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Examining the Effects of Peer-Led Team Learning as a Support for Community College Transfer Students' STEM Achievement

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Abstract: Peer-led Team Learning (PLTL) is a model of instruction and learning that has been used to address low success rates in various science, technology, engineering, and mathematics (STEM) courses and other fields in higher education. (1) While research conveying the efficacy of this model of instruction remains mixed, this project sought to add to the body of knowledge communicating the benefits of PLTL for STEM achievement. This study examined the experiences of STEM community college transfer students' engagement in PLTL within their major course of study when a suite of supports was provided. (2) Specifically, study participants were enrolled in degree programs at a four-year rural, regional university in the engineering, computer science, and mathematics (ECSM) fields and were provided social, financial, and academic assistance. Qualitative analysis of the data revealed that with a PLTL component, community college transfer students were more likely to participate, engage, and perform better in coursework given the additional supports. (3) Study participants indicated the community of learners created through PLTL was a primary motivator for continued engagement and progress towards ECSM degree attainment. (4) Implications for practice extend to engagement and retention efforts of STEM students from the community college population

Keywords: community college transfer students; STEM; retention; peer-led team learning

1. Introduction

National educational policy reforms have raised concern about the shortage of science, technology, engineering, and mathematics (STEM) professionals to meet growing labor market needs. Institutions of higher education have made concerted efforts to recruit and retain students interested in pursuing a STEM degree. Such efforts have included scholarships [1]; residential, social, and curricular learning communities [2]; mentoring programs [3]; undergraduate research experiences [4]; experiential learning [4]; and academic assistance, such as tutoring [5]. While several of the studies cited target distinct populations [3,4] or highlight specific programs [2,5,6], the current research base still finds some of these strategies ineffective and costly [1].

To confound this, higher education institutions have been preparing for the demographic cliff, aptly named for the steep decline in first-time, full-time freshmen enrolling in colleges and universities beginning in the year 2025 [7]. The Western Interstate Commission for Higher Education [8] attributes the decrease to low birth rates during and following the Great Recession. Moreover, allocations for state higher education appropriations have been on the decline [9]. In response to the drop in tuition funds projected by decreases in student enrollment, higher education institutions have thus looked to other student groups for enrollment growth such as graduate students [10], online education [11], and non-resident freshmen [12]. The demographic cliff presents an added challenge to meeting STEM workforce demand and has compelled institutions to target efforts at other populations rather than the traditional population of entering freshmen. For example, community college transfer students (CCTS) are one such population to which recruitment and retention efforts should be directed if higher education institutions are to survive [13].

A College of Engineering (COE) at a four-year university engaged in efforts to assist the population of community college transfer students (CCTS) seeking to obtain a STEM degree. In 2019, a National Science Foundation (NSF)-funded project was received by this College of Engineering to provide CCTS with a suite of academic, financial, and social supports designed to meet the unique needs of these STEM students. The first cohort of CCTS were encouraged to take part in various activities outside regular class hours to assist with coursework, engage in a supportive community, and develop as professionals prior to graduation. During the 2019–2020 academic year, a peer-led team learning (PLTL) model was also incorporated into 39 COE courses where student success rates were low and CCTS actively participated in these PLTL sessions. While these support areas adopted by this COE play a role in student success, this research project will primarily detail the measures taken in the academic domain and the incorporation of a PLTL program provided to STEM CCTS.

PLTL was chosen as an avenue for support given the prior success demonstrated by research on implementation in science-based undergraduate courses [14]. Recent research conducted with PLTL has included the implementation of cyber-led PLTL in an organic chemistry course [15], and within international contexts as a support for first-year biology students [16], with results indicating successful learning outcomes for students. Although PLTL has been investigated in STEM field content areas of mathematics, engineering, and computer science [17–19], research regarding PLTL and CCTS is limited. However, one study detailed the structure and outcomes of a partnership between a university and community college to transfer the PLTL practice to the two-year college [19]. Gates et al.'s [19] evaluation of the program through qualitative analysis of student responses found favorable results for a variety of student outcome measures for community college students majoring in computer science.

Therefore, the significance of this study is to communicate the features and research analysis of the PLTL program through the CCTS' experiences in the different PLTL courses offered in the COE. To serve this purpose, this study sought to answer the following questions:

How do CCTS describe their experiences with PLTL, when a suite of supports is provided? When coupled with a suite of supports, do these experiences influence PLTL participation?

Within research question one, CCTS participants in this study were limited to a convenience sample of individuals who engaged in PLTL and had access to the academic, social, and financial supports provided. This was done so that barriers often experienced by CCTS that would hinder PLTL participation would be limited. Moreover, and to further delineate the purposes of research question two, PLTL participation was defined as having attended a PLTL session five or more times within the course of a semester. In responding to these research questions, it is hoped that results from this study would inform higher education institutions on methods that may be undertaken to ensure CCTS success in STEM.

1.1. Peer-Led Team Learning

As an instructional model and conceptual frame, PLTL has been utilized for many years at various institutions of higher education with mixed results [20,21]. However, studies do exist that communicate the benefits of PLTL [22]. First introduced in chemistry courses at the City College of New York in 1991 [23], the PLTL model is grounded in the theoretical frames of social constructivism and equity, with equity broken down into the constructs of outputs, inputs, and fairness [14]. As such, the PLTL model involves smallgroup cooperative learning, where all students are given an opportunity to meet regularly with successful students, designated as peer leaders. PLTL was designed to enrich course content understanding through discussion in a way that meets the majority of students' needs, given the structure of the supports provided by the institution. These small group discussions, held outside of class time, do not incorporate formal procedures, but focus on enhancing student understanding of a specific topic [24–26].

To provide a conceptual basis for PLTL, ref. [14] provided two main theoretical frames driving the research: social constructivism and equity. Attributed to Vygotsky [27], social constructivism is a theory that knowledge is socially constructed and situated in interactions with others. In conjunction with this theory, learners are exposed to role models with advanced disciplinary knowledge and skills in a field which the learner can interact, observe, and model [14,28]. In terms of PLTL, these role models are the peer leaders themselves "who have succeeded in their institutional culture as well as their particular course" [14] (p. 1688).

