in English 101—Composition I were retained at a rate of 74% over all other sections whereas students enrolled in English 101 with exposure to an embedded tutor were retained at a rate of 86%. Students enrolled in English 102—Composition II in all other sections were retained at a rate of 69%; whereas, students enrolled in English 102 with exposure to an embedded tutor were retained at a rate of 92%. As for supplemental instruction. In Spring 2017, while students in sections of Math 126—Pre-Calculus I (a gateway mathematics course) whose instructors utilized supplemental instruction were retained at 71%, students in sections without supplemental instruction usage were retained at 62%.

In addition, students who attended at least one supplemental instruction session for their Pre-Calculus I course in Spring 2017 had an average term GPA of 2.67, while students who did not take advantage of supplemental instruction session had an average term GPA of 2.21. This example suggests, too, that there is self-selection bias where students who tend to be resilient and seek help may also tend to have higher GPAs than students who do not seek assistance. We, too, have examined outliers when there are small populations and single sections compared to many other sections of the same course. Therefore, we have directed our focus on those examples where we have multiple or large sections to use as comparisons with several other sections that do not use embedded tutoring or supplemental instruction.

Table 1 illustrates that students who use supplemental instruction for mathematics and science courses consistently earn higher term and course GPAs than students who do not attend supplemental instruction sessions. For example, students who used supplemental instruction in Spring 2018 had, on average, a 2.73 GPA, while those who do not have, on average, a 2.36 GPA. This begs the question, as mentioned before, do students who participate in supplemental instruction tend to be the type of student who would have a higher GPA than a student who would not take advantage

Table 1. Average course grades and term GPAs of students who attended supplemental instruction sessions compared to those who did not.

	Spring 2017	Fall 2017	Spring 2018
Course grade (SI attendees)	2.36	2.66	2.38
Course grade (SI non-attendees)	2.05	1.92	2.05
Term GPA (SI attendees)	2.81	2.77	2.73
Term GPA (SI non-attendees)	2.37	2.24	2.36

Permissions granted from the Truckee Meadows Community College Institutional Research Office (2018a).

of such a service? Again, this is a form of self-selection bias. This is a reason that we find it essential to have several data points to ensure validity.

Furthermore, we examine retention in sections (of other courses) taught by that same instructor who used embedded tutoring in one section but not others. For example, in Spring 2017, students in English Composition I sections with embedded tutoring were retained at 76% while those in sections without embedded tutoring were retained at 70%, and students in English Composition I sections with no embedded tutor but whose instructors used an embedded tutor in another section were retained at 69%. In this same term, English Composition II students with embedded tutoring were retained at 84% while those in sections without embedded tutoring were retained at 70%, and students in English Composition II sections with no embedded tutor but whose instructors used an embedded tutor in another section were retained at 69%. As another example, Math 127—Pre-Calculus II sections with embedded tutoring were retained at 68% while those in sections without embedded tutoring were retained at 67%, and students in Pre-Calculus II sections with no embedded tutor but whose instructor used an embedded tutor in another section were retained at 70%. Chemistry 121—General Chemistry I sections with embedded tutoring were retained at 75% while those in sections without embedded tutoring were retained at 79%, and students in General Chemistry I sections with no embedded tutor but whose instructor used an embedded tutor in another section were retained at 87% (Table 2).

Several factors may play into the apparent success of embedded tutoring when comparing multiple sections of courses, even when controlling for the same instructor. For example, the course modality may play a role (e.g., online courses tend to have lower success rates than in-person classes). Class timing and consequent student demographic trends may also have an effect (e.g., evening classes tend to have a higher proportion of students with full time jobs who may have less time to focus exclusively on coursework). Furthermore, some inconsistencies in apparent success may arise simply from the use of small sample sizes. In the first two examples from English courses, there were multiple courses and larger student populations, and the last two examples from mathematics and chemistry comparisons were made between one section with a small population and multiple sections with much larger populations. Indeed, when averaged over three semesters (Spring 2017, Fall 2017, and Spring 2018), students in mathematics classes with an embedded tutor were retained at 52%, while students in sections taught by the same instructor but without an embedded tutor were retained at 48%, showing an increase in student success in the presence of an embedded tutor. Similarly, students in chemistry classes with an embedded tutor over the same three semesters were retained at 86%, while students in sections taught by the same instructor but without an embedded tutor were retained at 82% (Table 3).

Although the data may show some inconsistencies, our observations of supplemental instruction sessions, instructor reflections, and student surveys reveal that using embedded tutors and supplemental instruction leaders not only help students to learn course material but to learn how to learn effectively and collaboratively. For example, several survey prompts and open-ended questions demonstrate the effects of tutor support in students' overall development as learners (Table 4).

