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What are their perceptions of supplemental instruction? A South African study of student feedback analysis

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ABSTRACT

This paper documents students' perceptions of supplemental instruction based on feedback analysis. With the context of two South African universities occupying the central focus, the study presents the findings on how students observe supplemental instruction, thereby proposing the framework for advancing university teaching.The ontologies and epistemologies of the paradigm of pragmatism were employed in the investigation of the perceptions of supplemental instruction. Through a mixed-methods research approach, quantitative data from 6,772 randomly sampled final year students was collected. Qualitative data, on the other hand, were collected from 20 purposively sampled students. The latter methodological lens was used to collect and analyze data, which sought to address the following research question, which served as the guideline for this research endeavor: What are students' perceptions of university supplemental instruction? The study was framed within the QUANT-QUAL explanatory sequential mixed-methods research design. The analysis of data, by SPSS and a thematic approach, was anchored on Constructivist theory. The findings identified that technology integration and supplemental student-teaching hallways lead to enhanced student engagement and active learning. The findings further underscore the critical role of supplemental instruction in assisting students to reflect on their performance in different modules. This study contributes to the growing field of technology-based teaching and learning by illustrating how supplemental instruction can be systematically integrated into the university teaching-learning context. The framework for advancing university teaching presented offers practical guidance for lecturers to implement supplemental instruction, while accommodating students' technological needs and preferences.

Keywords: Supplemental instruction, university teaching, technology integration.

INTRODUCTION

Universities are institutions centralized around teaching and learning experiences, which are co-created among students, between students and lecturers, and between students and administrators.[1] While scholarly reiteration has been on reproducing knowledge (through teaching and learning) based on

[1] Hasan Gül, Mehmet İnce, and Abdullah Turan, "University Students' Quality Expectations from Academics: The Case of the Karamanoğlu Mehmetbey University," 2011.

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lecturer-student engagement, the contemporary "truly digital native" cohort of students[2]; cognitively diversified student demographics[3] and the recognition of collaborative learning within higher education spaces call for the scholarly endeavors, whose foci are on the confluence of supplemental instruction, use of digital learning platforms and the resultant student performance. Again, even though scholars commend the implications of supplemental instruction on student performance, particularly for "at-risk modules", there is a need to excavate data on how students themselves perceive, conceptualize, and theorize supplemental instruction in their respective learning. The critical implications of supplemental instruction on student performance, particularly in higher education research, have, over the past few decades, been documented by several scholars.[4]

However, while there has been an abundance of discussions on the role and the functioning of supplemental instruction, the contemporary postulation of technology-based teaching and peer-student knowledge co-creation, which expanded exponentially during and after the outbreak of COVID-19, reintroduced supplemental instruction as a compelling pedagogy within the contemporary higher education spaces.[5] Therefore, even post-COVID-19 outbreak, this study argues that probing into the role of supplemental instruction from the students' point of view is arguably a legitimate scholarly endeavor, which has (yet) received minimal scholarly attention.

This paper addresses this research gap by examining the perceptions of students on supplemental instruction. Specifically, the research investigates the perceptions of university students on supplemental instruction. The significance of this research lies in its contribution to evolving higher education teaching and learning practices that efficiently address the needs of the contemporary cohort of students. Furthermore, the research contributes to the framework for advancing university teaching, which can be used within the context of South African universities. By examining the intersection of technology-based learning with supplemental instruction and South African students' learning needs, this study bases a needs-responsive framework that caters to various students' needs.

LITERATURE REVIEW

The review of literature in this paper ia arranged as illustrated in Figure 1 below:

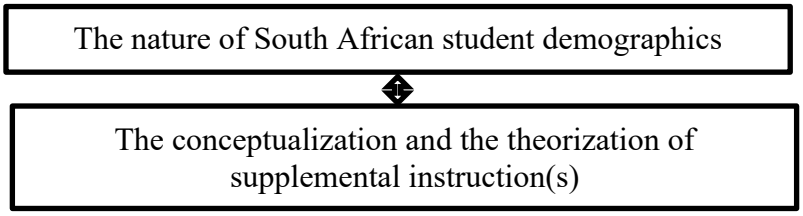

Figure 1: An illustration of the arrangement of the literature review.

The Nature of South African Student Demographics

Student demographics from a political and socio-economic standpoint

Several studies of the influence on various aspects of academic success of the South African student population have been conducted over the past years.[6] This study argues that these studies give different perspectives on the nature of student demographics in South Africa. For example, Makalela's discourse

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[2] Kari A Hensen and Mack C Shelley, "The Impact of Supplemental Instruction: Results from a Large, Public, Midwestern University," *Journal of College Student Development* 44, no. 2 (2003): 250–59.

[3] Muhammad Saifullah Khalid, Qi Zhanyong, and Jannat Bibi, "The Impact of Learning in a Diversified Environment: Social and Cognitive Development of International Students for Global Mind-Set," *European Journal of Training and Development* 46, no. 5–6 (2022): 373–89.

[4] Milos Ljubojevic et al., "Using Supplementary Video in Multimedia Instruction as a Teaching Tool to Increase Efficiency of Learning and Quality of Experience," *International Review of Research in Open and Distributed Learning* 15, no. 3 (2014): 275–91; Ananya M Matewos et al., "Teacher Learning from Supplementary Curricular Materials: Shifting Instructional Roles," *Teaching and Teacher Education* 83 (2019): 212–24; Cynthia A Stanich et al., "A New Approach to Supplementary Instruction Narrows Achievement and Affect Gaps for Underrepresented Minorities, First-Generation Students, and Women," *Chemistry Education Research and Practice* 19, no. 3 (2018): 846–66.