To operationalize a definition so that a systematic examination of learning could be achieved, and issues of equity further analyzed within PLTL, ref. [29] divided equity into three main conditions: equity of outputs, equity of inputs, and equity of fairness. Equity of outputs refers to outcomes, or "results" as stated by [29] (p. 19), in which success may be achieved in the same manner regardless of group membership (e.g., women achieving at the same rate as men). Equity of inputs deals with the resources for achievement and success so that "all have a level playing field" [29] (p. 20). Equity of fairness refers to the examination of the resources and results so that changes and tradeoffs may be made in terms of situational fairness [29]. In terms of PLTL, equity of outputs may refer to having a peer leader that serves as a role model for success in a population that is analogous to the demographics and background of the students they serve [29,30]. Equity of inputs may refer to the provision of supports so that all students may have equal opportunities to engage in PLTL. In terms of equity of fairness, institutions should examine courses for the possibility of PLTL implementation and engage in the "balancing act" of how to expend resources, knowing that the needs of some students may be met at the expense of others [14,29].

Moreover, Gafney and Varma-Nelson [31] identified a model containing six critical components for successful implementation of a PLTL model. The critical components consisted of faculty involvement, importance of PLTL to the course, leader selection and training, appropriate materials, appropriate organizational arrangements, and administrative support [31]. In adopting and adapting PLTL, these authors also suggest that implementation occur in phases, with institutions conducting a pilot phase to determine applicability, reproducibility, and commitment for student success and engagement. In the prior stages of this project, the COE used these critical components and tested the implementation in various STEM courses with success [32,33]. Once program implementation was researched and issues addressed [32], the PLTL program was fully launched and a cohort of CCTS was encouraged to participate.

1.2. Community College Transfer Students

According to College Board Research, 42% of all US undergraduates are enrolled at community colleges [34]. Taylor and Jain [35] indicated that slightly less than half of students receiving their bachelor's degree have transferred from community colleges. CCTS are generally older with a mean age of 22–26 and are more likely to be minority, first-generation, and low-income college students [36,37]. CCTS are generally commuters, who work either full- or part-time and integrate college education into work and family responsibilities [36,38,39].

The ability to finance their education is a crucial factor for this population [36,39–41]. Pell grants provide some financial assistance, but bachelor's degree recipients who originate in two-year institutions tend to accumulate more debt than students who begin in a fouryear institution [42]. CCTS are thus more likely to work while pursuing their degree to overcome financial pressures; however, working more than 30 h a week lowers their GPA and puts these students at risk of not completing college [34]. CCTS face further academic barriers when making the transition to a four-year university [38,39]. These barriers frequently result in a drop in GPA in the initial semester at the university. This is referred to in the literature as "transfer shock" [43,44]. Thus, it is noted that CCTS have difficulties becoming immersed in the university community due to the previously mentioned work, family responsibilities, commuter student status, or simple lack of interest [39]; however, the financial constraints of this population are further linked to low levels of social and academic integration [45,46].

Pascarella et al. [47] and Taylor and Jain [35] found that social and academic integration can play a significant role in the persistence of transfer students. Prior results of PLTL in STEM disciplines indicated this methodology as a potentially promising method for simultaneously addressing both academic challenges and social barriers faced by this population.

Given the mixed results on the efficacy of PLTL present in the literature [20,21], this study sought to add to the body of knowledge on use of this instructional model for STEM student success. Additionally, and based on the prior success of PLTL implementation within the College of Engineering depicted in this study [32,33], further investigation sought to dive deeper into the research work and explore the efficacy of instruction of this type with unique and important STEM student populations. CCTS were chosen for this study due to the distinct and diverse challenges faced by this population and the contribution that attention to these students in academic and social settings may have for increasing STEM degree persistence, attainment, and workforce development. As mentioned, the limited research base involving the application of PLTL for CCTS learning application is another motivation for conduction of this study. However, what research does exist shows promise for CCTS success [19]. Additional research involving CCTS and PLTL provides strength to the argument for the viability of this instructional model to assist diverse populations of students with STEM content knowledge success in their STEM career pursuits.

2. Materials and Methods

A qualitative case study design was utilized for this research to encompass a complete thick, rich description and analysis of an instance bounded within a particular context [48]. Depictions of CCTS' participation experiences in PLTL serve as the instance. The context extends to CCTS provision of a suite of supports provided in concert with the PLTL components, and the interactions that resulted from participation. The choice of qualitative methods and, more specifically, a case study design was to ensure that the topic was explored through multiple lenses so that the instance under observation could be fully revealed and understood [49]. As a comprehensive form of analysis [50], qualitative case study methodology provides a format that allows the research to have the following characteristics:

- Particularistic—focusing on a particular situation, event, program, or phenomenon;
- Descriptive—yielding a thick, rich description of a phenomenon under study;
- Heuristic—illuminating the reader's understanding of the phenomenon under study [48,51].

To provide this type of methodology for the current study, depictions of the setting, PLTL program, and full descriptions of interview student participants accompany the explanation of the procedures and analysis conducted.

2.1. Setting

The COE at the four-year rural, regional university in this study is one that houses the disciplines of engineering (civil, electrical, environmental, mechanical, and technology), computer science, and mathematics. As a newly established college, this COE has made concerted efforts to attract and retain graduates to all programs through assistance in some form, including the establishment of the PLTL program and the hiring of a student success coordinator [32]. The program developed by the COE in this study was centered around the six critical components of PLTL [31], with the components guiding the various measures the college undertook for implementation. While a more detailed description of how this was accomplished is beyond the scope of this paper, the authors suggest Lockwood et al. [32] for further reading.

Since faculty involvement was listed as the first of the six critical components of a successful PLTL model [31], course instructors were given the authority to select their own peer leaders from their best former students with the understanding that faculty would be working very closely with the chosen student. In this manner, issues involving personalities could be considered at the onset and were relatively nonexistent by the implementation of the program. In addition, faculty and leaders both received the same PLTL training centered around metacognitive learning strategies [33]. Peer leaders often attended lectures and scheduled regular meetings with faculty to discuss moment-to-moment material and strategies for student assistance. Having the leader regularly attend and be involved in the lecture component conveyed the importance of PLTL to the course, served as a constant reminder of the support, and allowed for content material review for the peer leader to work with the instructor to develop challenging, active learning materials for workshops.

