2 Supplemental Instruction at Higher Education Institutions: A Scoping Review

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Abstract: Higher education institutions (HEIs) play an important role in generating and transferring knowledge. However, dropout rates and weak exam results are worrying. To address these issues, many HEIs have implemented Supplemental Instruction (SI), implying that groups of students meet regularly during the semester under the guidance of an experienced student leader. Considering the widespread implementation of SI, it is important to understand: 1) how SI sessions should be organised, 2) the characteristics of successful SI leaders, and 3) the degree to which SI improves retention rates and exam results. In this study, a scoping review (SR) of articles in the world's largest curated abstract and citation database of research literature – Scopus – is conducted to achieve precisely that. The review found that there is solid evidence of positive effects of SI programmes for the participators, but the results on the digital transformation of this learning activity are not sufficiently addressed. Also, there is a lack of evidence on how these positive effects rely on the programme's organisation. Consequently, there is a need for further studies using control groups faced with different approaches to further reveal the effects. Finally, we find that the role of SI leaders is poorly accounted for in the reviewed literature. Particularly the human aspects of the SI leader seem to be under-researched. These findings are relevant for the future direction of research on SI, specifically, and for peer-assisted learning in general.

1. Introduction

The wealth of nations is, to a great extent, determined by their human capital (Manuelli and Seshadri, 2014), and education is one of the most important investments that can be made in a country's future (Becker, 1964). It is therefore worrying that many students drop out of their college or university programme and that exam results are weak in some courses (Ministry of Education and Research, 2016). Also, the change in role from strict guidance at lower levels of education to own responsibility for progress in education at HEIs can be demanding for many students. It is therefore important for the HEI to support students through this period of transition by considering the needs for both professional development and social interplay (Helde & Suzen, 2019).

When focusing on professional development, many HEIs have implemented Supplemental Instruction (SI) as a measure to improve retention rates and exam results. The SI programme was developed by Dr Deanna Martin at the University of Missouri

in Kansas City in 1973. Since then, SI has spread to more than 1,500 universities and colleges in almost 30 countries (Martin, 2008). SI is a non-traditional form of tutoring that focuses on collaboration, group study, and interaction for assisting students in undertaking 'traditionally difficult' courses. The students who attend SI sessions are responsible for teaching each other the course content and for working together to solve problems.

Each SI session is attended by a group of students, acting as model students, who are enrolled in the target course and facilitated by an SI leader. The SI leaders are an important difference between SI and other peer-assisted support activities (Lockie & Van Lanen, 2008). Typically, leaders are academically successful students with good interpersonal skills who recently completed the course and achieved a good grade (TCAO, 2008). The main role of the SI leader is to facilitate discussion among students participating in the programme. Moreover, the SI leaders are recruited, trained, and supported by an SI supervisor who is also trained within the framework of the programme (Dawson et al., 2014). The SI supervisor is neither part of the faculty teaching the course nor in direct contact with the students participating in the SI sessions. These participants – students, SI leaders, and the SI supervisor – interact with the faculty teaching the course that is supported by the SI programme.

There is a well-developed body of literature studying a variety of topics related to SI. This includes review articles, which have usually focused on specific aspects of the programme. For example, the review by Dawson et al. (2014) focused only on the effectiveness of SI and a restricted time span. On the other hand, Stout and McDaniel (2006) reviewed the evidence on benefits for the SI leaders gained by participating. Consequently, there is a need for a more holistic view of the literature considering the most recent publications.

We have taken the approach of a scoping review, which is a relatively new addition to the options for a literature search (Davis et al., 2009). This type of scoping review facilitates the identification of gaps in the evidence base where no research has been conducted, with the potential to summarize and convey findings, as well as identify the relevance of the need of a systematic review or otherwise (Arksey & O'Malley, 2005).