[5] Kimber L Wilkerson et al., "Supplementary Reading Instruction in Alternative High Schools: A Statewide Survey of Educator Reported Practices and Barriers," *The High School Journal* 99, no. 2 (2016): 166–78.

[6] Pam Christie, Dawn Butler, and Mark Potterton, "Schools That Work," *Report of the Ministerial Committee, Pretoria: Government Printer*, 2007; Jenny Leach and Robert E Moon, "The Power of Pedagogy," 2008.

on and about the complex dynamics of student revolution in the new sociopolitical dispensation since the fall of apartheid in 1994 explains the nature of South African student demographics from a political standpoint.[7] As a matter of fact, the complex way in which South African students organize themselves [which manifested through #feesmustfall] explains not only the political dimension within the student demographics, but also how and to what extent politics amplify the socio-economic inequalities of South African citizens, which subsequently permeate and define the institutions of higher learning.[8] The central focus in this study, however, is not to elicit political discourses, but rather to investigate how they [politics] are instrumental in comprehending the nature of South African student demographics. Again, by drawing from Kalitnyi's arguments on how socio-economic dissimilarities manifest in student performance,[9] and by operationalizing Nekhubvi et al's observation of universities as economically and culturally diverse spaces, [10] this study seeks to negotiate the relevance of supplemental instruction, particularly from the "student knowledge co-creation perspective." It argues that the studies whose foci are on how the understanding of the political dimension of student demographics calls for supplemental instruction are limited. The findings that were inferred from this study address this phenomenon, which has been bedeviling scholars for some time.

Student demographics from the language standpoint

South African student demographics are characterized by language diversity and multiplicity, which, according to research, makes the realization of multilingual education as a right to remain a controversial issue in South Africa. This is despite the South African Constitutional and legislative frameworks that support multilingual education. In fact, student language diversity has accelerated arguments on which language(s) is (are) to be used for epistemic access.[11] Even though South African higher education institutions are not the only ones with linguistically diverse student demographics, the hegemony of English and Afrikaans over indigenous languages, according to scholarship, has proven to circumscribe the ubiquity of multilingualism within student demographics. Furthermore, the supremacy of English and Afrikaans and the expansion of multilingualism call for transformative multilingual pedagogies (i.e., plurilingualism and translanguaging), which, advance through supplemental instruction (which will be explained in-depth in the subsequent section). For example, Garcia and Leiva defines translanguaging as students' exploitation of full linguistic repertoires for meaning-making purposes materializes through student-student and through student-lecturer interactions.[12]

The Conceptualization and the Theorization of Supplemental Instruction

The conceptualization and the limitations of supplemental instruction

Supplemental instruction refers to the interventional or mitigating instructional approach, which happens between fellow students and between students and lecturers. This instructional approach is the

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[7] Leketi Makalela, "'Our Academics Are Intellectually Colonised': Multi-Languaging and Fees Must Fall," *Southern African Linguistics and Applied Language Studies* 36, no. 1 (2018): 1–11.

[8] Meghan Healy-Clancy, "The Everyday Politics of Being a Student in South Africa: A History," *History Compass* 15, no. 3 (2017): e12375; Anne Heffernan, *Limpopo's Legacy: Student Politics & Democracy in South Africa* (Boydell & Brewer, 2019).

[9] Vivence Kalitanyi and Edwin Bbenkele, "Assessing the Role of Socio-Economic Values on Entrepreneurial Intentions among University Students in Cape Town," *South African Journal of Economic and Management Sciences* 20, no. 1 (2017): 1–9.

[10] Vhutshilo Nekhubvi et al., "Effects of Students' Socioeconomic Status on Academic Performance: A Case of First-Year Students at a South African University," *International Journal of Business Ecosystem & Strategy (2687-2293)* 7, no. 2 (2025): 414–21.

[11] Caroline Kerfoot and Anne-Marie Simon-Vandenbergen, "Language in Epistemic Access: Mobilising Multilingualism and Literacy Development for More Equitable Education in South Africa," *Language and Education* (Taylor & Francis, 2015); Caroline Kerfoot and Christopher Stroud, "Towards a Sociolinguistics of Potentiality: Linguistic Citizenship, Quasi-Events, and Contingent Becomings in Spaces of Otherwise," *International Journal of the Sociology of Language* 2024, no. 287 (2024): 1–22; Vuyokazi Nomlomo and Misiwe Katiya, "Multilingualism and (Bi) Literacy Development for Epistemological Access: Exploring Students Experience in the Use of Multilingual Glossaries at a South African University," *Educational Research for Social Change* 7, no. 1 (2018): 77–93; N Xulu-Gama and S Hadebe, "Language of Instruction: A Critical Aspect of Epistemological Access to Higher Education in South Africa," *South African Journal of Higher Education* 36, no.5 (2022):291–307.

[12] Ofelia García and Camila Leiva, "Theorizing and Enacting Translanguaging for Social Justice," in *Heteroglossia as Practice and Pedagogy* (Springer, 2013), 199–216; Siphelele Mbatha et al., "Synchronising English Second Language Proficiency and Mathematical Understanding through Plurilingualism in Correctional Centre Classrooms: Empirical Perspectives," *Interdisciplinary Journal of Education Research* 7, no. 1 (2025): a08–a08.

remedial strategy, particularly for students who are underperforming in "at-risk-modules." The limitations of supplemental instruction include challenges with low student participation rates, which can be caused by a lack of student motivation or engagement, and inadequate support or training for student leaders (such as a lack of a coordinated plan or feedback).