PLTL sessions were provided at least once weekly with more offerings being held at the suggestion of the faculty member, students enrolled in the course, or if a more challenging topic approached. Since peer leaders regularly attended lectures, their presence was a constant reminder to students of the assistance that may be provided, and peer leaders stayed up to date with course material and information. As part of modifications made to the PLTL format at this institution, peer leaders were also "on call" and would make themselves readily available to students through text, phone call, or online collaboration technologies. Peer leaders were compensated for time spent on-demand to students, as well as any time needed to prepare for PLTL workshops. While more specific program descriptions are beyond the scope of this paper, more information about the PLTL program at this institution can be found in work by Lockwood et al. [32] and Meador et al. [33]. Through adherence to the six critical components outlined by Gafney and Varma-Nelson [31], with a few modifications to accommodate learning and program differences, the PLTL model in the COE at this institution has seen increased success, especially in courses previously identified as having high drop-fail-withdraw rates [33].

2.2. Participants

Recruitment of participants was limited to only those CCTS who received assistance through a scholars' program in the COE at the institution in this study. This ensured that study participants were receiving the suite of supports offered through participation in the NSF funded Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) program and had access to a course with a PLTL component. The suite of supports provided by their S-STEM involvement consisted of assistance in academic, social, and financial areas. Academic and social support consisted of, but was not limited to, frequent interaction with faculty advisors and a student success coordinator; monthly S-STEM scholarship meetings encouraged participation in PLTL, undergraduate research experiences, major specific student organizations, and participation in community service opportunities. Financial assistance was provided through need-based scholarships as determined by federal financial aid guidelines.

Thirteen students, eight males and five females, met all eligibility requirements and agreed to participate. All majors in the COE, with the exception of civil engineering, were represented with four computer science, two math, two electrical, two mechanical, and two environmental engineering students, and one engineering technology student. Of the thirteen undergraduate CCTS participants, three were at the sophomore level, six were at the junior level, and four were senior-level. All students maintained a 3.0 GPA, were in fullor half-time status, and were in good academic standing with the institution. In addition, four of these 13 students agreed to participate in an interview. To provide the thick, rich description necessary in qualitative research [48], and to provide an idea of the types of CCTS involved in this study, a detailed portrayal of each interview participant is provided. Pseudonyms are used to maintain the anonymity of study participants. It should also be noted that the interview participants described all attended the same community college, which served as the primary transfer institution to the four-year university in this study.

2.2.1. Chrissy

Chrissy is a junior-level white female environmental engineering major who grew up in the rural area proximal to the university. She began her post-secondary career attending community college after completing high school and then transferred to an out-of-state, four-year university. While she maintained grades of A/B in all courses, she quit school for a time as she married a member of the armed forces and relocated to the East Coast. Upon her husband's discharge, the couple moved back to the area and Chrissy resumed classes at the community college earning a mix of A's and B's. Upon transfer to the study institution, Chrissy had a majority of A's on her transcript and was selected by her advisor, a faculty proponent of PLTL, to serve as his peer leader. She also became good friends with Marsha, another study participant. Although these two individuals took many of the same courses at the community college together and knew of each other, they did not officially meet until after transfer to the university.

2.2.2. Kyle

Kyle is a sophomore-level, white male computer science major who also grew up in the rural area proximal to the university. Before entering post-secondary education, Kyle participated in an alternative educational program designed to meet the needs of students at risk for dropping out of high school. Kyle is not married and currently lives with his disabled mother and siblings. Finances were a challenge for Kyle as none of his family members had the means to assist with funding his education and were "barely getting by". He originally studied music at the community college and changed to business administration before finding his way to computer science. He specified the limited job prospects in music and his dislike for business administration courses as his reason for changing majors. After transferring from community college, Kyle has maintained a near 4.0 institutional grade point average in his major-specific courses.

2.2.3. Marsha

Marsha is a junior-level, white female environmental engineering student who grew up in the rural area proximal to the university and who attended the local community college right after high school. At the time of data collection, Marsha was in her last year of study, planning to graduate the following semester and was being advised in her program by the same faculty member as Chrissy. Marsha is currently married and has aspirations of staying in the region once her degree is complete. It is also interesting to note that Marsha was unsuccessful in taking two math courses at her community college but was able to complete these degree requirements upon transfer to the university, with both courses providing a PLTL component. Marsha holds a primarily B-level grade point average.

2.2.4. Mateo

Mateo is a senior-level, Hispanic male computer science major who grew up in a rural area farther away, but still in relative proximity to the university. While he attended the same community college as the other interview participants, part of his classes were taken at a satellite campus closer to his hometown. Mateo stated that his family could not afford his education, so he worked part-time at a feed-yard to pay for school. He often carpooled an extra hour to the community college main campus with classmates, when the courses he needed were no longer offered at the satellite campus. He would "hang out" in the mathematics tutoring center when differences in schedules left him with significant time before he could carpool home. Mateo is very proud of the fact that he has saved enough money from his work during the summer to pay for his living expenses and school so that he can graduate debt-free. He was highly recommended by his community college professors and subsequently selected as a tutor in the mathematics department at the four-year university. Mateo maintains a near 4.0 grade point average.

2.3. Procedure

Upon receiving human subject research approval, data collection began with the conduction of a focus group for students who met the qualifications for participation: being a CCTS and an NSF scholarship recipient. Approximately 20 students met the qualifications and were invited to attend the focus group, with 13 total participating. The focus group was audio recorded and lasted for approximately one hour. Students were first asked about their participation in PLTL, where all students indicated that they had attended at least five PLTL workshops. Elaboration of their experiences was elicited with questions such as "What factors have impacted your decision to participate or attend a PLTL workshop?" and "Besides PLTL, is there anything else you do outside of class, where you are interacting with peers in your major or peers in the same class, for assistance with material?".

Recordings of the focus group were transcribed, and notes were taken in a research team member's reflexive journal. Notes and transcriptions were then used by the research team to discuss and elaborate on the ideas discussed by the CCTS participants during the focus group. At the conclusion of the focus group, student participants were asked to provide their interest in participating in a follow-up interview with a member of the research team. The individual interview protocol was then modified to reflect the determined changes and capture the concepts discussed by students during the focus group. Four focus group participants consented to take part in follow-up interviews and one interview was conducted with each participant. Interviews were audio recorded and transcribed by the research team and reflexive journal notes were taken immediately upon the conclusion of each interview. Transcribed interviews were also sent to interview participants for accuracy and elaboration of content.

2.4. Analysis

In a deductive approach and prior to analysis, a priori codes were developed from the foundational theoretical basis of PLTL. A priori codes of social constructivism, equity of outputs, inputs, and fairness were created, as these areas frame much of the PLTL literature [14]. A codebook containing these a priori codes, along with their respective definitions from the existent literature, was created to assist the analysis, create a consensus among coding members of the research team, and "maximize coherence among codes" [52]. Table 1 contains information in the a priori codebook. Data sources for analysis existed in the form of focus group and interview transcriptions, observational notes taken during focus group and interviews, and the researcher's reflexive journal.

