Effects of SI Administration Staffing and Support on SI Program Outcomes

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Abstract

This study explored the relationship between the Supplemental Instruction (SI) administrative hours at various colleges and universities and program outcomes (attendance rate, the difference in the average final grades, and the difference in the rate of Ds, Fs, and withdraws). All regression models were insignificant, but training-related hours per SI leader were statistically significant in one model and positively influenced the attendance percentage. This study also explored the relationship between funding and the beforementioned outcomes but netted no significant relationships. Small sample size limited these findings, so future studies should explore separate administrative constructors and collect larger samples.

Keywords: Supplemental Instruction, SI, learning assistance, program administration, SI administration, program outcomes, higher education

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Supplemental Instruction (SI) is an academic assistance program primarily used in post-secondary institutions to support student academic success. Dr. Deanna Martin designed SI at the University of Missouri – Kansas City to decrease attrition rates for courses with high numbers of students who withdraw from specific courses (Hurley et al., 2006). SI provides regularly-scheduled, voluntary study sessions for students enrolled in traditionally challenging courses (Arendale, 1994; Hurley et al., 2006). The purpose of this study is to examine the influence and relationship of SI program administrative tenets and financial support for SI programs on the outcomes of an SI program.

SI programs generally have positive outcomes for high-risk courses. High-risk courses are selected because of a higher rate of students who earn Ds, Fs, or withdraw (DFW rate); a high course enrollment (Arendale, 1994); and a perception of difficulty by the students (Martin & Arendale, 1992). When reviewing the literature on SI, Hurley and Gilbert (2008b) describe how SI programs are positively related to academic outcomes such as reducing attrition, increasing graduation rates, increasing grades, and gains in knowledge. Because of its success in these areas, the SI model has been replicated by institutions worldwide (Arendale, 2010) and verified by the Department of Education as an exemplary

educational program (Hurley & Gilbert, 2008a; Martin & Arendale, 1992).

The key feature of SI programs is SI sessions, which are regularly scheduled for the students enrolled in the targeted class (Hurley & Gilbert, 2008a). Sessions are led by the SI leader, who is usually a student who has taken the targeted course and performed well (Hurley & Gilbert, 2008a). The SI leader sits in the course again to align their SI sessions with the course content, reinforce their content knowledge, and model good student behavior during the class by listening and actively taking notes (Hurley & Gilbert, 2008a). Another key figure in SI programs is the SI faculty member who assists the program administrators in selecting an SI leader (Martin & Arendale, 1992), provides the leader support in planning sessions, and encourages student attendance to SI sessions (Hurley & Gilbert, 2008a). SI programs are managed by a staff member responsible for hiring and selecting SI leaders, training leaders, coordinating SI placement, assisting leaders, and conducting program evaluation (Martin & Arendale, 1992).

There is a void in the literature regarding the optimization and prioritization of supervision in SI programs. Program administrators are given some guidance on the level of supervision needed from the literature, but this guidance might be unrealistic or unsubstantiated with studies. For example, it is claimed that one full-time SI program supervisor cannot adequately supervise more

than three or four leaders without some assistance (Wilcox, 2008). This figure is, in practice, often unrealistic due to tight budget climates and is only supported through a description of the supervisor's responsibilities. The International Center for Supplemental Instruction (International Center), based at the University of Missouri – Kanas City, provides additional guidance for an SI program seeking accreditation, which is seen as the standard of best practice. The International Center suggests that SI programs need to have a clear focus on planning, supervision of SI leaders through observation, significant and ongoing training for leaders, and program evaluation (International Center for Supplemental Instruction, 2019a). Sometimes, the level of these activities is recommended in the rubric for accreditation (Curators of the University of Missouri, 2018); however, these recommendations do not guide programs on prioritizing these activities. Thus, there is a gap in our understanding of how SI administrator activities and a program's level of support related to the program's outcomes and prioritizing those responsibilities. This study seeks to add to our understanding of the effective administration of SI programs.

Literature Review

SI was created in the 1970s to support courses with higher rates of attrition (Hurley & Gilbert, 2008a). SI targets high-risk courses rather than high-risk students to support students in a non-remedial

manner, and because it serves students in groups versus individually, it is more cost-effective than traditional one-on-one tutoring models (Hurley & Gilbert, 2008a). The creation of SI was timely in higher education. Families were expecting more from post-secondary institutions due to rising costs and lower student outcomes, such as graduation rates increased accountability from the government and accrediting bodies (Cohen & Kisker, 2010). However, as SI approaches 50 years since its inception, examining its administrative structure for efficiency and effectiveness in promoting student academic outcomes is needed.

There are three main groups of individuals in SI programs: the SI leader, the SI supervisor, and faculty member of the targeted course (Hurley & Gilbert, 2008a; Martin & Arendale, 1992). The SI leader is collaboratively selected for the position by the faculty member and SI supervisor (Martin & Arendale, 1992). Once hired, the SI leader attends class again and plans and holds scheduled review sessions outside of class (Hurley & Gilbert, 2008a). SI faculty members must be willing partners in the SI program and work with their SI leader regularly to assist them with session planning (Hurley & Gilbert, 2008a). An SI supervisor is generally trained by the International Center (Wilcox, 2008) and, if possible, full-time (Ainsworth et al., 1994). An SI supervisor leads regular programming activities such as training SI leaders, observing SI sessions, planning program logistics, conducting program evaluation, and fostering

relationships with stakeholders across campus (Hurley & Gilbert, 2008a). The literature on SI programs provides further guidance on these administrative activities.

Training is vital for all learning assistance professionals (Arendale, 2010), and training is a significant aspect of an SI supervisor's workload (Wilcox, 2008). In general, SI program supervisors are expected to lead approximately eight to 16 hours of training for SI leaders each semester (Wilcox, 2008). These training sessions cover various topics such as learning theory, collaborative learning, and how to lead sessions (Lipsky, 2006; Martin & Arendale, 1992; Zaritsky & Toce, 2006). Other writers discuss the importance of ongoing training to help leaders continue to use effective strategies in sessions (Hurley et al., 2006).