Locating the effectiveness of the supplemental instruction

Supplemental instruction was initiated within the context of the United States of America's higher education institutions in the 1970's.[13] The examination of the intellectual timeline between the initial creation of supplemental instruction in the United States of America and the implementation thereof within the South African context is twenty years. This study predicates this claim upon Ning and Downing's indication that supplemental instruction was initially employed in South Africa in the 1990's.[14] In their attempt to present the inferential statistical data on the impact of supplemental instruction on students' performance,[15] the results indicate that students attending supplemental instruction sessions obtain higher final grade scores and significantly fewer low grades. Similar findings were also inferred from the study on students' mathematics performance and conceptual understanding, which was conducted by Villegas-Ch et al.[16] (see Figure 2 below).

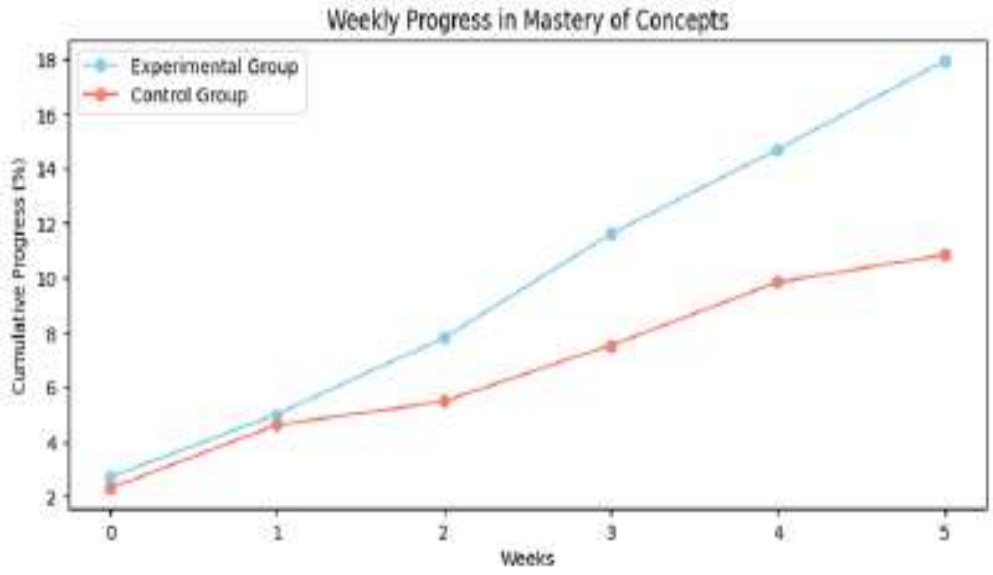

Figure 2: Students' mathematics and performance, and conceptual understanding.

Congos and Schoeps further record that:

> The benefits of supplemental instruction attendance go beyond better academic performance in a given semester. In a study at the University of Missouri at Kansas City, supplemental instruction has produced higher re-enrolment in subsequent semesters. Students in the highest and lowest quartiles of entry tests produced better academic performance than would be expected. Encouragingly, minority students who attended SI sessions had a higher number of A, B and C grades and a lower number of D, F and W grades than minority students not attend supplemental instruction sessions.[17]

[13] Phillip Dawson et al., "On the Effectiveness of Supplemental Instruction: A Systematic Review of Supplemental Instruction and Peer-Assisted Study Sessions Literature between 2001 and 2010," *Review of Educational Research* 84, no. 4 (2014): 609–39.

[14] Hoi Kwan Ning and Kevin Downing, "The Impact of Supplemental Instruction on Learning Competence and Academic Performance," *Studies in Higher Education* 35, no. 8 (2010): 921–39.

[15] Hensen, Kari A, and Mack C Shelley. "The Impact of Supplemental Instruction: Results from a Large, Public, Midwestern University." *Journal of college Student development* 44, no. 2 (2003): 250-59.

[16] William Villegas-Ch et al., "Adaptive Intelligent Tutoring Systems for STEM Education: Analysis of the Learning Impact and Effectiveness of Personalized Feedback: W. Villegas-Ch et Al.," *Smart Learning Environments* 12, no. 1 (2025): 41.

[17] Dennis H Congos and Nancy Schoeps, "Does Supplemental Instruction Really Work and What Is It Anyway?," *Studies in Higher Education* 18, no. 2 (1993): 165–76.

Although these studies were conducted in the United States of America, this study argues that they underscore the effectiveness and the necessity of supplemental instruction.Worth noting, however, is that the effectiveness of this instructional approach was observed when factors that influence cognition (i.e., Biological, lifestyle, and environmental factors) were controlled.[18]

Conceptualizing the application of the supplemental instruction

Supplemental instruction is conceptualized by scholars as the peer-predicated academic intervention, which is designed to assist university students with mastering the content of challenging modules.[19] It (the supplemental instruction) is voluntarily facilitated by a student leader and seeks to advance student performance and alleviate exclusion. [20] For different scholars, the supplemental instruction is characterized by collaborative and supportive environments. Building on these premises, supplemental instruction typically involves scheduled, out-of-class small group sessions that are tightly aligned to the curriculum. This is done by the student leader, having previously succeeded in the module, facilitates problem solving, models effective study strategies, and scaffolds difficult concepts through dialogic questioning, worked examples, and guided practice. The approach is intentionally non-remedial and inclusive. It targets historically high-risk modules rather than individual students, normalizing help-seeking and fostering a culture of collaborative learning that strengthens academic confidence and sense of belonging. [21]