Table 1. A priori Codebook.

Code	Definition	Source
Social Constructivism	Students make sense of their surroundings and experiences by actively developing concepts and models. As a process, this sense-making is assisted by social interactions through discussions, debate, and problem-solving tasks. Individuals interpret their experiences using socio-collaborative tasks in order to progress meaning within the group interactions to defend, assert, and understand their developed conceptions.	[14]
Equity of Outputs	"characterized as a distribution curve of student outcomes that roughly looks the same across a group. . . the primary goal is for all students to achieve a certain threshold of science literacy" (p. 19). "Implicit, long-term, but clearly definable goal that involves both closing achievement gaps while raising standards for all" (p. 20)	[29]
Equity of Inputs	"In the context of science education, this may be manifested in equally good classroom facilities, materials, technology, curriculum, and teachers. It may mean equal access, an equal opportunity to take upper-level classes, or equally encouraging treatment of students by teachers in classes" (p. 20)	[29]
Equity of Fairness	"Perhaps even more resources are needed—more instructional assistance or extra time allotted for tutoring. Perhaps extant resources could be allocated differently or new more effective approaches to instruction developed. . . It must be done within the school, weighing the best way to reach these students and the cost to other students" (p. 21)	[29]

Each data source was then read and coded by two members of the research team to the corresponding a priori codes. Following this first iteration of coding and as a peerdebrief [52], two members of the research team compared the labels assigned to the data sources for consistency and verification. Discrepancies were discussed, referencing the codebook, and a consensus of label was determined for that discrepant data source. The two team members then discussed the emergent themes within the data sources that fell under the a priori codes. Descriptive labels were then created for each theme and a second iteration of coding was conducted. For the second iteration of coding, data selected within a particular theme were cross-referenced for existence among multiple data sources. A third iteration of coding was conducted for accuracy and qualitative reliability [52].

3. Results

While individual themes developed within each overarching a priori code, relationships between these themes also emerged. Themes embedded within the a priori codes and the relationships among the themes are depicted in Figure 1. Each developed theme and the nature of the relationships between noted themes will be subsequently described. It should be noted that 121 total unique data points, including sentences, phrases, or other quoted utterances from the focus group and interview transcriptions within the data set, were coded to the a priori codes for theme development. Themes and relationships will be presented as one reads the diagram depicted in Figure 1 from left to right.

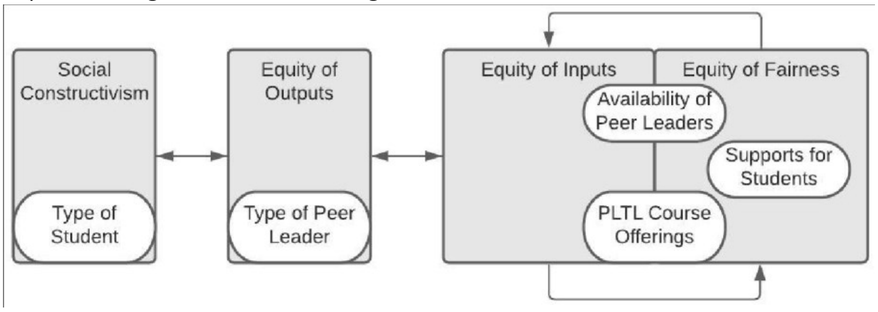

Figure 1. A priori and Thematic Relationships Diagram.

3.1. Type of Student

From among all sources, there were 42 out of 121 total data points coded to the a priori code of 'social constructivism', and the theme 'type of student' emerged from within this data subset. 'Type of student' was further delineated into the types of students who did or did not attend PLTL course components. For example, when Kyle was prompted about the types of students that attend PLTL, he stated that

> "Most of the people who attend will have 4.0s, kids who have that drive to maintain the best grades. You know, so I think the kind of person who's going to attend is always going to be that type, who just knows what they need and are willing to go get it; that are determined".

Within the discussion of types of learners that utilized PLTL, the CCTS often referred to two different types, those motivated to achieve As and those only wishing to maintain the average C or "just pass". To illustrate this idea, Chrissy stated that she believed students attended PLTL based on it being "a personality thing, because they're obviously very motivated students who want to do well. And then there's the ones that are like, just going to pass with a 70 or whatever". As many of the CCTS participants in this study were highly motivated and high-achieving, the data on these types of learners attending PLTL, because of personality, symbolized the reciprocal relationship that existed between social constructivism and the equity of outputs as shown in the thematic diagram. To elaborate, Heylighen [53] stated that social constructivism "sees consensus between different subjects as the ultimate criterion to judge knowledge. 'Truth' or 'reality' will be accorded only to those constructions on which most people of a social group agree" (p. 2). Wilson and

Varma-Nelson [14] provided that the equality of outputs "refers to a situation in which the demographics or background of successful students is analogous to the demographics or background of the overall student population" (p. 1687). The data collected for this study suggested that community college transfers, as a type of highly motivated and successful learner, gravitated towards PLTL as workshops were conducted by peer leaders who were established as highly motivated and successful.

3.2. Types of Peer Leaders

Of the total 121 data points coded, 26 corresponded to the theme of 'type of peer leaders'. Within this theme, under the overarching a priori 'equity of outputs' code, CCTS described that peer leaders were both content experts as well as project or course experts. That is to say that not only could peer leaders help with course material, but they could also offer skills for studying for an exam with a particular professor, assistance with course project requirements, or assistance on information necessary for subsequent courses or completing degree program-required capstone projects. This is consistent with PLTL literature which suggested that students view peer leaders as role models who know how to successfully navigate the culture of the institution and courses [22].

With this notion in mind, focus group participant four went so far as to say that they select courses with specific peer leaders attached in much the same way they would register for courses with a favorite instructor. When specifically asked whether peer leaders were content or project/course experts, Mateo conveyed that in his experience, "so far there is a mixture of both. They would like tell us how some code works or explain something further or they will tell us this would be on the exam, you want might want to focus on this". When asked for further elaboration, all interview participants indicated that they found peer leaders extremely beneficial, the cause of their continued PLTL engagement, and contributed greatly to their success in the course.