Next, SI program supervisors are expected to assist SI leaders through observations and supporting planning for sessions. Observations of SI sessions help SI leaders improve their sessions by providing a chance for feedback and individual training (McDaniel, 2008). Bolman and Deal (2013) indicated that effective organizations provide feedback to improve performance and on-the-job training. SI program supervisors are recommended to observe the first three SI sessions at the beginning of the term and then weekly or biweekly for the remainder of the term (Wilcox, 2008). For SI program accreditation, SI program supervisors are encouraged, at the highest level of performance, to observe SI leaders at least ten

times if they are new leaders and eight times if they are returning (Curators of the University of Missouri, 2018). Planning support for SI sessions is also a part of the supervisor's responsibilities. SI leaders are expected to plan each session and work with their supervisor and faculty member(s) to plan SI sessions (Hurley et al., 2006).

The SI supervisor is responsible for a full range of administrative duties. Supervisors have significant responsibilities in managing the hiring processes and ensuring potential SI leaders meet the qualifications for the position (McDaniel, 2008). Assessment and evaluation of the SI program is also critical (Hurley et al., 2006) and adds to the program's creditability (Wilcox, 2008). Other administrative responsibilities include determining courses, maintaining faculty relationships, and marketing SI to students (Martin & Arendale, 1992; Wilcox, 2008). Lastly, supervisors are responsible for the program's logistics, such as scheduling sessions and supervision of the daily operations (Hurley et al., 2006).

Beyond the administrative responsibilities, there are the costs associated with running an SI program. Generally, SI leader salaries are the highest cost to an SI program (Martin & Arendale, 1992; Wilcox, 2008). Other costs include supplies (Widmar, 1994) and release time or salaries for administrative personnel (Wilcox, 2008). Some programs use experienced SI leaders to help with the supervision of SI leaders to reduce salary costs for administration

(Martin & Arendale, 1992). Despite these costs, SI is largely seen as a low-cost and efficient program due to its group-based approach (Wilcox, 1992; Zerger et al., 2006).

SI programs have several measurable outcomes. The first measure of success is the attendance percentage. SI sessions are usually voluntary for students to attend (International Center for Supplemental Instruction, 2019b); thus, the percentage of students who attend at least one SI session is one indicator of program success. Also, Arendale (2000) studied the influence of SI program constructs on program outcomes, including participation rate, and found that SI supervisor involvement was significantly related to participation rate. Thus, exploring administrative hours and financial support and their relationship with participation would further support this finding.

Beyond attendance percentage, there are other standard measures consistent in the evaluation of SI programs. Hurley et al. (2006) described comparing the rate of students who earn a D, F, or withdraw from a course of the students who attend at least one SI session and the students who do not attend any SI sessions. Another measure compares the average final grade of the students who attend SI sessions with the students who do not attend any SI sessions (Hurley & Gilbert, 2008a). These are considered consistent outcomes to measure SI program success.

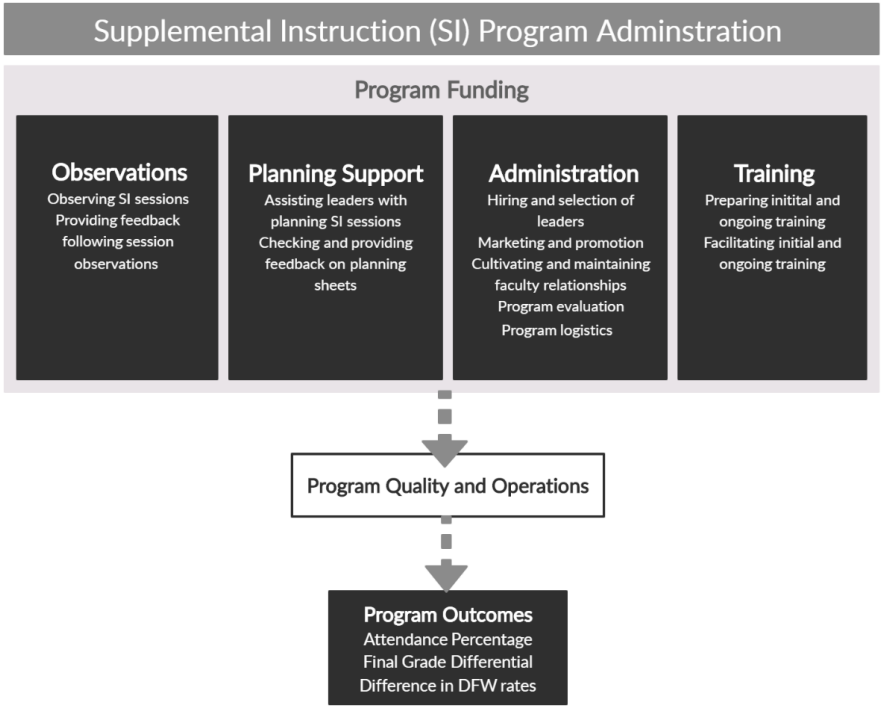
There is limited guidance and research on the administration and financial support of SI programs. Wilcox (2008) suggested that one SI program supervisor can only supervise at most four SI leaders before needing assistance, reasoning that there is little time left between observation, planning, training, and managing the program. However, they do not cite any research substantiating this ratio. Arendale (2000) explored how aspects of SI programs such as observations, class attendance of the SI leaders, session activities, and training impact program outcomes (the participation rate, the difference in DFW rates, the difference in average grades, and satisfaction of SI program by administrators). Arendale (2000) found that SI supervisor involvement and leader training were significantly related to program success, but he did not indicate these areas' optimal levels. Similarly, there has been no discussion on how financial support affects SI program outcomes in the literature. Thus, this study seeks to add to our understanding of effective administration and support of SI programs.

Research Questions

This study uses SI program-level data for a specific semester or term from various institutions. The percentage of students served from each program, final average grade differential between the students who attend SI and those who do not, and the difference in the DFW rates of SI session attendees and non-attendees were collected where available and serve as the dependent variables in

this study. The independent variables in this study relate to the SI program's supervision and support during that specific semester. The independent variables include the average observation hours per SI leader, average hours spent assisting with planning per SI leader, the average training-related hours per SI leader, average supervisory hours per SI leader, and average funding per SI leader. For a complete definition of terminology used, please refer to Appendix B. Figure 1 visually explores the possible relationships between these variables.