The aim of this study is to use the scoping review to examine the scientific literature on SI at higher education institutions to reveal knowledge gaps. Having in mind the discussion above, we address how SI sessions should be organized to obtain the objectives, what characteristics an SI leader should have, and whether the implementation of SI at HEIs has led to improved retention rates and exam results. Specifically, the research questions (RQs) are formulated as follows:

- RQ1: How should SI sessions be organized to achieve the programme's objectives?
- RQ2: What are the characteristics of successful SI leaders?
- RQ3: How well does SI succeed in contributing to achieving its main objectives of improving retention rates and exam results?

The knowledge gained from this study will be relevant for institutions considering implementing SI as a pedagogical measure to improve retention rates and exam results. Moreover, the scoping review provides input to the research community by suggesting knowledge gaps to be addressed in future studies.

The next section presents how the structure of the scoping review is applied in this study. Then, in Section 3 we present findings from the reviewed literature related to the three research questions. In Section 4 we discuss knowledge gaps and accounts for the validity beyond that of the individual research questions. Finally, in Section 5 we provide some concluding remarks.

2.   Method

As mentioned in Section 1, this study applies the scoping review (SR) method. This is a method increasingly used to identify knowledge gaps, set research agendas, and identify implications for decision-making. Specifically, we broadly follow the five stages in the methodological framework proposed by Arksey and O'Malley (2005): 1) identify the research questions, 2) identify relevant studies, 3) study selection, 4) charting the data, and 5) sorting, summarizing, and reporting the results. The procedures we have followed are presented in more detail below.

2.1   Identifying the Research Questions

The primary focus of this study is on the use of SI at HEIs. It was determined that the RQs presented in Section 1 should be answered.

2.2   Identifying Relevant Studies

An SR should be as comprehensive as possible in identifying studies that can contribute to answering the research questions (Arksey & O'Malley, 2005). Consequently, we decided to search for relevant literature in the world's largest curated abstract and citation database of research literature (Schotten et al., 2017) – Scopus. The primary search term used was 'supplemental instruction', and for a document to end up in our search results, this primary search term would have to be either in the title (TITLE), the abstract (ABS), or in the keywords (KEY). This was done to increase the likelihood that SI was a key concept in the documents our search returned.

Due to limited coverage in Scopus, only studies published after January 2000 were included. In doing so, we ensure that the most recent and timely studies are examined. The search string employed also limited our results to documents written in what many consider the language of science, namely, English (Lillis et al., 2010). Finally, the documents generated by our search would also have to be published in a journal. This was done to increase the likelihood that the documents included in our study have

gone through a review process. The search was conducted on January 23, 2020, and the query string used is shown in Table 1.

Tab. 1:   Search terms employed

	Search term
Concept	(TITLE-ABS-KEY("supplemental instruction"))
Time of publication	AND (LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014) OR LIMIT-TO (PUBYEAR,2013) OR LIMIT-TO (PUBYEAR,2012) OR LIMIT-TO (PUBYEAR,2011) OR LIMIT-TO (PUBYEAR,2010) OR LIMIT-TO (PUBYEAR,2009) OR LIMIT-TO (PUBYEAR,2008) OR LIMIT-TO (PUBYEAR,2007) OR LIMIT-TO (PUBYEAR,2006) OR LIMIT-TO (PUBYEAR,2005) OR LIMIT-TO (PUBYEAR,2004) OR LIMIT-TO (PUBYEAR,2003) OR LIMIT-TO (PUBYEAR,2002) OR LIMIT-TO (PUBYEAR,2001) OR LIMIT-TO (PUBYEAR,2000))
Language	AND (LIMIT-TO (LANGUAGE,"English"))
Type of publication	AND (LIMIT-TO (SRCTYPE,"j"))