The institution in this study not only assigned peer leaders to conduct workshops for specific courses, but also allocated resources for peer leaders to be available to students in an on-demand nature, and within reason, for the schedule of the peer leader. Study participants overwhelmingly found this beneficial. Detailing her experience, focus group participant nine provided that "there was one occasion where I wasn't able to make one of the sessions, so I texted him real fast. He set up a zoom meeting with me and he went over it. It helped me out a lot". Although skeptics may raise red flags to this deviation in a PLTL model being a detriment to the peer leaders, Marsha, referencing Chrissy's experience being on-demand as a peer leader, indicated that "my friend is now a peer leader. And she said that she would do it again, she doesn't mind doing it. It's not like an inconvenience to her. It's helping her learn the material".

3.3. Thematic Relationships

Due to the close relationship uncovered within the data, 'equity of inputs' was highly interrelated with 'equity of fairness'—the balance between allocating resources to benefit some students at a cost to others [14]. Due to the large number of double-coded data points that corresponded to 'equity of inputs' and 'equity of fairness', the themes developed for these two overarching codes were diagrammed, as shown in Figure 1, to exist within both. These consisted of the availability of peer leaders and PLTL course offerings, as described by the community college participants. When considering equal access for all for program supports, the trade-offs of allocating institutional resources that allow for this access must be considered and were mentioned by study participants. The following is an excerpt from Kyle on the on-demand nature of peer leaders outside of the workshop and the platforms used for availability, access, and convenience for students.

> "My computer science peer leader uses Discord. Discord was originally created for video game chats and creating gaming communities. You know, so a math major is much less likely to know about discord than a CS major. You know, I do have a peer leader in my calculus course, who uses Google Classroom. And I mean, that's fine. But a lot of kids

don't like using Google Classroom. So yeah, I think it just comes down to computer literacy and activity".

Within a member check with Chrissy, she stated that she was compensated well in student wages for being "on call" as a peer leader. Within peer leader training, Chrissy was also provided information about platforms like Discord that could be used to communicate with students outside of workshops or class meetings. During her interview she described her experience as a peer leader as follows:

"Discord is an option but it is a computer science thing I don't know about. So I just gave them my number instead. If you need help on something, text me. I have probably three or four that frequently ask me about something on the homework or ask me to go over a specific thing from the session. So I like when they do that because I hope this is helpful. But only a few of them reach out. And I make sure that I told them to give me time because I have to figure out an answer. So don't text me when it's due at midnight".

Another established theme, within the 'equity of inputs/fairness' data subset, extended to course offerings with a PLTL component. As part of the focus group and interview protocol, participants were asked for expansion of ideas on what degree program courses they felt would be better suited for PLTL components. Overall results were mixed, with CCTS participants split on wanting an availability of PLTL in freshmen-level or major introductory courses versus junior- or senior-level courses, where material was conceptually and theoretically more difficult. Chrissy positioned herself on the side of PLTL in freshmen-level and introductory major courses by stating

"I think it would have been beneficial for physics. And then like I said, statics, to get that understanding. Because what I've noticed is the professor will say something and it sounds so complicated. Then the leader will work the same problem. And you're like, that's it? Like in statics, if I could go back and have a peer leader in statics it would be just really simple. Because even now, I wouldn't know how to work those problems, because I just didn't get a good understanding of it. So I think it would help".

Mateo was on the opposite end of the spectrum, having transferred credit to the four-year university that placed him in upper-level courses. The following is an excerpt from his interview.

"But for some basic classes, I don't think we essentially need peer leaders. But it also depends on the class because there's some classes that are challenging. You could get by finding students that help you or asking the professor. But there's some classes that, you'll go to a lecture and you'll have no idea what's going on. I took one of those classes before and I had to go to the session the first day because I'd have no idea. It was my first class when I transferred here and I was having so much trouble".

However, there were students, such as Kyle, who communicated that offerings in both ends of a degree program would be beneficial. Kyle stated that he

"would say it would probably be best to base it [PLTL] on a similar structure that high school tutoring goes into, because high school is a pretty big transition from middle school. And so a lot of tutors and tutoring sessions in high school are utilized in the freshman year and in the senior year, just because difficulty in course load and life ramping up usually happens in those two transitory periods".

Focus group participants also indicated that resources such as having peer leaders within classes, and pre-professional organizations advertising PLTL sessions, increased their interest and motivation to attend PLTL workshops. As a necessary component of successful PLTL implementation [31], these themes communicate the importance of administrative allocation of resources, such as Discord and wide-spread PLTL offerings, to ensure an equity of input and fairness. Having the option to attend workshops online, with on-demand access to peer leaders, and more courses that include a PLTL component contributes to an equal opportunity of PLTL.

3.4. Supports for Students

While much of the themes and associated data that corresponded to 'equity of inputs/fairness' overlapped, the only exception was the theme of 'supports for students' that developed within those data points coded only to 'equity of fairness'. This theme attends to the second research question: When coupled with a suite of supports, do these experiences influence the decision to participate in PLTL? Data indicated that supports for students in the form of scholarships, direct PLTL information, and encouragement to attend PLTL sessions, contributed to the creation of a community of learners and feelings of acceptance and belonging within the STEM degree program for CCTS. One exemplification of this was the friendship between Chrissy and Marsha that formed as a result of PLTL participation, although both had made acquaintance in their courses at the community college they attended. Chrissy went so far as to say the following about receiving her scholarship:

> "I would have to work full time to pay for school and bills and everything. And I don't have to. And it's been cool to be recognized for working hard. Like, that was the first thing when I got it I was like, wow. I've never had recognition for working hard. I want to keep my grades up, so that's why I go to sessions. It's motivating and makes you want to work hard, because there was a reward for putting in that effort".

Mateo provided a nuanced form of information by describing several STEM major peers without student supports. He also offered his own experience at the community college prior to receiving any supports associated with his scholarship status. Table 2 shows Mateo's depictions of his and his non-scholarship receiving peers' situations.

Table 2. Mateo's Description of Himself and His Peers.