Figure 1.
SI Administrative Tenets and Program Outcomes



The following research questions guided the study:

1. What is the relationship between the observation hours per SI Leader, planning hours per SI leader, training hours per SI leader, administrative hours per SI leader, and funding per SI leader for an SI program (from now on referred to as "the supervision and support of the SI program") and the percentage of students enrolled in an SI course that attend at least one SI session?
2. What is the relationship between the supervision and support of the SI program and the final grade differential between students who attended SI sessions and students who did not?
3. What is the relationship between the supervision and support of the SI program and the difference in DFW rates of students who attended SI sessions and those who did not?

Methodology

Setting and Participants

This study took place between January and March 2020. The target audience was higher education institutions with an SI program in North America. SI programs in North America exist at all types of post-secondary institutions so that data could be from a two- or four-year school as well as public or private entities. At the time of writing, there are over 1,000 institutions with an SI program in North America.

The International Center has a website with institutions with a trained SI supervisor and a list of accredited programs. These program websites were mined to create a list of institutions that could potentially have SI programs. To generate more potential SI program contacts, a list of higher education institutions in states in the Midwest was created to explore potential SI programs. Each institution's websites were examined for evidence of an SI program or SI-like program for contact information. If there was an SI program, the email and phone number, if found, were added to a list to use for contact. The survey and reminders were also posted on two listservs commonly used by SI professionals, which provided another way to reach potential SI programs.

From the list of programs, approximately 575 individuals were emailed from over 550 institutions, and 36 of those completed the survey (roughly a 6.3% response rate). From the listservs or other means, approximately 12 additional SI programs responded to the survey. If institutions replied to the survey invitation email to indicate that they could not fill out the survey, the typical reasons included being new to SI program administration, that the institution does not have an SI program, they did not have time to complete the survey, or that they did not have access to data needed to complete the survey. Table 1 shows the frequency of institutions and the demographic characteristics of the institutions that

responded to the survey. One institution was Canadian, while the rest were located in the US.

Table 1.
Institutional Characteristics of the Survey Respondents

		Frequency
Was the institution public or private?	Private	9
	Public	53
	Unknown	1
Was the institution a 2-Year or 4-Year Institution?	2-Year	14
	4-Year	48
	Unknown	1
Was the SI program accredited by the International Center?	No	38
	Unsure	4
	Yes	21

A majority of the SI programs that responded to the survey were from public, four-year institutions. In 2018, public higher education institutions represented approximately 40.5 % of the institutions in the US, and four-year institutions accounted for approximately 67% of higher education institutions (U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics, 2019). In contrast, the data collected was approximately 84% public and 76% four-year institutions. The percentage of four-year institutions collected seems similar enough to represent, but the data collected might be biased towards public institutions. Not all responses were complete, and others provided information that would suggest that their data would be skewed or unusable. Thus, the program responses were reviewed, and responses were

removed if the program used different attendance criteria to classify SI attendees (e.g., SI attendees needed to attend three times before being counted in that group), or if there was evidence of extra credit or required attendance to SI sessions that were included in the program's data. These institutions would have influenced the analysis as these criteria would have affected the program outcomes directly.

Additionally, responses were checked for reasonableness and adjusted if needed. For example, a program with 70 SI leaders suggested their funding level was 20 dollars, which did not make sense, so the funding level was removed from that program's response and left blank. After removing these responses and adjusting for specific values, 47 institutions/data points remained in the study.

Survey Design and Implementation

Significant care was used when designing and implementing the survey. The initial survey was designed with good survey design practices, such as avoiding biased phrasing, focusing questions on a single thought, and placing easy-to-answer questions at the end (Fink, 2017). Additionally, Fink (2017) and Newcomer and Triplett (2015) recommended pilot testing a survey to gather feedback on the design and clarity of questions. Thus, the initial draft of the survey was sent to two SI program supervisors for initial review

and feedback. Their suggestions were incorporated, and they were asked to review the survey again to provide additional feedback. A final pilot testing round included experts at the International Center, four former or current SI program supervisors trained in the SI model, and two higher-level administrators whose units include SI programs. Using experts in the field to examine the survey can increase the validity of the results (Creswell, 2014), so these processes added validity to the instrument. The feedback from these pilot testing processes was incorporated before distribution. See Appendix A for the final version of the survey.

Initial emails and follow-up emails were sent to the list of program contacts inviting them to fill out the survey. In total, most programs had about a month to respond to the survey.

Data Analysis

To control for SI program size, the independent variables (observation hours, planning support hours, training-related hours, administration hours, and program funding) were divided by the number of SI leaders actively working that term for that program. Table 2 shows the descriptive statistics of the variables and outcomes in this study. Linear regression was the primary method of analysis. Linear regression is an analysis method to measure the linear relationship between at least two predictor variables (Miles & Shevlin, 2001). Field (2018) outlines several regression models' assumptions, including additivity and linearity, independence of

errors, homoscedasticity, normal distribution of errors. Of these assumptions, one possible concern is program funding and the assumption of independence. The values for observation hours, training-related hours, planning support hours, and administrative hours depend on program funding because funding dictates how much administrative time is spent on these areas. Several programs also indicated that calculating funding was a challenge when responding to the survey. Given this and the violation of the independence assumption, program funding was examined separately with each dependent variable. For the remaining four independent variables, other possible concerns for multiple linear regression include multicollinearity and outliers (Field, 2018). All these assumptions were met except for some possible outliers, which are addressed later.

Table 2.
Descriptive Statistics of the Variables and SI Leaders

	N	Mean	SD	Minimum	Maximum
Average Final Grade Differential*	46	0.62	0.40	0.03	2.00
Difference in the DFW Rates (%)	45	16.38	10.28	0.12	55.00
Attendance Percentage (%)	46	37.91	15.03	7.84	71.10
Observation Hours Per SI Leader	48	7.42	7.05	0.36	30.30
Training Hours Per SI Leader	48	3.13	3.86	0.29	20.45

Planning Hours Per SI Leader	48	3.49	4.98	0.00	22.50
Administration Hours Per SI Leader	46	17.93	20.62	0.64	104.17
Funding Per SI Leader	43	$3,091.26	$1,648.05	$93.75	$8,333.33
Number of SI Leaders	48	25.67	19.945	3	83

*Values are presented in GPA format using a four-point scale (4 = A, B = 3, etc.)