THEORETICAL FRAMEWORK

The understanding of the Theory of Constructivism

The study was underpinned by the Theory of Constructivism, which was promulgated by Jerome Bruner in 1966.[22] According to this theory, people's construction of meaning and understanding of the world is cemented upon the principles of cognitive theory. Henceforth, the theory of constructivism is also known as cognitive constructivism. The theory further indicates that knowledge is co-constructed within the social setting, thus people's interaction (within social settings) informs cognitive development.[23] According to Applefield et al., if people encounter something new, they have to merge it with their pre-existing ideas and experience(s), thereby re-constructing and co-constructing ideas to come up with an advanced understanding of the phenomenon.[24] Constructivists believe that people are active creators of their own knowledge, but knowledge is constructed within the social setting.[25]

Educational implications of the theory of constructivism

Within the educational context, constructivists believe that learning is an active process that is based on the assumption that knowledge is constructed and co-constructed amongst learners as they attempt to make sense out of their experiences.[26] This theory was considered a pertinent lens for understanding students' perceptions of supplemental instruction because it (the theory of constructivism) is the framework through which the idea of peer student interaction and teaching can be comprehended. Again, the theory of constructivism views learning as an activity that seeks to encourage students to

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[18] Deanna C Martin, D Arendale, and Robert Blanc, "Mainstreaming of Developmental Education: Supplemental Instruction and Video-Based Supplemental Instruction," *Alternatives to Developmental Education. San Francisco: Jossey Bass*, 1997.

[19] Robert A Blanc, Larry E DeBuhr, and Deanna C Martin, "Breaking the Attrition Cycle: The Effects of Supplemental Instruction on Undergraduate Performance and Attrition," *The Journal of Higher Education* 54, no. 1 (1983): 80–90; E Koch and M Snyders, "The Effect of Video Supplemental Instruction on the Academic Performance in Mathematics of Disadvantaged Students," *South African Journal of Higher Education* 15, no. 1 (2001): 138–46.

[20] M Ody and W Carey, "Demystifying Peer Assisted Study Sessions (PASS): What…," in *Chall. Learn. Dev. 6th LDHEN Symp. Bournemouth Univ*, 2009, 1–9.

[21] Alfredo R Paloyo, "A Note on Evaluating Supplemental Instruction," *Journal of Peer Learning* 8, no. 1 (2015); Marion E Stone and Glen Jacobs, "Supplemental Instruction: New Visions for Empowering Student Learning," 2006.

[22] Jerome S. Bruner, *Toward a Theory of Instruction* (Cambridge, MA: Harvard University Press, 1966).

[23] Fosnot, Catherine Twomey. *Constructivism: Theory, Perspectives, and Practice.* Teachers College Press, 2013.

[24] James M Applefield, Richard Huber, and Mahnaz Moallem, "Constructivism in Theory and Practice: Toward a Better Understanding," *The High School Journal* 84, no. 2 (2000): 35–53.

[25] Samuel Yoders, "Constructivism Theory and Use from 21 St Century Perspective.," *Journal of Applied Learning Technology* 4, no. 3 (2014).

[26] Lydia Omowunmi Adesanya and Marien Alet Graham, "Promoting Formative Assessment Practices in Senior Phase Mathematics Classrooms Using Meaning Equivalence Reusable Learning Objects," *South African Journal of Education* 43, no. 3 (2023): 1–21.

use practical approaches to create more knowledge, reflect on, and talk about what they are doing. In fact, the theoretical idea of using practical approaches as means for and towards creating knowledge is the one that is held in the pragmatic epistemological stance (i.e., the paradigm used to predicate the ontological and epistemological stances).

This paper is of the position articulated by Piaget that learning arises through the interplay of assimilation and accommodation as learners actively reorganize their cognitive schemas in response to experience and challenges.[27] In the context of supplemental instruction, structured peer dialogue and problem-centered tasks can deliberately induce productive cognitive conflict, prompting accommodation and deeper conceptual change. Supplemental instruction leaders, therefore, design activities that surface misconceptions, scaffold hypothesis testing, and require learners to externalize, justify, and negotiate meanings, through accelerating equilibration and transfer. This operationalization preserves constructivism's core commitment, which is on learner agency, experiential engagement, and reflective abstraction, while aligning with a pragmatic stance that treats purposeful activity as a vehicle for knowledge construction.[28]

Contextualising the Study

The study was contextualized within two South African universities in South Africa. In the process of evaluating the overall student experiences about different modules at the end of the semester, the researchers inferred findings that divulged their (students') perceptions about the crucial role of supplemental instruction. The study subsequently investigated and probed into those perceptions in-depth through semi-structured interviews. Furthermore, based on the findings of this study, the researchers predicated the proposal of the framework for advancing student teaching, which offers practical guidance for lecturers and students to implement supplemental instruction while accommodating students' technological needs and preferences.

METHODOLOGY

This study adopted the pragmatic epistemological stance, acknowledging both quantitative and qualitative data as pertinent for investigating students' perceptions of supplemental instruction. For the qualitative strand, 20 students were purposively sampled from the total population of 6,772 (n=6772) students who gave feedback on and about their perceptions of supplemental instruction within the two selected South African universities. Amongst the purposively selected students were 3 student leaders. For the quantitative strand, a total of 6,772 students filled in the questionnaires and module evaluation tools. While 6,772 students were randomly sampled from both universities, qualitative findings were particularly inferred from the purposive sampling of 20 students who are enrolled in " at-risk modules" across the two universities. The purposive sampling of 20 students was informed by the conceptualization of supplemental instruction as the interventional pedagogical approach for " at-risk modules." Nevertheless, because some scholars argue for the transverse use of supplemental instruction across both "at-risk" and "not at-risk students." Hence, for the quantitative strand, a total of 6,772 students (from the selected two universities) were randomly sampled, thereby including both at-risk and not at-risk modules. The selection of participants was based on neither age nor socio-economic background(s).