2.3   Study Selection

The query presented in Table 1 returned 169 documents from the Scopus database. We read and assessed the abstracts of all articles. To be included in the additional process, we had to be able to answer 'yes' to the two following questions: 1) is the article related to higher education?, and 2) is the article about Supplemental Instruction, as it is presented in the Introduction of this chapter? Following this, about one-third of the articles were considered irrelevant for our study. The main reason for being excluded was that the article was related to, for example, kindergarten, elementary, or
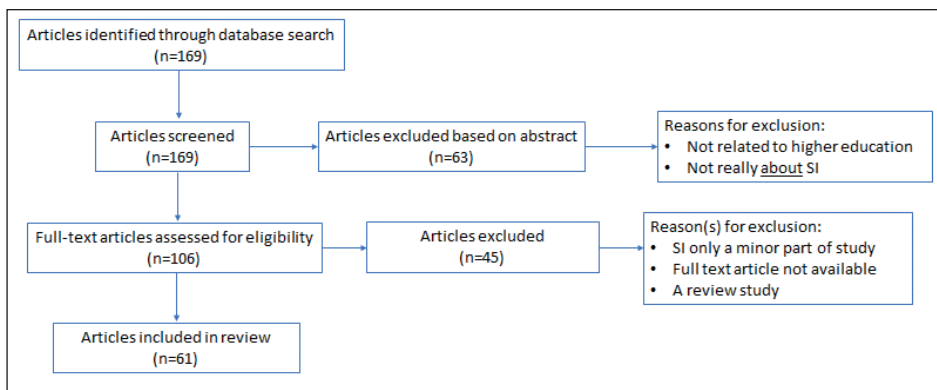

Fig. 1:   Search process

high school. Full-text versions of the 106 remaining articles were sought, but we were unable to retrieve full-text versions of four articles. Of the 102 full-text articles that we read, 41 were excluded because SI was only briefly mentioned, or because it was a review study. The search strategy left us with 61 articles for our review; the selection process is illustrated in Figure 1.

2.4   Charting the Data

In the fourth stage of the framework of Arksey and O'Malley (2005), we documented data related to each article included in our analysis. The data that we stored in Excel included the names of the authors, publication year, article title, and the field of study. Moreover, citation information was stored in the software tool EndNote X9. The articles included in the analysis are listed in Table 2.

Tab. 2:   Overview of selected studies
(sorted in alphabetical order after year of publication)

Author (Year)	Name of journal[a]	Field of study
Etter et al. (2000)	J ACCOUNT EDUC	Accounting
Howitt and Harding (2000)	ASIAN R ACCOUNT	Accounting
Hodges et al. (2001)	J COLL READ LEARN	History
Bushway and Flower (2002)	INTL J PHYTOREMEDIATION	Statistics
Hensen and Shelley Ii (2003)	J COLL STUDENT DEV	Various fields
Hurley et al. (2003)	MED TEACH	Medicine
Zulu (2003)	AILA R	Law
Hurley et al. (2006)	NEW DIR TEACH LEARN	Various fields
McGuire (2006)	NEW DIR TEACH LEARN	No particular
Moore and LeDee (2006)	J COLL READ LEARN	Biology
Painter et al. (2006)	NEW DIR TEACH LEARN	Various fields
Peters et al. (2006)	J WOMEN MINOR SCI ENG	Various fields

Author (Year)	Name of journal [a]	Field of study
Zaritsky and Toce (2006)	NEW DIR TEACH LEARN	Various fields
Zerger et al. (2006)	NEW DIR TEACH LEARN	Various fields
Peterfreund et al. (2007)	J COLL STUDENT RET: RES, THEO PRACT	STEM
Rath et al. (2007)	CBE-LIFE SCI EDUC	Biology
Fayowski and MacMillan (2008)	INT J MATH EDUC SCI TECHNOL	Calculus
Ning and Downing (2010)	STUD HIGH EDUC	Business
Drake (2011)	COLL TEACH	Various fields
Harding et al. (2011)	INT J MATH EDUC SCI TECHNOL	Mathematics
Terrion and Daoust (2011)	J COLL STUDENT RET: RES, THEO PRACT	Various fields
Malm et al. (2012)	STUD HIGH EDUC	Engineering
Price et al. (2012)	J COLL READ LEARN	Psychology
Rath et al. (2012)	J CHEM EDUC	Chemistry
Grillo and Leist (2013)	J COLL STUDENT RET: RES, THEO PRACT	Various fields
Lockie et al. (2013)	J PROF NURS	Nursing
Mosley et al. (2013)	CURRENTS PHARMACY TEACH L	Pharmacy
Dancer et al. (2014)	STUD HIGH EDUC	Business
Goldstein et al. (2014)	ACCOUNT EDUC	Accounting
Goomas (2014)	C COLL J RES PRACT	Psychology
Tangwe and Rembe (2014)	MEDITERR J SOC SCI	Various fields