The sample size also played a significant role in this study. The sample size needed for a study depends on several factors. Miles and Shevlin (2001) suggest using a power analysis for determining the appropriate sample sizes for any study or experiment. This process uses the significance level, the desired effect size in the population, and desired power level (Miles & Shevlin, 2001). In this study, the significance level is set at 0.05, and the study seeks to uncover large effect sizes. Lastly, the power level was set to 0.8, which Cohen (1988) suggests is conventional (as cited by Miles & Shevlin, 2001).

Additionally, the needed sample size for the study is affected by the number of predictors in the regression model (Miles & Shevlin, 2001), which in this study is four. With four predictor variables, a significance level of 0.05, a power level of 0.8, and the ability to detect large effect sizes, this analysis needs a sample size of at least 40. Thus, this study has a sufficient sample to detect large effects for

the four predictor variables. Next, the assumptions of multiple linear regression are explored.

As mentioned earlier, there were potential concerns related to outliers. Outliers were uncovered using residual plots, as recommended by Miles and Shevlin (2001). For the model examining attendance percentage as the dependent variable, two outliers were discovered by inspecting the residual plots. There was one outlier for the model examining DFW rates, while in the model examining differences in final grades, three outliers were identified. Miles and Shevlin (2001) suggest determining why an outlier occurs. With these responses, there was insufficient evidence to suggest that there was a measurement error. Thus, Miles and Shevlin (2001) present a dilemma: including the outlier might influence the model but excluding it might be inappropriate. Therefore, Miles and Shevlin (2001) recommend running the analysis twice and reporting the results with the outliers included and not included. This strategy was used in this study. The new datasets with the outliers removed were also checked for multiple linear regression assumptions, and no additional concerns were noted.

As funding was separated from the other predictor variables, a separate analysis was conducted using that variable with the dependent variables. Correlations measure the linear relationship between two variables (Miles & Shevlin, 2001). Thus, the correlation

would be an effective way of measuring the potential relationship between program funding and program outcomes. According to Field (2018), two assumptions are considered when calculating a correlation: linearity and normality. Both assumptions were checked before proceeding, and no concerns arose. Thus, the correlation was used to analyze the SI program's funding as it relates to the outcomes of the SI program.

Findings

Research questions organize the findings in this section. However, since the analysis related to funding was separated, it is addressed in a separate subsection.

Attendance Percentage

Multiple linear regression was used to determine if there was a relationship between the supervision and support of the SI program and attendance percentage. As addressed in the previous section, there were two outliers in the dataset, and the following results included those outliers in this analysis. A non-significant regression equation was found, F (4, 39) = 2.573, p = .053, with an R^2 = .209, which suggests the model accounted for approximately 20.9% of the variance in the sample. None of the model variables are statistically significant at α = 0.05 except for training hours per SI leader, p = .027. Table 3 gives the regression coefficients and standardized beta values.

Table 3.
Coefficients for Regression Model for Attendance Percentage with Outliers Included

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	β	*t*	Sig.
Constant	39.850	3.904		10.208	<.001*
Observation Hours Per SI Leader	-0.040	0.320	-0.019	-0.126	0.900
Training Hours Per SI Leader	1.259	0.550	0.333	2.290	**0.027***
Planning Hours Per SI Leader	-0.611	0.449	-0.207	-1.359	0.182
Administration Hours Per SI Leader	-0.160	0.105	-0.220	-1.531	0.134

*Significant at $\alpha = 0.05$

For the next analysis, the two outliers were removed from the dataset, and the regression equation was calculated again with attendance percentage as the dependent variable. In this new analysis, a significant regression equation was not found, $F(4, 37) = 1.296$, $p = .289$, with an $R^2 = .123$, which suggests the model accounted for approximately 12.3% of the variance in the sample. Additionally, none of the model variables were statistically significant at $\alpha = 0.05$. Table 4 gives the regression coefficients and the standardized beta values for this new model.

Table 4.
Coefficients for Regression Model for Attendance Percentage with Outliers Excluded

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	β	*t*	Sig.
Constant	40.947	4.429		9.245	<.001*
Observation Hours Per SI Leader	0.022	0.348	0.011	0.062	0.951
Training Hours Per SI Leader	0.653	1.231	0.088	0.531	0.599
Planning Hours Per SI Leader	-0.656	0.464	-0.234	-1.415	0.165
Administration Hours Per SI Leader	-0.161	0.107	-0.233	-1.502	0.142

*Significant at $\alpha = 0.05$

Average Final Grade Differential

A similar process was conducted using the average final grade differential as the dependent variable instead of the attendance percentage. The same independent variables were included. Also, similar to the models created with the attendance percentage, three outliers were discovered when checking the assumptions. This model was conducted with those outliers included. The regression equation was not statistically significant, F (4,3 9) = 1.480, $p = .227$ with an $R^2 = .132$. This model accounted for roughly 13.2% of the variance. None of the variables included in the model were statistically significant at $\alpha = 0.05$ as well. Table 5 gives the

regression coefficients and the standardized beta values for this model.

Table 5.
Coefficients for Regression Model for the Average Final Grade Differential with Outliers Included.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	β	*t*	Sig.
Constant	0.605	0.108		5.585	<.001*
Observation Hours Per SI Leader	-0.015	0.009	-0.272	-1.690	0.099
Training Hours Per SI Leader	-0.005	0.015	-0.053	-0.351	0.728
Planning Hours Per SI Leader	0.022	0.012	0.287	1.803	0.079
Administration Hours Per SI Leader	0.003	0.003	0.156	1.038	0.306

*Significant at $\alpha = 0.05$

The three outliers were removed from the dataset, and the regression model was created again. Again, the regression model was not significant, F (4, 36) = .914, $p = .466$, with an $R^2 = .092$ which is about 9.2% of the variance. Additionally, none of the variables were significant in the model at $\alpha = 0.05$. Table 6 gives the regression coefficients and the standardized beta values for this new model.