Participants were informed of anonymity and confidentiality. The participants were also told that their participation was purely voluntary and that they were not deprived of their right to withdraw their participation at any given time should they wish to do so. Likewise, all participants signed forms indicating their consent to participate in the study. The researchers applied for and acquired the ethical clearance certificates from the two universities. The validity of the data was ensured by the triangulation of two data collection tools (surveys as well as semi-structured interviews). Prior to the collection of qualitative data, the researchers requested that the proceedings be recorded using a tape recorder. In an attempt to ensure the accuracy of the translation of data (from isiZulu to English), the researchers used

[27] Jean Piaget, *Piaget's Theory of Intelligence*, vol. 2 (Englewood Cliffs, NJ: Prentice Hall, 1978).
[28] Robert S Siegler and Shari Ellis, "Piaget on Childhood," *Psychological Science* 7, no. 4 (1996): 211–15; Jean, Piaget and Bärbel Inhelder, *The Child's Construction of Quantities: Conservation and Atomism*, vol. 8 (Psychology Press, 1974).

the expertise of a language expert, who evaluated appropriateness, tone, and style in the translated text. Permission to record semi-structured interview proceedings and survey results was obtained from participants.

The study was framed within the QUANT-QUAL explanatory sequential mixed methods research design, which is a design that begins by collecting quantitative data and subsequently uses qualitative data to attach meaning to quantitative findings. This research design was suitable for this study to support quantitative and qualitative methods.

In this study, two instruments were utilised. For quantitative data, surveys were administered, while for qualitative data, a semi-structured interview schedule was used. The quantitative data was analyzed by *SPSS* through a *t-test* in parallel with qualitative data (which were analyzed thematically from semi-structured interviews with educationists).

PRESENTATION OF FINDINGS AND DISCUSSION

Presentation of Quantitative Data

Tests of normality

When normality assumptions do not hold, it becomes difficult to draw accurate and reliable conclusions about the nature of reality.[29] In this study, the researchers conducted the Shapiro-Wilk test to ascertain whether the data were normally distributed or not. They further conducted the Shapiro-Wilk test to determine whether the comparison should be done using a parametric or non-parametric test.

In the Shapiro-Wilk test, the alpha value, which is greater than .05 ($p > .05$) determines the normality of data. The null hypothesis (H_0) was that the student survey feedback on supplemental instruction program scores for modules at risk and those not at risk across faculties (as indicated in figures 1 and 2 below) were normally distributed.

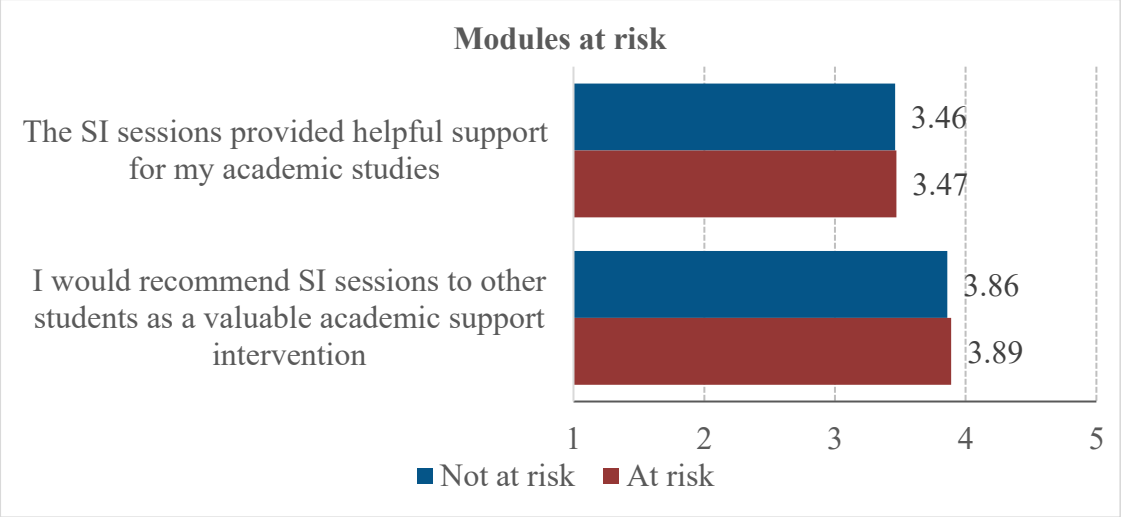

Figure 3: Student survey feedback for at-risk and not at-risk modules

[29] Keya Rani Das and AHMR Imon, "A Brief Review of Tests for Normality," *American Journal of Theoretical and Applied Statistics* 5, no. 1 (2016): 5–12; Derya Öztuna, Atilla Halil Elhan, and Ersöz Tüccar, "Investigation of Four Different Normality Tests in Terms of Type 1 Error Rate and Power under Different Distributions," *Turkish Journal of Medical Sciences* 36, no. 3 (2006): 171–76.