Qualitative data from students focused on liking particular tutors and their personalities, tutoring resulting in specific desired grades, and frustration with particular subjects (computer programming

Table 2. Comparison of retention rates: sections with or without an embedded tutor—Spring 2017.

Course	Retention in sections with embedded tutor	Retention in sections taught by same instructor but without embedded tutor	Retention in all sections without embedded tutor
Composition I	76% (n = 127)	69% (n = 52)	70% (n = 698)
Composition II	84% (n = 112)	69% (n = 134)	70% (n = 1010)
Pre-Calculus II	68% (n = 19)	70% (n = 54)	67% (n = 291)
General Chemistry I	75% (n = 28)	87% (n = 55)	79% (n = 244)

Permissions granted from the Truckee Meadows Community College Institutional Research Office (2018b).

Table 3. Compilation of retention rates: sections with or without an embedded tutor—Spring 2017, Fall 2017, and Spring 2018.

Subject	Retention in sections with embedded tutor	Retention in sections taught by same instructor but without embedded tutor	Retention in all sections without embedded tutor
English	76% (n = 376)	71% (n = 221)	74% (n = 3526)
Math	52% (n = 122)	48% (n = 251)	64% (n = 1623)
Chemistry	86% (n = 136)	82% (n = 148)	80% (n = 728)

Permissions granted from the Truckee Meadows Community College Institutional Research Office (2018c).

Table 4. Student survey data.

Survey Prompt	Average Rating (Scale from 1 to 5)
I feel more confident in my ability to succeed in other courses as a result of tutoring	4.64
The tutor provided a supporting and engaging learning environment	4.68
The tutor made me more interested in the subject matter	4.48
Supplemental instruction has helped me to improve my study skills and approaches	4.62

and mathematics courses in particular). These student-generated data points illustrate how interactions with embedded tutors and supplemental instruction leaders lead to greater engagement in learning and improved study skills that are applicable to all courses.

Employing the social nature of learning, tutors model effective learner behaviors such as developing questioning strategies in the classroom setting, creating example completed assignments, leading study groups, facilitating the development of social groups, and exemplifying self-directed learning. In the online environment, embedded tutors synchronously and asynchronously coach students in writing and research skills. In the face-to-face class and online environments, embedded tutors, who also work at the physical tutoring center site, are available outside of class for in-person appointments and small study group meetings to provide additional support, application of course material, and explanations of challenging and important concepts. Additionally, TMCC's approach gives faculty a menu of strategies for working with embedded tutors in their courses. TMCC provides a web page devoted to embedded tutoring and supplemental instruction to guide tutors and instructors. Instructors may use a combination of embedded tutoring and supplemental instruction, and embedded tutors may attend some but not all class sessions, depending on the instructors' needs and goals for embedded tutoring and supplemental instruction. Importantly, ground rules should be set (e.g., discussions and training for faculty) and understandings should be established (e.g., embedded tutors and supplemental instruction leaders do not proctor or grade tests). Overall, we have found that the variety and flexibility of approaches has led to the program's success measured in completion, GPA, and retention.

Conclusions and further research

Our research, as well as that of others, suggests that faculty members who utilize embedded tutoring strategies have the opportunity to help students to improve their grades and to improve course retention rates (Arendale, 1994; Congos & Schoeps, 2003; Dawson et al., 2014; Grillo & Leist, 2013; ; Martin & Arendale, 1994; Martin & Blanc, 1981; Rabitoy et al., 2015; Stone & Jacobs, 2008). Moreover, many embedded tutoring models create social and academic support mechanisms that many community colleges students need as they may not develop these relationships or learning and study skills organically.

Studies on types of supplemental instruction demonstrate promising, although sometimes inconsistent, results. Our results indicate that multiple unaccounted factors may affect the apparent success of supplemental instruction and embedded tutoring programs. The influence of these factors on success results may be reduced by compiling data from multiple classes over several semesters to help randomize class characteristics and student demographic trends and by employing multiple strategies and methods to measure program effectiveness. For instance, student success data may

not adequately demonstrate the success of a program due to self-selection bias; additional information such as that from surveys, observations, and focus groups provides further information to help individual institutions develop processes and approaches that best serve their student populations.