Table 6.
Coefficients for Regression Model for the Average Final Grade Differential with Outliers Excluded

	Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
	B	Std. Error	β		
Constant	0.605	0.078		7.771	<.001*
Observation Hours Per SI Leader	-0.012	0.008	-0.302	-1.546	0.131
Training Hours Per SI Leader	-0.008	0.011	-0.111	-0.695	0.491
Planning Hours Per SI Leader	0.005	0.012	0.082	0.425	0.673
Administration Hours Per SI Leader	0.002	0.002	0.172	1.061	0.296

*Significant at $\alpha = 0.05$

Difference in the DFW Rates

Lastly, a regression analysis was run using the difference in the DFW rates between the students who attended at least one session and the students who did not attend any SI sessions as the dependent variable with the same independent variables used for the attendance percentage and average final grade differential models. In this model, only one outlier existed, and it was included for this first model. A non-significant regression equation was the result, $F(4, 38) = .902$, $p = .472$, with an $R^2 = .087$. This model accounted for about 8.7% of the variance in the data. Additionally, none of the independent variables in the model were significant at $\alpha = 0.05$. Table 7 gives the regression coefficients and the standardized beta values for this new model.

Table 7.
Coefficients for Regression Model for the Difference in the DFW Rates with Outliers Included

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	β	*t*	Sig.
Constant	19.024	2.658		7.158	<.001*
Observation Hours Per SI Leader	-0.028	0.214	-0.022	-0.133	0.895
Training Hours Per SI Leader	-0.031	0.370	-0.013	-0.084	0.934
Planning Hours Per SI Leader	-0.357	0.301	-0.196	-1.186	0.243
Administration Hours Per SI Leader	-0.091	0.070	-0.202	-1.293	0.204

*Significant at $\alpha = 0.05$

For the last regression analysis, the sole outlier was removed from the dataset. The regression model was created using the DFW rates' difference as the dependent variable with the same independent variables. This model was not significant, F (4, 37) = .721, $p = .583$, with an $R^2 = .072$ which is approximately 7.2% of the variance in the sample. Again, none of the independent variables were statistically significant at $\alpha = 0.05$. Table 8 gives the regression coefficients and the standardized beta values for this model.

Table 8.
Coefficients for Regression Model for the Difference in the DFW Rates with Outliers Excluded

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	β	*t*	Sig.
Constant	16.211	2.126		7.626	0*
Observation Hours Per SI Leader	0.059	0.166	0.061	0.358	0.722
Training Hours Per SI Leader	0.086	0.287	0.048	0.299	0.766
Planning Hours Per SI Leader	-0.283	0.233	-0.204	-1.211	0.234
Administration Hours Per SI Leader	-0.061	0.055	-0.178	-1.116	0.272

*Significant at $\alpha = 0.05$

SI Program Funding

SI program funding and its potential relationship with the SI program's attendance percentage, the average final grade differential, and the difference in the DFW rates were examined via Pearson correlation. None of these relationships were statistically significant at $\alpha = 0.05$. Both of the correlation coefficients for the relationship with per SI leader funding and the average final grade differential, and a difference in DFW rates were positive. In contrast, the correlation coefficient with attendance percentage was negative. Table 9 shows the correlations of these values with the corresponding *p*-values.

Table 9.
Pearson Correlations with Per SI leader Funding by Program Outcome

	r	Sig.	*N*
Average Final Grade Differential	0.257	0.105	41
Difference in DFW Rates	0.032	0.844	40
Attendance Percentage	-0.220	0.167	41

Discussion

None of these models were statistically significant, suggesting that other factors explain the SI program outcomes variance. Arendale (2000) learned significant relationships between participation rate in SI sessions and the program constructs, which included SI supervisor involvement, SI leader involvement, SI leader training, and institutional involvement. When drilling that down further, SI supervisor involvement was significantly related to higher participation rates. Because this study focused on SI supervisor activities and did not involve the other constructs, these other constructs explain some of the model's variances. Moreover, Arendale (2000) recommended that further research include national studies of SI programs with constructs such as institutional or student characteristics were not incorporated in this study. Finally, this research only had a sufficient sample size to detect large effects according to a power analysis based on Miles and Shevlin's (2001) work. Therefore, it is possible that medium or small effects of the constructs exist, but the sample size was insufficient to

detect those effects. Nonetheless, there are some results to explore further from this study and possible areas of future research.

Attendance Percentage

Neither regression model using the attendance rate as the dependent variable was statistically significant; however, the model including the outlier showed that training hours per SI leader was significant. This result suggests that every additional hour of training/training planning time conducted per SI leader will net a 0.65% boost in the SI sessions' attendance rate across the program. This result should be treated with caution, however, as the model itself was not significant. If significant, the model only accounted for approximately 21% of the variance in the data. However, the model including the outliers was approaching statistical significance with $p = .053$, which might suggest this model's variables can be influential with more data to detect smaller effects. Both of those effects were erased with the outliers removed, suggesting that the outliers were influential on the model.

Given the prevalence of training in the literature on leading SI programs, it is perhaps unsurprising that training time per SI leader showed up as a significant result in one of the models. In the supervisor manual handed out by the International Center, strategies to boost attendance are addressed with supervisors (Curators of the University of Missouri, 2019). McDaniel (2008) discussed scheduling ongoing training for SI leaders to provide

support for each other. Such support might be influencing the SI leader's performance and thereby increasing attendance percentages. This result might also be a result of better attendance tracking. McDaniel (2008) recommends discussing data collection, such as attendance at sessions, as part of pre-term training. That emphasis in training might result in better tracking of attendance; consequently, attendance percentages would go up. Lastly, Bolman and Deal (2013) discuss training in the context of effective organizations. Thus, training might result in better organizational outcomes, in this study, attendance rates. Surprisingly, administrative hours per SI leader was not significant in either model related to attendance. Arendale (2000) found that participation rates were significantly related to the specific SI program supervisor constructs questions on conducting program evaluation. Administrative hours in this study captured the time spent conducting program evaluation, so this study's insignificant results somewhat run contrary to Arendale's (2000) findings.

Difference in Average Final Grade

Neither model—the one with or without outliers—was statistically significant. This finding suggests that other factors influence the average final grade differential. It is worth noting that observation hours per SI leader and planning hours per SI leader were approaching significance in the model that included outliers with $p = .099$ and $p = .079$, respectively. These results also

approached statistical significance, so it might suggest that these variables have a medium or small effect on the average final grade differential. However, observation hours per SI leader showed a negative effect on the difference in average grades, while planning hours per SI leader showed a positive effect.