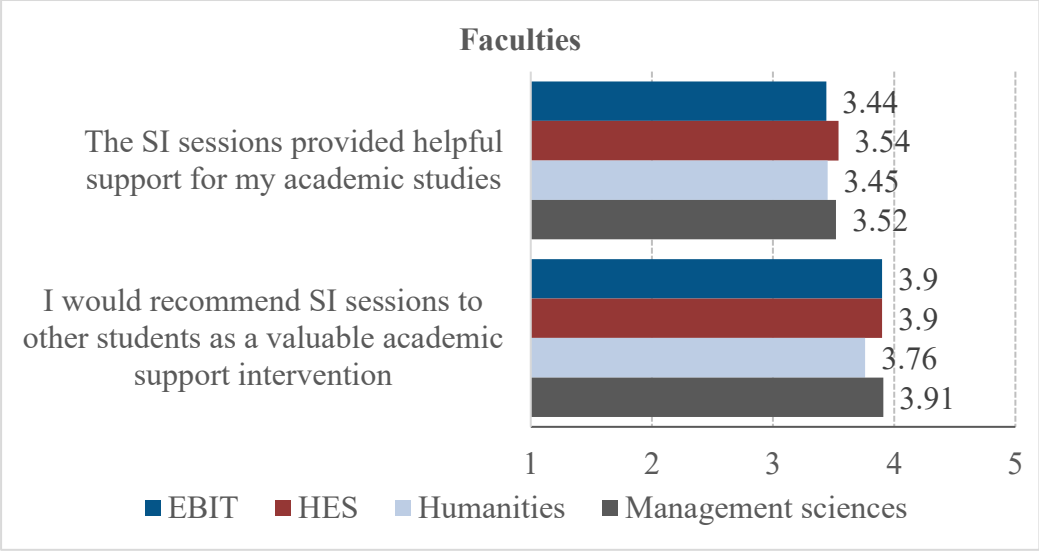

Figure 4: Student survey feedback across different faculties

Tables 1 and 2 below determine the normality of data, and establish whether the null hypothesis should be accepted or rejected.

Table 1: The tests of normality table for student survey feedback for at-risk and not at-risk modules

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**Df**	**Sig.**	**Statistic**	**df**	**Sig.**
At risk modules	,100	6772	,500*	,977	6772	,572
Not at-risk modules	,117	6772	,099	,965	6772	,503

Table 2: The tests of normality table: Student survey feedback across faculties

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**Df**	**Sig.**	**Statistic**	**df**	**Sig.**
EBIT	,151	1002	,096*	,077	1002	,097
HES	,159	1420	,099	,065	1420	,900
Humanities	,173	3350	,540	,978	3350	,534
Management sciences	,143	1000	,094	,054	1000	,090

According to the tests of normality tables, there were no statistically significant values between the scores and normality; in other words, the data were normally distributed (i.e., there is no *p*-value that is less than 0.05).

Paired samples t-test results (modules at risk and modules not at risk)

The hypothesis for the paired sample *t*-test was as follows:

The null hypothesis: The difference between the paired sample means is equivalent to zero. This denotes that the perceptions of students on the use of supplemental instruction did not differ between modules at-risk and modules not-at-risk.

The alternative hypothesis: The difference of the paired sample means is NOT equivalent to zero. This denotes that the perceptions of students on the use of supplemental instruction differ between modules at-risk and modules not at risk.
The following paired samples *t*-test were used to observe if there was any difference in students' perceptions based on modules-at-risk and modules not at-risk.

Table 3: The paired samples *t*-test results: modules at risk versus modules not at risk

	Paired Differences					t	Df	Significance	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
				Lower	Upper				
Modules at risk– Modules not at risk	0,05000	2,239	,0936	-15,26494	-12,85506	2,051	6772	<.001	<.001

According to the paired samples *t*-test results in Table 3 above, the difference between students' perceptions for at-risk and not-at-risk modules is positive. This connotes that there was a slightly greater number of positive perceptions on the workability of supplemental instruction for at-risk modules compared to not-at-risk modules. To establish if the mean difference is statistically significant, the *t*-value has to be greater than the critical value of 2,045. For this study, the *t*-value is 2,051, which is closer to the critical value of 2,045. Therefore, the difference was not statistically significant.

Presentation of Qualitative Findings
During the process of thematically analyzing qualitative data, two major themes emerged. Although the themes appear to be distinct, it was discovered that overlapping pieces subsequently caused them [themes] to converge and intertwine (see Figure 3 below). Furthermore, there was a deliberate intersection and coordination of pieces of data to address the following research question:

- **What are students' perceptions of university supplemental instruction?**

The data presented and discussed in this context are used to propose a framework for advancing university teaching, which offers practical guidance for lecturers and students to implement supplemental instruction while accommodating students' technological needs.