Author (Year)	Name of journal[a]	Field of study
Wilson and Rossig (2014)	INTL R ECON EDUC	Various fields
Clark and May (2015)	C COLL J RES PRACT	Nursing
Goomas and Isbell (2015)	C COLL J RES PRACT	Various fields
Malm et al. (2015)	EUR J ENG EDUC	Engineering
Naidoo and Paideya (2015)	S AFR J EDUC	Various fields
Okun et al. (2015)	EDUC PSYCHOL	Psychology
Rabitoy et al. (2015)	J HISPAN HIGH EDUC	STEM
Summers et al. (2015)	J COLL READ LEARN	History
Bruno et al. (2016)	ANAT SCI EDUC	Human anatomy
Chan et al. (2016)	PERANIKA J SOC SCI HUM	Various fields
Malm et al. (2016)	EUR J ENG EDUC	Engineering
Paloyo et al. (2016)	ECON EDUC REV	Various fields
Alden (2017)	J CHEM EDUC	Chemistry
Attridge et al. (2017)	PHARM EDUC	Pharmacy
Guarcello et al. (2017)	TECHNOL KNOWL LEARN	Psychology
Harrison et al. (2017)	MED SCI EDUC	Medicine
Hizer et al. (2017)	J SCI EDUC TECH	Biology
Im et al. (2017)	INT J SCI MATH TECH LEARN	Mathematics
Musah and Ford (2017)	J RES EDUC EFFECT	Chemistry

Author (Year)	Name of journal[a]	Field of study
Cobb et al. (2018)	INT R ECON EDUC	Various fields
Mitra and Goldstein (2018)	INFORMS T EDUC	Business
Owens et al. (2018)	J HEALTH CARE POOR UNDERSERVED	Human anatomy
Allen et al. (2019)	ACTIVE LEARN HIGH EDUC	Various fields
Balzer Carr and London (2019)	J COLL STUDENT RET: RES, THEO PRACT	Various fields
Buchanan et al. (2019)	J EXP EDUC	Various fields
Lozada and Johnson (2019)	J TRANSFORMATIVE EDUC	Various fields
Paabo et al. (2019)	J COLL STUDENT RET: RES, THEO PRACT	Various fields
Trate et al. (2019)	J CHEM EDUC	Chemistry
Channing and Okada (2020)	C COLL J RES PRACT	Various fields
Hickey et al. (2020)	INT HIGH EDUC	Chemistry

[a] Abbreviations from Caltech Library (https://www.library.caltech.edu/journal-title-abbreviations).

2.5   Sorting, Summarizing, and Reporting the Results

At the fifth stage of the framework suggested by Arksey and O'Malley (2005), the findings from the SR are sorted, summarized, and reported. Broadly, this is done in the remainder of this chapter. Specifically, how SI sessions should be organised is reported in Table 3, the characteristics of successful SI-leaders are reported in Table 4, and the degree to which SI contributes to higher retention rates and better exam results is reported in Section 3.3.

3.   Findings

This scoping review yielded, as mentioned earlier, 61 articles addressing a number of subjects. Of these, 15 were related to biology and health, 14 to STEM, 6 to business and accounting, and 26 to various topics, such as law and history, or covering more than

one subject. The majority of the studies related to universities in North America, with some exceptions, such as studies from South Africa. In this section, we present the findings related to the three research questions.

3.1   How Should SI Sessions be Organized?

When compared with other academic support interventions, SI programmes are organized somewhat homogeneously and according to recommendations provided in handbooks (e.g. Alyea & Gutierrez, 2017). Consequently, all programmes accounted for are characterised by voluntary participation, no tuition fee, and tutoring by trained SI leaders. Still, the literature accounts for a variety of approaches within the framework of SI. We find some differences in aspects such as duration, number of participants, number of parallel sessions, sign-up rules for attending, training programme for leaders, and involvement of faculty. Table 3 provides examples of the diversity in how SI sessions are organized.