Stout and McDaniel (2006) describe observations and debriefing as part of a performance evaluation process for SI leaders. Even though observations are described as developmental (Stout & McDaniel, 2006), it is possible that SI supervisors conduct more observations when performance is lagging. This type of coaching or supporting relationship is recommended by the coaching and directive leadership styles when follower competence is low (Blanchard et al., 1985). Additionally, the rubric for accreditation of SI programs recommends a greater number of observations for newer SI leaders (Curators of the University of Missouri, 2018), who are likely less competent than their more experienced peers. Thus, the number of observations could be weighted for less competent leaders and skew results negatively. Nonetheless, this finding merits additional exploration and future studies should examine the relationships between observation hours of sessions and measures of program performance.

In contrast, planning support for SI sessions might result in higher quality sessions. McDaniel (2008) suggested that supervisors assist SI leaders in planning that uses effective pedagogy and

encourages the use of lesson plan formats. Thus, these planning processes may influence the quality of SI sessions and the performance of the students who attend sessions and thereby increase the difference in the average grades between the students who attend SI sessions and those who do not. Similar to observations, future research should explore planning support systems. In the second model, outliers were removed. The near significant effect was removed for these variables; subsequently, there is insufficient evidence to suggest that these two constructs truly affected the difference in average grades. Nonetheless, future research should explore these constructs to see if there are smaller effects.

Difference in the DFW Rates

Neither regression model was significant when exploring the relationships between administrator activities and the difference in the DFW rates of the students who attend SI sessions compared to the students who do not attend SI sessions. Hurley and Gilbert (2008a) described SI program evaluation processes, which include examining the difference in the average final grade between the SI session attendees and non-attendees as a measure of student learning while examining the differences in DFW rates as a measure of attrition for that course. The results in these models suggest that SI administrator activities do not significantly affect the attrition in these high-risk courses. As suggested earlier, the sample size was

sufficient to detect large effects, but not small or medium effects; thus, supervisory activities may have a medium effect or small effect on attrition for these courses.

Program Funding

When examining the correlations of the program outcomes (average final grade differential, the difference in the DFW rates, and attendance percentage) with SI program funding per SI leader, there were no significant correlations. The relationship between funding and both the average final grade differential and difference in DFW rates were positive, $r = .257$, and $r = .032$, respectively. According to Field (2018), we can calculate the effect size of each of these by squaring them; thus, $R^2 = .066$ for the relationship between the average final grade differential and per SI leader funding, and $R^2 = .001$ for the relationship between the difference in the DFW rates and per SI leader funding. Cohen (1988) suggests that $R^2 = .02$ is a small effect size while $R^2 = .13$ is a medium effect size (as cited in Miles & Shevlin, 2001). Thus, even if the results were statistically significant, the effect size for the relationship between funding per SI leader and average grade differential is small. The relationship between per SI leader funding and the difference in the DFW rates is minimal if it exists at all. Similarly, the relationship between funding per SI leader and attendance percentage was negative, $r = -.220$, $R^2 = .048$, which is a small effect size. These effects should be

treated cautiously, as there were no statistically significant correlations in the analysis.

Understanding these relationships is challenging. Bolman and Deal (2013) describe organizations as groups advocating for limited resources. One would suspect that being able to advocate for program resources successfully would improve the program outcomes. This result is modestly true for the relationship between funding per SI leader and the average grade difference, but not for attendance percentage. Hurley and Gilbert (2008a) indicate that SI faculty involvement is critical to the program's success. Faculty can easily refer students to an SI program (Martin & Arendale, 1992); thus, attendance percentage as an outcome might be more related to faculty involvement than program funding. Bolman and Deal (2013) suggest that its size influences an organization's structure, so attendance percentages may be affected more by institutional size than by funding. Possibly, large institutions have more resources while smaller institutions have less. Still, larger institutions would have larger class sizes, while smaller institutions with smaller class sizes would refer students to SI sessions more easily. Regardless, more research should be conducted on funding and program outcomes. Before conducting this study, the International Center was consulted and suggested funding in the study (J. Collins & M. Cross, personal communication, August 8, 2019). This vein of

research should be continued as it has significant implications for the field.

Limitations

There are several limitations to this study. The first set relates to the quality of the data collected. First, the data collected was from a convenience sample, which refers to "people who are willing to complete the survey are also available when you need them" (Fink, 2017, p. 99). This type of sampling can introduce bias in the results because the sample may not be representative of the population. The institutions' demographic characteristics appeared to be relatively representative regarding four-year institutions (see Table 1), but there was a bias towards public institutions. Second, although the survey was vetted by experts, as suggested by Creswell (2014) and pilot tested as suggested by Fink (2017), there was room for misinterpretation of the questions, so it is possible that the respondents misinterpreted the questions when responding. While there was insufficient evidence to remove the outliers mentioned earlier, they may be outliers because the respondents misinterpreted the question and responded accordingly.

Third, several programs responded via email or within the survey context to indicate that they tracked their data differently, such as classifying SI attendance as those who attend three or more sessions versus one or more. Those results were excluded when it

was known. Still, some of the respondents may have included their data without sharing those differences in their calculations, which could have introduced errors into the data. Lastly, as mentioned several times, the sample size is a possible limitation. With a larger sample size, multiple linear regression may have been able to detect small and medium effect sizes (Miles & Shevlin, 2001). It should also be noted that data collection for this study was interrupted by international events that disrupted educational operations, which affected the total number of respondents, specifically the COVID-19 pandemic of 2020.

The second set of limitations concerns characteristics or qualities outside the data collection process. For example, institutional size or classification was not included in the analysis. There is a possible relationship between the institution's characteristics and SI program outcomes, especially since our sample was biased towards public institutions. Additionally, as funding for SI programs is primarily salaries (Wilcox, 2008), the funding might be contingent on the cost of living in the areas surrounding the institution rather than a marker of institutional support. Besides those, there were also differences in institutional practices as it pertains to their SI program. Wilcox (2008) recommends flexibility in the model for newer SI programs as they adapt SI to their institution. Several institutions included in the study were different in ways they adapted the SI model, such as the number of SI leaders per

enrollment, number of sessions offered each week, differences in class attendance, and others. If any of those differences directly affected the outcomes of the program, the response would have been excluded; otherwise, the response was included. Thus, these differences could be related to SI program outcomes more than this study's constructs.