Student	Major	Description
Mateo (talking about himself)	Computer Science	I was going to apply to this university, but then I saw how much it costs. So I withdrew and went to the community college. I went over to the satellite campus near my hometown first. The classes were so small, and I had a better idea of how college was. Then I went to the main campus, which is a little bit bigger, and I had a better idea of how it was. For a whole year and a half, I drove back and forth to my community college 60 miles away. When I went to the community college, I would do my homework, then I would work at a feed yard. It was horrible. I just told myself, I'm not going to do this for the rest of my life. Then I got the scholarship and I can put more time into academics.
Hispanic Female	Engineering Technology	I do have a friend. She went the same route I did [attending a community college first] because I told her about how I did stuff. Right now she's here, and she's barely taking any classes. This is our first semester and she still doesn't know anything about the university. She only has one in-person class. Does this scholarship also cover engineering technology majors I wonder? She's from Mexico, but she got her citizenship one or two years ago. I really want to hope for her. She's also working in her hometown and she drives back and forth to the university.
Hispanic Male	Computer Science	He's still trying to go to college, but here's the thing, his parents are really scared. They are afraid he might get caught and get thrown back to Mexico. They won't let him drive. So he's having so much trouble going to college. He's finished with all the classes he can take at the community college, I think, and now he has just computer science classes. But he has to drive all the way to the university to take those classes, but they won't let him.

These peers were having a challenging time managing school and life obligations. His situation was quite different than his peers as Mateo indicated he had more time that allowed for PLTL attendance, leisure activities, and working a job for wants rather than needs. Mateo largely attributed these benefits to the support provided by the scholarship and expressed a desire to help his peers in a more challenging situation. In a follow-up member check, Mateo provided that his peers' need to work and time off-campus often prevented them from participating in programs like PLTL. He wondered if their position, GPA, and degree progress would be altered had they also received scholarship funds. The viewpoints presented from data provided by Mateo correspond to the idea of equality of fairness as "equity in science learning that reflects broader responsibility, embodied by the social justice model: obligation to prepare all students to participate in postindustrial society with an equal chance at attaining the accompanying social goods—rights, liberties, and access to power" [29] (p. 21).

4. Discussion, Implications, and Conclusions

This project contributes to the body of knowledge on the benefits of PLTL to a variety of learners with different backgrounds and conditions in STEM coursework. The developed dataset themes of 'type of student', 'type of peer leader' and 'availability of peer leaders', 'PLTL course offerings', and 'supports for students' cultivated from the theoretical basis of PLTL literature, through deductive analysis, convey the benefits of PLTL. These themes correspond to the social nature of learning inherent in a constructivist approach and shed light on equity matters that arise when CCTS are afforded the supports that allow for PLTL participation.

In terms of the 'type of student', study participants described highly motivated, highachieving individuals as students that regularly attended PLTL. Yet in consideration of this, [21] posited that one of the issues for faculty is keeping good students engaged and student transitions from high school to college, or community college to university, may create feelings of isolation. However, results from this study, consistent with prior literature [19,21], indicated that participation in PLTL helps to mitigate feelings of isolation. For this study, a sense of belonging was described as stemming from the supports provided and learned in collaboration with similar peers through PLTL. Although results were mixed, this research recommends that institutions consider offering components such as PLTL in courses at both the upper and lower levels of a degree program of study. This recommendation is offered for consideration from this study's findings so that the transitional needs of both traditional freshmen and CCTS may be met, and these individuals may also aspire to greater expectations, such as serving as a peer leader, with the added support.

In that regard, the role of the peer leader cannot be discounted. As prior research indicates that these individuals embody an equity output by serving as a model of success [14,29], having CCTS that serve as peer leaders contributes to CCTS' successful outcomes. Evidenced through Chrissy's experience, recruiting high-achieving CCTS to serve as peer leaders increased a sense of belonging and content knowledge generation. Also consistent with prior research [14], students in this study indicated that the types of peer leaders that served their needs were both skilled in discipline knowledge, and knowledge specific to the culture of the institution or course. As study participants indicated a desire to serve as a peer leader, serving in this capacity creates additional opportunities for extended learning, team-building skills, and a deeper understanding of content [22]. As peer leaders are selectively chosen by students and instructors alike and play an "indispensable role" in the PLTL model [54], the addition of being available on demand provides another opportunity for access to this resource. Other institutions of higher education considering implementation or modifications to PLTL should look to fill peer leader positions with qualified CCTS to provide another avenue for institutional community building and to serve as a model of success to other students with similar backgrounds. Findings from this study communicate that the benefits to CCTS from this allocation of institutional resources for this model outweigh the costs.

While ideas surrounding the equity of outputs and inputs were expressed through the relationships built between the types of CCTS attending PLTL, peer leader facilitation, and peer leader availability, issues involving the equity of fairness arose in the manner of supports provided to a select group of students. While the findings portrayed the success of PLTL participation and subsequent achievement for CCTS who were afforded a suite of supports (e.g., academic, financial, social), the costs come at the expense of having some students, for a variety of reasons, without the support or who could significantly benefit from both modes of assistance. However, scholarships and PLTL programs such as this are a push in the right direction to help as many students as possible obtain access to STEM knowledge necessary for personal degree attainment and community development. For matters involving equity of fairness, Lynch [29] specified that institutions "in the position to provide basic conditions for science education for all, or have gone beyond the minimum, can turn attention to conditions for groups of learners within the school" (p. 21).

When considering the results of this study, the limited sample size subsists as a limitation, which makes generalizability challenging. Although 13 CCTS participated in this study, not all experiences were able to be showcased to keep results presentation concise. In addition, only four students consented to follow-up interviews. While a noted limitation, a coincidental convenience of having these four CCTS interviewees was that they were representative of the population under study and those individuals that met the qualification criteria for study participation. Other limitations that lead to possible avenues for further research include data collection and level analysis of participation in PLTL by CCTS S-STEM scholarship program participants and non-program participants. This could include data collection in the form of PLTL attendance, duration of sessions, course completion, STEM major retention, and GPA to determine the effects of PLTL participation on STEM student success. Evidence from faculty members could also be recorded and analyzed as another data source for triangulation of findings.

Although the results of this project are consistent with PLTL literature, one distinction is the descriptive information provided by the specific population of CCTS receiving a suite of supports while completing their STEM degree. The authors understand that the limited sample size and the qualitative methodological nature of the study make it challenging for generalizability of results. However, the thick, rich description of the program, participants, and their experiences provided through these methods [55] affords the opportunity for other institutions to replicate similar programs based on their need and similar student populations. Outcomes and implications from this study may include dissemination of information for possible PLTL program replication or modification across other institutions, different programs of study, and diverse student populations.