Tab. 3:   Variation in organisation between universities –
            examples from the reviewed articles

Source (example)	Relevance	Explanation
Hodges et al. (2001)	Group size	Groups were established with 10–12 students each
Peterfreund et al. (2007)	Duration	SI classes held once a week for an hour and a half
Fayowski and MacMillan (2008)	Early start up	Implemented during the first 2 weeks
Hurley et al. (2003)	Sign-up routines	Sign-up sheets several days prior to each session
Etter et al. (2000)	Timing of sessions	Scheduled close to the class time and in same building
Malm et al. (2012)	Scheduling	Scheduled during normal school hours (8 am to 5 pm)
Bruno et al. (2016)	Faculty involvement	SI leaders attended all course lectures and met with the SI supervisor on a weekly basis to discuss their ideas related to session content and organisation
Wilson and Rossig (2014)	Incentivizing	Participating at the SI programme gives student credit

Let us elaborate on the information in Table 3. First, the duration of sessions is within the range of 50 minutes to 2 hours, with most studies reporting 90 minutes. The group size is usually between five and ten students per tutor as reported, for example, by Hurley et al. (2003). With respect to scheduling of SI courses, an example is given in

Table 3 on the timing close to the lecture given by the faculty. Etter et al. (2000) also mention the physical location being close to the usual teaching facilities. It could be challenging to find suitable times for the SI programme, and Summers et al. (2015) gave an example where a survey was administered to determine SI session times that would work well with students' schedules. The SI courses are usually offered without any credit incentives, but there are exceptions, such as accounted for by Wilson and Rossig (2014), directing particular attention to underrepresented minorities.

3.2 What are the Characteristics of Successful SI Leaders?

As argued in the Introduction, we are not aware of any previous scoping reviews focusing on the characteristics of SI leaders that increase students' ability to reach their learning objectives. In the articles, there is surprisingly little information about this. Of the studies accounting for the selection of SI leaders, the main focus is on topical knowledge measured by grades (e.g. Goomas, 2014). We also observe that while some articles refer to the tutors as SI leaders, others use the term SI facilitators (e.g. Rath et al., 2012). A selection of topics addressing the SI leaders is presented in Table 4.

Tab. 4: Selected characteristics of successful SI leaders addressed in the articles

Example source	Explanation
Goomas (2014)	Good topical knowledge
Summers et al. (2015)	Training of SI leaders
Hodges et al. (2001)	Observed and receiving feedback
Rath et al. (2012)	Human aspects making SI leaders suited to the role

The most commonly reported criteria when selecting SI leaders is good topical knowledge. This is measured by earlier achievements in the course and, for example, reported by Goomas (2014) to be earning a grade of A or B. Other criteria are also mentioned by a few articles, such as Lozada and Johnson (2019), introducing a case where SI leaders were recruited by friends who had earlier served in the role.

A key element of a successful SI programme seems to be the extensive SI leader training, particularly in group facilitation practices, including the use of proactive and participative activities in the sessions (University of Wyoming, 2014). For the SI leaders, participation in the programme will have some similarities with leader development programmes (Lund Universitet, 2017). When working with education, it is important to reflect on our own performance and practice (Schön, 2009). Hence, to further develop skills in leadership and pedagogy, the future SI leader must be willing to analyse and evaluate their own performance. The training programmes for new SI leaders vary but are usually arranged as intensive courses at the beginning of the semester. For example, Hodges et al. (2001) explained that one provided 3 days of training using the SI model. In the context of history subjects, Summers et al. (2015)

account for 16–18 hours of training during the start of the fall semester. This was complemented by monthly training sessions during the semester.

Only few articles examine the role of SI leaders and account for continued observation of the performance and feedback during the duration of the SI programme. In the case of Summers et al. (2015), SI leaders were observed during a session and later were provided with individualized feedback in regards to their strengths and areas for improvement.