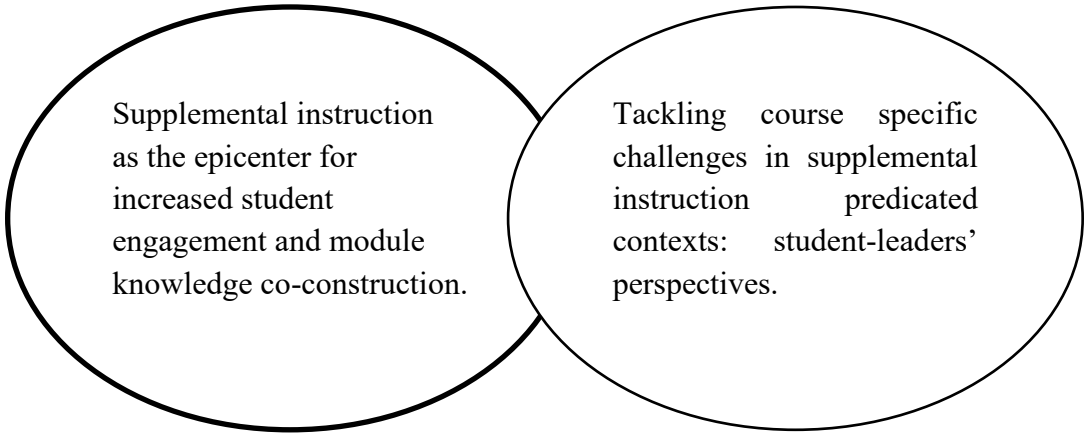

Figure 3: An illustration of the convergence and intertwinement of themes

Supplemental instruction as the epicenter for increased student engagement and module knowledge co-construction

Scholars conceptualize supplemental instruction within the context of student knowledge co-construction.[30] In fact, the vast majority of studies whose foci are on supplemental instruction are framed within the Constructivist theoretical lens, thereby underscoring the central role of peer engagement in the development of module understanding.[31] This study further excavated data that, reaffirms that supplemental instruction catalyzes knowledge co-construction and optimized student engagement. **Student A**, for example, indicated that it was through supplemental instruction that he got to better understand the module content, through interaction with peers and group discussions.

Student A:

> *There are study groups for challenging modules, such as the one you are lecturing. Sometimes we find it difficult to come to your office for help, since you are always very busy. We have created a study group, and we elected four students to be leaders in that group. I personally now have a better understanding of the module content. It is much better to interact with fellow students because our strengths are not the same. We even interact via WhatsApp. That is why perhaps half of the students in your module passed assessment 3.*

The verbatim words of **student A** indicate a sound understanding of what supplemental instruction entails. His understanding, in our view, is congruent with that which the scholars hold in their theorization of supplemental instruction. The conceptualization of supplemental instruction as a peer-based academic intervention which is designed to assist university students with mastering the content of challenging modules was reaffirmed by **student A**. The verbatim words of **student A** reveal the critical implications of both peer interaction and knowledge co-construction amongst students (as posited in the Constructivist theoretical stance). While there is no prevalent scholarly documentation of the role of modern technology (WhatsApp groups, for instance) in catalyzing supplemental instruction interaction sessions, **student A** identified that the integration of modern technology in supplemental instruction processes leads towards sound student interaction, knowledge co-construction, and understanding of the module content. In fact, three other students shared a similar sentiment, which is clearly contained in the verbatim words of **student B:**

> *I would say supplemental instruction aids us in understanding what we are failing to understand in class. For example, we struggle with the linguistic part of your module. With the assistance of XXX from the ICT department, we managed to create some sort of a website, which is a platform for discussion and interaction.*

Based on the words of **student B**, there is a need, this study argue, for scholarship whose concentration is on the confluence of modern technology and supplemental instruction, particularly at the present time, where institutions of higher learning are dominated by the generation of "truly digital natives." Henceforth, in the proposed framework, the technological aspect was featured (the proposed framework will be discussed at a later stage).

Quantitative data revealed that there is no statistically significant difference between the perceptions of students (as far as supplemental instruction is concerned) for at-risk and not-at-risk modules. Drawing from the verbatim words of **student C**, it can be argued that, indeed, for students, supplemental instruction is as instrumental for at-risk modules as it is for not-at-risk modules (two other students shared a similar sentiment).

Student C

> *I believe I need to pass all the modules. With that being said, supplemental instruction for me has been as useful for modules in which I fail as much as it is useful for the modules which I*

[30] Xinran Zhu, Hong Shui, and Bodong Chen, "Beyond Reading Together: Facilitating Knowledge Construction through Participation Roles and Social Annotation in College Classrooms," *The Internet and Higher Education* 59 (2023): 100919.

[31] Keith James Topping, "Advantages and Disadvantages of Online and Face-to-Face Peer Learning in Higher Education: A Review," *Education Sciences* 13, no. 4 (2023): 326; Sheina Lew-Levy et al., "Peer Learning and Cultural Evolution," *Child Development Perspectives* 17, no. 2 (2023): 97–105.

find easy. The idea either way is to get to interact with other students, either for the modules you pass or the modules you are failing to pass.

The verbatim words of **student C**, in the researchers subjective view, give a revolutionary idea that supplemental instruction ought to be conceptualized as a resource and interactive platform, which aids students in mastering the content of both at-risk and not-at-risk modules. Furthermore, the words of **student C** reveal the interplay between supplemental instruction, knowledge co-construction, and the development of cognition (the latter is central in the constructivist theory). The study, therefore, argues that supplemental instruction is the matrix within which knowledge construction, co-construction, and cognitive development are reproduced.

From this theme, data was drawn that reiterate the scholarly conceptualization of supplemental instruction. The study further managed to attach an explanation to the lack of a statistically significant difference between the at-risk module mean and the not-at-risk module mean. Overall, this theme provides the framework for understanding the theory of constructivism (and the educational implications thereof) because the participants indicated that the development of their cognition and their conceptualization of content mastery is predicated on social interaction and knowledge co-construction, as posited.