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References

1. Heidel, J.; Ali, H.; Corbett, B.; Lui, J.; Morrison, B.; O'Connor, M.; Richter-Egger, D.; Ryan, C. Increasing the number of homegrown STEM majors: What works and what doesn't. *Sci. Educ.* **2011**, *20*, 49–54.
2. Dagley, M.; Georgiopoulos, M.; Reece, A.; Young, C. Increasing retention and graduation rates through a STEM learning community. *J. Coll. Stud. Retent. Res. Theory Pract.* **2015**, *18*, 167–182. [CrossRef]
3. Wilson, Z.S.; Holmes, L.; deGravelles, K.; Sylvain, M.R.; Batiste, L.; Johnson, M.; McGuire, S.Y.; Pang, S.S.; Warner, I.M. Hierarchical mentoring: A transformative strategy for improving diversity and retention in undergraduate STEM disciplines. *J. Sci. Educ. Technol.* **2012**, *21*, 148–156. [CrossRef]
4. Amaya, L.R.; Betancourt, T.; Colling, K.H.; Hinojosa, O.; Corona, C. Undergraduate research experiences: Mentoring, awareness, and perceptions—A case at a Hispanic-serving institution. *Int. J. STEM Educ.* **2018**, *5*, 1–13. [CrossRef]
5. Jin, L.; Doser, D.; Lougheed, V.; Walsh, E.J.; Hamdan, L.; Zarei, M.; Corral, M. Experiential learning and close mentoring improve recruitment and retention in the undergraduate environmental science program at an Hispanic-serving institution. *J. Geosci. Educ.* **2019**, *67*, 384–399. [CrossRef]
6. Batz, Z.; Olsen, B.J.; Dumont, J.; Dastoor, F.; Smith, M.K. Helping struggling students in introductory biology: A peer-tutoring approach that improves performance, perception, and retention. *CBE-Life Sci. Educ.* **2015**, *14*, 1–12. [CrossRef]
7. Adams, M. *The Demographic Cliff Is Already Here—And It's About to Get Worse*; Education Advisory Board: Washington, DC, USA, 2020. Available online: https://eab.com/insights/expert-insight/enrollment/the-demographic-cliff-is-already-here-and-itsabout-to-get-worse/ (accessed on 2 March 2023).
8. Bransberger, P.; Falkenstern, C.; Lane, P. *Knocking at the College Door: Projections of High School Graduates*, 10th ed.; Western Interstate Commission for Higher Education: Boston, MA, USA, 2020. Available online: https://knocking.wiche.edu/wpcontent/uploads/sites/10/2020/12/Knocking-pdf-for-website.pdf (accessed on 13 April 2023).
9. Cumming, K.; Laderman, S.; Lee, J.; Tandberg, D.; Weeden, D. *Investigating the Impacts of State Higher Education Appropriations and Financial Aid*; State Higher Education Executive Officers Association: Denver, CO, USA, 2021. Available online: https: //sheeo.org/wp-content/uploads/2021/05/SHEEO_ImpactAppropationsFinancialAid.pdf (accessed on 29 March 2023).
10. Jaquette, O. Do public universities replace state appropriations with master's students? *Rev. High. Educ.* **2019**, *42*, 1101–1144. [CrossRef]
11. Ortagus, J.C.; Yang, L. An examination of the influence of decreases in state appropriations on online enrollment at public universities. *Res. High. Educ.* **2018**, *59*, 847–865. [CrossRef]
12. Jaquette, O.; Curs, B.R. Creating the out-of-state university: Do public universities increase nonresident freshmen enrollment in response to declining state appropriations? *Res. High. Educ.* **2015**, *56*, 535–565. [CrossRef]
13. Mullane, J. (Ed.) *Policy Makers and Colleges Must Better Serve Transfer Students*; Inside Higher Ed, 2020. Available online: https: //www.insidehighered.com/views/2020/04/23/policy-makers-and-colleges-must-better-serve-transfer-students-opinion (accessed on 2 March 2023).
14. Wilson, S.B.; Varma-Nelson, P. Small groups, significant impact: A review of peer-led team learning research with implications for STEM education researchers and faculty. *J. Chem. Educ.* **2016**, *93*, 1686–1702. [CrossRef]
15. Wilson, S.B.; Varma-Nelson, P. Implementing peer-led team learning and cyber peer-led team learning in an organic chemistry course. *J. Coll. Sci. Teach.* **2021**, *50*, 44–50. [CrossRef]
16. Arevelo-Marquez, L.; Mendez-Meced, A.T.; Monterrubio-Alvarez, J.; Malave-Lllams, K.; Lizardi-O'Neill, L.; Bayuelo-Florez, E.D. Peer-led team learning as educational tool for first-year biology students. *J. Coll. Sci. Teach.* **2021**, *50*, 24–31. [CrossRef]
17. Reisel, J.R.; Jablonski, M.R.; Munson, E.; Hosseini, H. Peer-led team learning in mathematics courses for freshmen engineering and computer science students. *J. STEM Educ.* **2014**, *15*, 7–15.
18. Eren-Sisman, E.N.; Cigdemoglu, C.; Geban, O. The effect of peer-led team learning on undergraduate engineering students' conceptual understanding, state anxiety, and social anxiety. *Chem. Educ. Res. Pract.* **2018**, *19*, 694–710. [CrossRef]
19. Gates, A.Q.; Casas, C.; Servin, C.; Slattery, M. Using peer-led team learning to build university-community college relationships. In Proceedings of the 2015 IEEE Frontiers in Education Conference (FIE), Washington, DC, USA, 21–24 October 2015; pp. 1–7.
20. Drane, D.; Micari, M.; Light, G. Students as teachers: Effectiveness of a peer-led STEM learning programme over 10 years. *Educ. Res. Eval.* **2014**, *20*, 210–230. [CrossRef]
21. Chan, J.Y.; Bauer, C.F. Effect of peer-led team learning (PLTL) on student achievement, attitude and self-concept in college general chemistry in randomized and quasi experimental designs. *J. Res. Sci. Teach.* **2015**, *52*, 319–346. [CrossRef]
22. Varma-Nelson, P. Peer-led team learning. *Metrop. Univ.* **2006**, *17*, 19–29.
23. Gosser, D.K.; Kampmeier, J.A.; Varma-Nelson, P. Peer-led team learning: 2008 James Flack Norris award address. *J. Chem. Educ.* **2010**, *87*, 374–380. [CrossRef]
24. Hanson, D.; Wolfskill, T. Process workshops: A new model of instruction. *J. Chem. Educ.* **2000**, *77*, 120–130. [CrossRef]