Routines for observation and feedback were accounted for by Hodges (2001), where SI leaders attended regularly scheduled weekly meetings with the SI supervisor, the course instructor, or both. Each SI leader was also observed at least three times during the semester by the SI supervisor or staff to receive feedback and facilitate their growth as an SI leader.

The leaders' attitudes towards other people, including their emotional intelligence, is often raised as an important attribute in research on leadership (Goleman, 1998). The last entry in Table 3 addresses the somewhat more intangible part related to interpersonal skills, making students who have graduated earlier suitable to undertake the role as SI leaders. These relational competencies are only rarely reported in the reviewed literature. The article by Rath et al. (2012) is one notable exception, accounting for the use of information other than topical knowledge (i.e. top grades) when selecting SI leaders. At the mid-sized public university studied by Rath et al. (2012), the faculty member selected SI leaders based on their maturity, personality, and competency with active learning approaches, as determined through interviews and conversations with faculty members familiar with them.

3.3 How Well Does SI Achieve Its Objectives of Improving Retention Rates and Exam Results?

The reviewed articles argue that there is a strong positive effect on retention rates and exam results of participating in the SI courses. This result seems to be valid for both weak and strong students. However, evidence indicates that benefits are particularly strong for weaker students (Buchanan et al., 2019) and underrepresented minorities (Wilson & Rossig, 2014). There is also a gender dimension that is somewhat ambiguous, where some studies find no specific pattern (e.g. Fayowski & MacMillan, 2008) while others find that males benefit the most (Peterfreund et al., 2007).

The problem of selection bias is raised in a number of studies that explore the degree to which the results can be trusted. It is argued that even though it is evident that the success rate is higher for students attending the programme, it cannot be ruled out that it is the most motivated and skilled students that attend the SI seminars. In the reviewed literature, this bias has been controlled for by correcting for prior GPA scores (e.g. Fayowski & MacMillan, 2008) or by including variables on the backgrounds of the students in the statistical analysis (e.g. Bushway & Flower, 2002).

4.   Discussion

We have raised a number of findings from the reviewed literature in Section 3 related to each of the three research questions. The findings are, however, related to each other. First, it is interesting to observe that within the strict limits of the SI programme we still find considerable variations in how sessions with students and training of leaders are organized. Even with the variations accounted for in sections 3.1 and 3.2, all programmes do, to some degree, report improved retention rates and performance measured by academic grades. This is interesting, but to gain a deeper understanding of the mechanisms and to give advice on how to best organise sessions, we need to know what is the best approach under a given set of circumstances.

We find little evidence, however, of how variations in the organisation of SI programmes influence outcomes. One question could be: is it better to hold fewer and longer sessions, than the opposite? Another question might be: should SI leader training be intensive at the start, or should it run through the duration of the semester? To reveal these relationships it might be necessary to conduct experiments where students and leaders are separated into treatment groups. These groups are then treated with different variations of the SI programme. Such a research project would require significant resources and could call for support from public funding programmes and involve interdisciplinary research groups at several universities. Such an extensive study would also, to a large extent, correct for selection bias compared to the results most frequently reported for individual courses or programmes in the current literature.

We would also like to raise the lack of focus on the role of SI leaders in the existing research. Similar to the topic organisation addressed above, the degree to which the outcome is successful for students due to different characteristics of SI leader training should be studied more thoroughly. Most articles report on academic achievements, and some on aspects of training. Only a few studies raise the importance of good relations between SI leaders and faculty throughout the duration of the SI programme. However, we would like to point out the lack of emphasis on the human aspects that make a student with good topical knowledge well suited to conduct training for younger students. In such an interpersonal role, there are many relational competencies that should be addressed. The importance of the students' relations to the tutors, labelled the relational turn in the social science tradition (Colbert et al., 2016), has recently attracted attention both in the education policy debate and within the pedagogical research (Ministry of Education and Research, 2016). One reason is the developing literature documenting the importance of the relationship between tutor and student (e.g. Skinner et al., 2008). The quality of the relations between tutor and student can therefore have a substantial impact on the learning outcomes and overall experience of the education process.