Tackling course-specific challenges in supplemental instruction-predicted contexts: student-leaders' perspectives

According to Crouch and Mazur, supplemental instruction is done to help students deal with module or course-specific challenges.[32] Although there have been scholarly debates on whether the manner in which students organize themselves and discuss issues which are outside of (yet related) to academics can be comprehended as supplemental instruction,[33] scholars from the context in which supplemental instruction was initiated assert that it (supplemental instruction) is intended solely for academic purposes. Again, the scholarship whose focus has been on how student leaders perceive and conceptualize supplemental instruction is minimal. However, from this study, two student leaders were interviewed whose responses were aligned with both the theory of constructivism and pre-existing scholarly conceptualization of supplemental instruction. Again, the responses from student leaders helped in attaching meaning to quantitative data.

Student leader A

I have been leading student-peer education groups for the past 2 years. Although we work with other structures such as Student Affairs and the Student Representative Council, our main focus is on helping fellow students deal with module-specific challenges. The sessions have been instrumental, and I would personally recommend other students to join.

Student leader A indicates that, even though they focus on helping students deal with problems that are predominantly module-specific and academic, they also spearhead liaison between students and other bodies that help them (students) deal with matters that are outside of academics. This models the importance of social interaction and knowledge co-construction, even beyond the immediate boundaries of formal learning. Of paramount importance, from the verbatim words of **student leader A** is that supplemental instruction works in two-fold ways (i.e., to help students tackle and deal with module-specific challenges and alleviate student worries and problems by helping them deal with issues outside of academics. It was further noted that the verbatim words from **student leader A**, (that indicated that she recommends supplemental instruction) proved to have a statistical appearance from the analysis of surveys.

Student leader B

The focus of us having online interactions and face-to-face discussions is to help each other deal with academic challenges. This does not only apply to at-risk modules. I have to say, we

[32] Catherine H Crouch and Eric Mazur, "Peer Instruction: Ten Years of Experience and Results," *American Journal of Physics* 69, no. 9 (2001): 970–77.

[33] Jennifer K Knight and Cynthia J Brame, "Peer Instruction," *CBE—Life Sciences Education* 17, no. 2 (2018): fe5.

can see the difference. Thina (us), we started at the beginning of 2023, and almost 98% of us passed the module. We also had the privilege of being joined by Dr. XXX, and we could see the change.

Although **student leader B** provides the quantitative indication of the number of students that were assisted through supplemental instruction, worth noting is that he specifies the importance of having supplemental instruction also led by lectures, thus challenging the traditional conceptualization of supplemental instruction as a peer-led student interaction.[34] The study, therefore, argues for the involvement of lecturers in supplemental instruction sessions; thus, it provides the framework that includes students, student leaders, and lecturers.

THE FRAMEWORK FOR ADVANCING UNIVERSITY TEACHING

Based on the findings, the study proposes the following framework for advancing university teaching, which is believed to offer practical guidance for lecturers and students seeking to implement supplemental instruction, while accommodating the technological needs and preferences of the present-day students (see Figure 4).

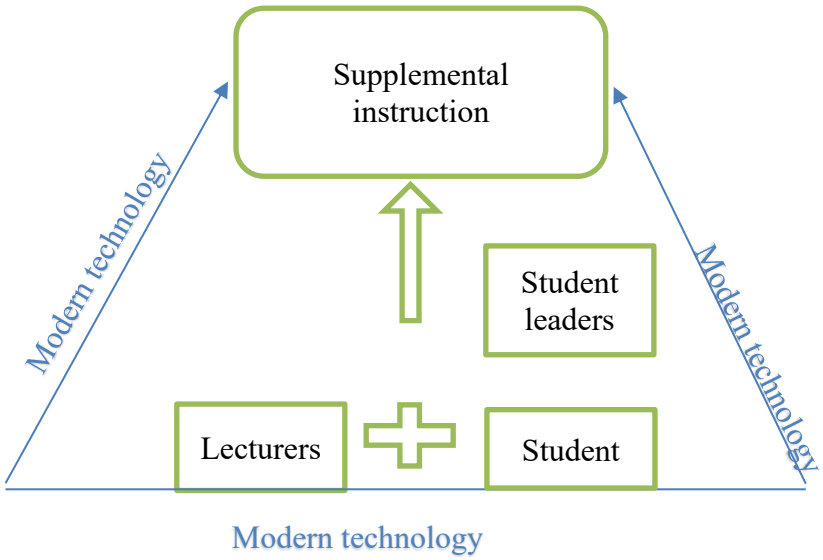

Figure 4: The framework for advancing university teaching

According to this framework, supplemental instruction is enclosed within modern technology. This means this instructional approach functions soundly with the use of technological devices and through online teaching and learning platforms. Furthermore, this framework recognizes the collective role of lecturers, student leaders, and students in the co-construction of knowledge. Thus, the study argues for the collaboration of the latter three (students, student leaders, and lecturers). Therefore, students and (or) lecturers seeking to advance the understanding of module content(s) are to consider the co-construction of knowledge, which manifests through student-student, student-student leader, and student-lecturer interactions. This model is assembled upon the theoretical ideas of constructivism.

CONCLUSION

This paper sought to excavate the perceptions of the selected South African students on supplemental instruction. The findings have revealed that supplemental instruction improves student performance in both at-risk and not at-risk modules, across different faculties. The study further underscored the critical need for integrating modern technology within supplemental instruction sessions, thus catering to the technological needs of the contemporary digital cohort of students. Based on the findings, the study

[34] Edward C. Jimenez, "Motivating Factors of Teachers in Developing Supplemental Learning Materials (Slms)," *Online Submission* 8, no. 5 (2020): 108–13.

recommends a framework for advancing university teaching, which offers practical guidance for lecturers and students seeking to implement supplemental instruction.

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