We plan to move forward by increasing faculty awareness and understanding of embedded tutoring and effective strategies at TMCC, with the hope of also increasing faculty participation as a result. Specific strategies that we are employing are offering professional development workshops on embedded tutoring and supplemental instruction for instructors; improving training processes for embedded tutors and supplemental instruction leader based on feedback from previous tutors, instructors, and tutoring students; and continuing to conduct primary and secondary research to help us to identify, develop, and implement best practices. In doing so, we expect either to reduce the inconsistencies in our data (i.e., embedded tutoring will be shown to be effective for all or nearly all courses) by increasing sample size and improving tutoring practices across the board or to have enough data to begin examining and identifying why embedded tutoring is effective for some courses and not others. We will also attempt to examine the effects of some of the proposed sources of the inconsistencies in our program success data (e.g., class timing or modality) on the success of the general student body and use the findings to normalize results obtained for the success rates of students who attend tutoring.

References

Arendale, D. (1994). Understanding the supplemental instruction model. In D. Martin & D. Arendale (Eds.), *Supplemental instruction: Increasing achievement and retention* (pp. 11–21). San Francisco, CA: Jossey-Bass.

Congos, D. H., & Schoeps, N. (2003). Inside supplemental instruction sessions: One model of what happens that improves grades and retention revisited. *Journal of Student Centered Learning*, *1*(3), 159–170.

Dawson, P., van der Meer, J., Skalicky, J., & Cowley, K. (2014). On the effectiveness of supplemental instruction: A systematic review of supplemental instruction and peer-assisted study sessions literature between 2001 and 2010. *Review of Educational Research*, *84*(4), 609–639. doi:10.3102/0034654314540007

Drake, R. G. (2011). Why should faculty be involved in supplemental instruction? *College Teaching*, *59*(4), 135–141. doi:10.1080/87567555.2011.586656

Grillo, M. C., & Leist, C. W. (2013). Academic support as a predictor of retention to graduation: New insights on the role of tutoring, learning assistance, and supplemental instruction. *Journal of College Student Retention: Research, Theory and Practice*, *15*(3), 387–408. doi:10.2190/CS.15.3.e

Henry, J., Bruland, H., & Sano-Franchini, J. (2011). Course-embedded mentoring for first-year students: Melding academic subject support with role modeling, psycho-social support, and goal setting. *International Journal for the Scholarship on Teaching and Learning*, *5*(2), 1–22. doi:10.20429/ijsotl.2011.050216

Martin, D. C., & Arendale, D. R. (1994). *Supplemental instruction: Increasing achievement and retention*. San Francisco, CA: Jossey-Bass.

Martin, D. C., & Blanc, R. A. (1981). The learning center's role in retention: Integrating student support services with departmental instruction. *Journal of Developmental & Remedial Education*, *4*(3), 2–4, 21–23.

Ning, H. K., & Downing, K. (2010). The impact of supplemental instruction on learning competence and academic performance. *Studies in Higher Education*, *35*, 921–939. doi:10.1080/03075070903390786

Paloyo, A. R. (2015). A note on evaluating supplemental instruction. *Journal of Peer Learning*, *8*(1), 1–4. Retrieved from http://ro.uow.edu.au/ajpl/vol8/iss1/2/

Rabitoy, E. R., Hoffman, J. L., & Person, D. R. (2015). Supplemental instruction: The effect of demographic and academic preparation variables on community college student academic achievement in STEM-related fields. *Journal of Hispanic Higher Education*, *14*(3), 240–255. doi:10.1177/1538192714568808

Stone, M. E., & Jacobs, G. (Eds.). (2008). Foreword. In *Supplemental instruction: Improving first-year student success in high-risk courses* (Monograph No. 7, 3rd ed., pp. v–vi). Columbia: University of South Carolina, National Resource Center for the First-Year Experience and Students in Transition.

Terrion, J. L., & Daoust, J. (2011). Assessing the impact of supplemental instruction on the retention of undergraduate students after controlling for motivation. *Journal of College Retention, Research, Theory, and Practice*, *13*(3), 311–327.

Truckee Meadows Community College Institutional Research (2018a). *Average course grades and term GPAs of students who attended supplemental instruction sessions compared to those who did not*. Unpublished table.

Truckee Meadows Community College Institutional Research (2018b). *Comparison of retention rates: Sections with or without an embedded tutor - spring 2017*. Unpublished table.

Truckee Meadows Community College Institutional Research Office (2018c). *Compilation of retention rates: Sections with or without an embedded tutor - spring 2017, fall 2017, and spring 2018*. Unpublished table.
Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
Yancy McGuire, S. (2006). The impact of supplemental instruction on teaching students how to learn. *New Directions for Teaching and Learning*, *106*, 3–10. doi:10.1002/tl.228
Zamberlan, L., & Wilson, S. (2015). Developing an embedded peer tutor program in design studio to support first year design students. *Journal of Peer Learning*, *8*, 5–17.