25. Johnson, D.W.; Johnson, R.T. Making cooperative learning work. *Theory Into Pract.* **1999**, *38*, 67–73. [CrossRef]
26. Tien, L.T.; Roth, V.; Kampmeier, J.A. Implementation of a peer-led team learning instructional approach in an undergraduate organic chemistry course. *J. Res. Sci. Teach. Off. J. Natl. Assoc. Res. Sci. Teach.* **2002**, *39*, 606–632. [CrossRef]
27. Vygotsky, L.S. *Mind in Society: The Development of Higher Psychological Processes*; Harvard University Press: Cambridge, MA, USA, 1978.
28. Bandura, A. *Social Learning Theory*; Prentice Hall: Englewood Cliffs, NJ, USA, 1977.
29. Lynch, S. *Equity and Science Education Reform*; Routledge: New York, NY, USA, 2000.
30. Lewis, S.E.; Lewis, J.E. Seeking effectiveness and equity in a large college chemistry course: An HLM investigation of peer-led guided inquiry. *J. Res. Sci. Teach.* **2008**, *45*, 794–811. [CrossRef]
31. Gafney, L.; Varma-Nelson, P. *Peer-Led Team Learning: Evaluation, Dissemination, and Institutionalization of a College Level Initiative*; Springer: Berlin/Heidelberg, Germany, 2008.
32. Lockwood, P.; Meador, A.; Mann, J. Adapting supplemental instruction and metacognition to the college of engineering results in a culture shift. In *National Symposium for Student Success and Retention*; Walen, S., Bennett, T., Eds.; Consortium for Student Rention Data Exchange: Norman, OK, USA, 2020.
33. Meador, A.; Lockwood, P.; Mann, J. Teaching more than just STEM: Applications of metacognitive learning strategies in a college of engineering. In *National Symposium for Student Success and Retention*; Walen, S., Bennett, T., Eds.; Consortium for Student Rention Data Exchange: Norman, OK, USA, 2020.
34. Torres, V.; Gross, J.P.K.; Dadashova, A. Traditional-age students becoming at-risk: Does working threaten college students' academic success? *J. Coll. Stud. Retent. Res. Theory Pract.* **2010**, *12*, 51–68. [CrossRef]
35. Taylor, J.L.; Jain, D. The multiple dimensions of transfer: Examining the transfer function in American higher education. *Community Coll. Rev.* **2017**, *45*, 273–293. [CrossRef]
36. Ma, J.; Baum, S. *Trends in Community Colleges: Enrollment, Prices, Student Debt, and Completion*; Research Brief; The College Board: New York, NY, USA, 2016.
37. National Center for Education Statistics. *Students Attending For-Profit Postsecondary Institutions: Demographics, Enrollment Characteristics, and 6 Year Outcomes*; Institute of Educational Sciences, US Department of Education: Washington, DC, USA, 2011.
38. Advisory Committee on Student Financial Assistance. *Pathways to Success: Integrating Learning with Life and Work to Increase National College Completion*; A Report to the U.S. Congress and Secretary of Education: Washington, DC, USA, February 2012.
39. Shapiro, D.; Dunbar, A.; Wakhungu, P.K.; Yuan, X.; Nathan, A.; Hwang, Y. *Completing College: A National View of Student Attainment Rates—Fall 2009 Cohort*; Signature Report No. 10; National Student Clearinghouse Research Center, 2015.
40. Piland, W.E. Community college transfer students who earn bachelor's degrees. *Community Coll. Rev.* **1995**, *23*, 35–44. [CrossRef]
41. Rhine, T.J.; Milligan, D.M.; Nelson, L.R. Alleviating transfer shock: Creating an environment for successful transfer students. *Community Coll. J. Res. Pract.* **2000**, *24*, 443–453.
42. Cataldi, E.F.; Green, C.; Henke, R.; Lew, T.; Woo, J.; Shepherd, B.; Siegel, P. *2008-09 Baccalaureate and Beyond Longitudinal Study (B&B:08/09): First Look (NCES 2011-236)*; U.S. Department of Education, National Center for Education Statistics: Washington, DC, USA, 2011.
43. Cejda, B.D.; Kaylor, A.J.; Rewey, K.L. Transfer shock in an academic discipline: The relationship between students' majors and their academic performance. *Community Coll. Rev.* **1998**, *26*, 1–13. [CrossRef]
44. Jenkins, D.; Fink, J. *What We Know about Transfer: Research Overview, Community College Research Center, January*; Teacher's College, Columbia University: New York, NY, USA, 2015. Available online: https://ccrc.tc.columbia.edu/media/k2/attachments/whatwe-know-about-transfer.pdf (accessed on 20 May 2024).
45. Cabrera, A.F. The role of finances in the persistence process: A structural model. *Res. High. Educ.* **1992**, *33*, 571–594. [CrossRef]
46. Engle, J.; Tinto, V. *Moving Beyond Access: College Success for Low-Income, First-Generation Students*; Pell Institute for the Study of Opportunity in Higher Education: Washington, DC, USA, 2008. Available online: https://files.eric.ed.gov/fulltext/ED504448.pdf (accessed on 5 March 2023).
47. Pascarella, E.T.; Smart, J.C.; Ethington, C.A. Long-term persistence of two-year college students. *Res. High. Educ.* **1986**, *24*, 47–71. [CrossRef]
48. Merriam, S. *Qualitative Research and Case Study Applications in Education*; Jossey-Bass: San Francisco, CA, USA, 1998.
49. Baxter, P.; Jack, S. Qualitative case study methodology: Study design and implementation for novice researchers. *Qual. Rep.* **2008**, *13*, 554–559. [CrossRef]
50. Yin, R.K. *Case Study Research: Design and Methods*; SAGE Publications: Thousand Oaks, CA, USA, 2002.
51. Yazan, B. Three approaches to case study methods in education: Yin, Merriam, and Stake. *Qual. Rep.* **2015**, *20*, 134–152. [CrossRef]
52. Creswell, J.W.; Creswell, J.D. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 6th ed.; SAGE: Thousand Oaks, CA, USA, 2022.
53. Heylighen, F. *Epistemology, Introduction*; Principa Cybernetica, 1993. Available online: http://pespmc1.vub.ac.be/EPISTEMI.html (accessed on 10 March 2023).
54. Cracolice, M.S.; Deming, J.C. Peer-led team learning. *Sci. Teach.* **2001**, *68*, 20–24.
55. Lincoln, Y.S.; Guba, E.G. *Naturalistic Inquiry*; SAGE: Thousand Oaks, CA, USA, 1985.