Consequently, improving and extending the criteria for selecting candidates for the role as SI leaders to include interpersonal relational competence might improve the benefits of the sessions even more without imposing considerable negative conse-

quences, such as higher costs. However, the perception of what is considered suitable competence might vary somewhat between people, and this must be kept in mind when deciding on the members of the committee handling the hiring process. To an even greater extent than for SI leaders, there seems to be a lack of focus in the reviewed literature on SI supervisors.

Finally, we would like to address two lessons to be learned from the scoping review of the literature. The first deals with geography. It seems that evidence stemming from this particular peer-assisted programme is most thoroughly documented in North America. There are some studies from around the world, but there is clearly a need to gather experiences globally to reveal how the SI programme can be implemented across cultures and contexts. The second deals with the recent development towards the digitalization of society. One event emphasising this development is the novel coronavirus (COVID-19), which to varying degrees closed down universities globally and made it impossible to carry out physical meetings. In the reviewed literature, there is virtually no mention of digital solutions to the SI programme. Digitalization can be implemented for meetings with students and provides opportunities for improving the training of SI leaders and interaction with SI supervisors and faculty.

5.   Concluding Remarks

The overall purpose of this chapter has been to examine the scientific literature on SI at HEIs by means of the scoping review methodology. Following a search of Scopus, 61 articles were identified as relevant for our study.

Our three most important findings related to how SI sessions ought to be organized are: 1) the sessions should be arranged during normal schooling hours to make it easier for students to attend; 2) students participating in SI sessions should receive credits to incentivize participation; and 3) faculty should be involved because it allows course and SI leaders to share ideas and experiences that can improve both the traditional lectures and the SI sessions.

When it comes to the characteristics of successful SI leaders, our most important findings are: 1) they should be well trained in their role by participating in a training course before becoming an SI leader and receiving continuous training and feedback during the semester to attain the necessary skills; 2) they ought to have good grades in the course for which they function as a leader, indicating strong knowledge of the topics and, as such, a good ability to answer questions from SI participants; and 3) they must have good interpersonal skills. This includes having the ability to empathize with students who struggle in a course, keep their commitments, and be willing and able to provide helpful feedback.

Finally, our review indicates strongly that SI participation has a significant positive effect on retention rates and exam results. Additionally, these effects seem to be strongest for weak students, minorities, and men. We therefore are confident that, for

institutions struggling with poor grades and low retention rates, it would be beneficial to implement SI.

The aforementioned findings demonstrate that the effects of SI participation are well documented, for students in general and for select groups. However, there are still some knowledge gaps that ought to be addressed in future studies. First, the most important knowledge gap is related to the human characteristics required for SI leaders to perform well in their role. The current body of literature mainly focuses on the need for SI leaders to have topical knowledge, but it is also important to know how to identify potential SI leaders who are able to reach out to SI participants and help them during their interactions. Second, even though the SI programme in general is successful, there seems to be a lack of knowledge regarding how variations in organisation and SI leader training influence retention rates and exam results. Hence, future studies should investigate these relationships in more depth. Third, the spread of COVID-19 in the spring of 2020 has clarified the need for knowledge on how SI sessions can be arranged digitally. By making SI digital, it will also become more accessible for students who are unable to show up on campus.

This study does have some limitations. It is, for example, worth noting that our review is based on literature retrieved from only one database – Scopus. Although this is the largest curated abstract and citation database in the world, Google Scholar is an even more comprehensive academic search engine (Gusenbauer, 2019). Thus, Google Scholar would likely generate broader search results. However, many of the listings in Google Scholar are not peer-reviewed and can therefore be of lower scientific quality (Aguillo, 2012). In our study we have also followed the recommendation made by Arksey and O'Malley (2005) of not assessing the quality of the studies included in a scoping review. This, of course, limits the degree of evidence that studies like this provide (Larsen et al., 2017). Nevertheless, we believe that this study provides novel and useful knowledge related to the implementation and use of Supplemental Instruction, specifically in peer-assisted learning, and in higher education in general. If implemented, this knowledge can improve the return on the vast public investments that are made in education.

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