Delimitations

There are a few delimitations of the study. The first was the assumption that supervisory characteristics would be related to SI program outcomes while not including other aspects of SI programs. For example, faculty involvement is seen as critical to an SI program's success (Hurley et al., 2006), but this study did not include a measure of that involvement. Some of the recommendations from Arendale's (2000) dissertation included national studies involving student characteristics or institutional characteristics. Thus, these are possible future areas of study but were also delimitations of this study. Second, the institutions in this data set were collected from North American institutions. Any institutions that filled out the survey as part of other international contexts were excluded. Third, in the survey, the hours reported included paraprofessional staff, such as experienced SI leaders who serve to mentor or assist in program management. Respondents were asked to lump the hours of professional and paraprofessional staff together, implying no difference in the quality of those hours.

There may be a difference between professional and paraprofessional staff, but there is a lack of research to determine what differences exist and the impact on program outcomes.

Recommendations for Practice

Because of the lack of statistical significance within the variables studied, this study does not offer many practice recommendations. The findings around training hours per SI and attendance percentage provide one recommendation. Based on this study's findings, SI program supervisors should consider prioritizing training-related activities when trying to boost SI attendance percentage. As McDaniel (2008) suggests, spending time discussing data collection during training is essential. This emphasis in training makes sure that leaders collect accurate attendance data. Spending time discussing the important role of SI leaders in attendance and working on strategies during training to promote session attendance is another recommendation. For example, the SI supervisor manual discusses SI marketing strategies to boost attendance and includes distributing handouts, offering sample tests, and writing SI times on the board every class period (Curators of the University of Missouri, 2019). Reviewing these strategies with SI leaders during training could be a valuable method of boosting session attendance. Besides the focus on attendance strategies, SI supervisors could focus on other aspects of training that could produce higher quality sessions or processes that would boost

attendance. One example might be creating a welcoming and inclusive environment in sessions to help students feel comfortable. Besides using training to boost attendance, there might be some considerations for SI programs to insert more planning support processes to support SI leaders and promote program outcomes. Still, this research did not substantiate that finding.

Further Areas of Study

This research provides multiple opportunities for additional areas of study. The first exploration area would be examining the supervisory constructs individually and controlling for other characteristics or constructs. For example, exploring the relationship of planning support or observations with course outcomes when controlling for training, funding, and administrative support at one institution could control outside variances present in this study. Studies such as these would help refine what practices are critical to an SI program's success and efficiency. Additionally, future research should explore what aspects of training-related activities are associated with attendance percentage to help supervisors prioritize their work. Given the near significance of planning support and observation hours on the difference in average final grades, future research should explore these constructs further. In particular, research should investigate the potential negative relationship between observation hours and the difference in average final grades.

The second area of recommended further study would be to explore mixed-method approaches of program effectiveness. Creswell (2014) suggests three possible mixed-method designs, convergent parallel mixed methods (qualitative and quantitative research are conducted at the same time and compared); explanatory sequential mixed methods (quantitative analysis informs qualitative data collection); and exploratory (qualitative analysis informs quantitative data collection). Any of these three approaches might help explore supervisory constructs more deeply and inform additional studies on how they influence program outcomes. Such approaches might produce informative findings through sequential research methodologies.

Lastly, future studies should continue to collect data on a national or international level. For example, this study analyzed data in North American contexts, but a similar study could be conducted with SI programs in Australia. Additionally, these studies could include other important characteristics, such as institutional characteristics, faculty involvement, and other key factors that are theoretically linked to an SI program's success. With such studies, a longer and more robust data collection process is likely warranted to ensure sufficient sample sizes to detect small and medium effects and a representative sample.

Conclusion

This study explored the relationships between SI program supervisory constructs and financial support with program outcomes through multiple linear regression and correlation. While no significant models or correlations were detected, the training hours per SI leader were significantly related to the program's attendance percentage. This finding suggests that every hour added for training-related activities per SI leader will net an increase of slightly more than a half of a percent in the program's attendance percentage. This finding suggests that training-related hours should be a critical component of an SI program supervisor's activities. Supervisors should focus on attendance strategies and creating high-quality sessions during training to boost attendance for the program. This study was limited by several factors but mainly sample size, measurement of constructs, and the exclusion of other potential factors that may influence an SI program's success. Future study areas should focus on the individual supervisory constructs and design studies that are longitudinal and consist of various research methodologies.

The cost of higher education has been increasing, and the accountability from governments and individual families for student success is increasing (Cohen & Kisker, 2010). Huisman and Currie (2004) suggest that higher education accountability is also related to how funds are used efficiently. As SI programs look to

expand or justify their continued funding, additional research is needed to evaluate program impact, support continued operational efficiency, and continuously improve program quality. Studies such as these lead conversations around effectiveness and efficiency to provide the best possible programming for student success.

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Appendix A

SI Program Survey

This survey is designed to collect data for a research study about the effect of SI program administrator activities and funding on program outcomes. We are conducting this study to determine what SI program supervisory activities are the most critical for program outcomes, the optimal level of those activities, and to assist in prioritizing these tenets. The research is conducted as part of a dissertation at the University of Missouri – Columbia.

We invite you to take part in this research study because of your potential affiliation with an SI program. If you do not feel you can answer the following questions or do not feel you are the appropriate person, please pass this survey along to the current SI supervisor at your institution.

Anyone who leads a Supplemental Instruction (SI) in North America based on the model created at the University of Missouri – Kansas City are invited to complete this study. You are assisting SI program administrators in learning how their activities affect program outcomes. By participating in this research, the results of the research will help SI program administrators lead their programs. The results of the study could help administrators find gaps in their current practice and subsequently advocate for resources. If SI programs are seeking to expand or implement new SI programs, the findings will help them do that.

Your participation in this research should only take approximately 10-15 minutes if your data is readily available. Your participation in this survey is entirely voluntary. You may stop at any time and decide not to complete the survey, and your responses will not be recorded. Only one survey response per program per semester/term is needed.

Participants who choose to include their email when completing this survey will receive a copy of the findings. There are no other known benefits to participate in the study.

The information we collect about your SI program will be kept anonymous, and no identifiable information for the institution or program will be present in the results of the study. Additionally, the data will be stored on the researcher's computer behind password protection.

If you have any questions or concerns, please contact Kirk Skoglund at kaskhn@mail.missouri.edu or the dissertation advisor, Dr. Timothy Wall, at timwall@nwmissouri.edu.

If you have questions about your rights as a research participant, please contact the University of Missouri – Columbia Institutional Review Board (IRB) by phone 573-882-3181 or email irb@missouri.edu.

Definition of Terms

- Administrative staff – any personnel associated with an SI program who assists in the program administration, including training, observations, session planning, program evaluation, data collection, and logistics. These personnel include SI mentors, graduate assistants, professional staff, and clerical staff.
- SI Mentors – program assistants that may assist with a variety of SI program tasks, including observations, assisting SI leaders with planning, assisting with training, data collection and evaluation.

To complete this survey, you will need access to the following information:

For a given semester or term, the following data points:

- **Average grade differential*** defined as the difference in the average final course grade of the entire SI program for a given semester using a four-point scale (4=A, B=3, etc.) between the students who attended at least one SI session compared to the students who did not attend any SI sessions.
- **The difference in DFW rates*** for the entire SI program defined as the difference between the rate of students who earn a D, F, or withdrew from a course and attended at least

one SI session and the students who earned a D, F, or withdrew from a course and did not attend any SI sessions

- **Percentage of students who attended at least one SI session*** for the entire SI program for SI-supported courses.
- **Approximate number of training hours, number of SI Leaders, number of observation hours, administration hours** (see guided questions below for more details.)
- **Approximate amount of funding devoted to the SI program for a given semester** (see the guided questions below for more detail.)
- *If you are missing this data point and cannot calculate it, you may leave it blank.

Guided Questions

For these questions, consider a specific semester or term for which you have the data listed above for your entire SI program.

1. What term or semester are you using? (e.g. Fall 2019 or Winter/Spring 2018)
2. What is the average final grade differential for your SI program during the designated semester or term? Calculate by taking the average final course grade of all the students who did not attend any SI sessions using a four-point scale (4=A, 3=B, etc.) and subtract it from the average final grade using a four-point scale (4=A, 3=B, etc.) for all the students attended at least one SI session. For example, if the average

final grade of the SI attendees was 2.00 and the average final grade of the students who did not attend SI sessions was a 1.50, the difference would be 2.00-1.50=0.50, and you would enter 0.50.

3. What is the difference in DFW rates for the institution's entire SI program during the designated semester or term? Calculate by subtracting the rate of students who earned a D, F, or withdrew from a class who attended at least one SI session from the rate of the students who earned a D, F, or withdrew from a class of the students who did not attend any SI sessions. For example, if the DFW rate of the student who attended SI sessions was 15% and the DFW rate of the students who did not attend SI sessions was 33%, the calculation should be 33-15=18% and that should be entered for this question.
4. What is the percentage of students who attended at least one SI session for the entire SI program for the given semester or term? Calculate by taking the total number of students who attended at least one SI session divided by the total number of students enrolled in SI supported courses.

Please estimate how many administrative hours were *spent in total* on the following activities <u>in a given semester or term</u>:

5. **Total Observation Hours:** The approximate number of hours spent observing, preparing to observe, and debriefing with

SI leaders following observations. These hours can include peer observations, observations by SI mentors or program assistants, and observations by professional or paraprofessional staff.

6. **Total Training Hours:** Any administrative hours planning and delivering training, including initial or pre-semester and any ongoing training. This figure includes the actual training time. Do not duplicate planning time. Occasionally, staff members work together to plan training, only double that time if each staff member is working on separate tasks.
7. **Total Planning Support Hours:** All administrative hours devoted to assisting SI leaders with planning SI sessions. This figure does not include faculty members' assistance with planning or an SI leader's individual planning time, only administrative time dedicated to assisting SI leaders with planning.
8. **Total Administrative Hours:** Any hours by office staff, SI leader, SI Mentors, graduate assistants, or professional staff devoted to SI program evaluation, faculty meetings, data collection, and tracking, report writing, room scheduling, emailing, etc. These hours should not include training, observations, or planning activities.
9. **Total Funding for the SI program for a specific semester and term**: The approximate total amount of funding, including

the salaries of all SI leaders and administrative staff, and operational costs of the SI program. If administrative staff have multiple roles, account only for the portions working for the SI program. For example, if 25% of an administrator's time goes to the SI program, only 25% of his/her salary should be used in this calculation. Additionally, if it makes sense to divide your annual budget by the number of terms/semesters to calculate the cost for a semester, please feel free to do that.

Other Questions

10. How many SI Leaders were employed and actively holding sessions by your institution's program during the given semester/term?
11. Was your institution's SI program accredited/certified by the International Center for Supplemental Instruction during that semester/term? (Yes/No)
12. Which adaptations, if any, differentiate your implementation of SI from the model presented by the International Center for Supplemental Instruction at UMKC? Please elaborate on them here.
13. Your institution's name?
14. Is your institution considered…? (public or private)
15. Is your institution considered….? (4-year or 2-year?

16. What is your name (if provided will only be used for follow-up/clarification purposes)?
17. What is your preferred email (if provided will only be used for follow-up/clarification purposes)?
18. What is your phone number (if provided will only be used for follow-up/clarification purposes)?

Thank you for completing the survey questions. Please click the arrow key to submit your responses.

Appendix B

Terms and Definitions

1. Administrative hours – any hours by office staff, SI leader, SI program assistants or SI mentors, graduate assistants, or professional staff that are dedicated to SI program evaluation, faculty meetings, data collection, and tracking, report writing, room scheduling, emailing, etc. This figure does not include training, observations, or planning activities.
2. Difference in DFW rates – the difference between the rate of students who earn a D, F, or withdrew (DFW) from a course and attended at least one SI session and the DFW rate of the students who did not attend any SI sessions
3. Grade differential – the difference in the average final grade of the entire SI program across all their courses for a given semester using a four-point scale (4=A, B=3, etc.) between the

students who attend at least one SI session compared to the students who did not attend any SI sessions.

4. Observation hours – the approximate number of hours spent observing, preparing to observe, and debriefing with SI leaders following observations. These hours can include peer observations, observations by SI mentors or program assistants, and observations by professional or paraprofessional staff.
5. Planning hours – all administrative hours devoted to assisting SI leaders with planning SI sessions.
6. Total Funding – the approximate total amount of funding, including the salaries of all SI leaders and administrative staff and operational costs of the SI program.
7. Training hours – administrative hours planning and delivering training and/or professional development, including initial and any ongoing training. This figure includes the actual training time as well as time planning it.