A Phenomenological Study: Slack Communication Between Professor-Student Relationships in

Computer Science

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Introduction

According to Code.org, approximately 50,000 Computer Science graduates in 2017, however, with over 500,000 available computing positions to fill in the United States (Code.org, 2019). A pressing issue is not enough qualified applicants to fill the remaining open position, and the gap will continue to widen even more. Corporations find it difficult and challenging to find the right talent. Also, corporations are working and partnering with the university to find a solution to encourage prospective students to take programming as a career path.

Statement of the Problem

Over the years, corporations realized to remain competitive in the global enterprise; software development teams tasked to modernize legacy systems through innovative software solutions. As the growth to modernize current applications became more difficult to keep up the pace with hiring. Corporations are partnering with the university to find ways to get more students interested in programming. School administrators evaluate to keep students from dropping out after the first year of study. Computer science majors have the highest number of drop out; when it comes to why students left the courses, the most common reason was that students with almost half expressed they left because they didn't like it, and a third said it was too hard to understand (Flinders, 2019). The need to adjust our curriculum, to focus on improving the communication between the professors and the students identified as a critical issue in computer science courses in higher education in the past years. Efforts are underway to

address the issue through the adoption of technologies and the development of new pedagogical

approaches. Effective communication is the key to keep students engaged in their courses.

Research Questions

1. How do students perceive their involvement with Slack as a communication tool?

   1a. How do students view their experience with Slack?

2. How do professors perceive their involvement with Slack as a communication tool?

   2a. How do professors view their experience with Slack?

Literature Review

It is a challenge to get university students to increase communication with professors

after classes for coding courses. The researcher thinks the use of Slack will impact the

communication level between students and professors in coding courses. This study is critical

because student-professor communication is crucial to keep students engaged in the course. The

student to professor class ratio creates a barrier for the professor to answer and cover all

questions posted during the lecture. The Slack app assists in addressing any ongoing issues and

problems.

Previous research done described how communication plays a vital role in the success of

the computer science course. However, no study covered the use of Slack as a communication

tool in computer science courses.

Theoretical framework

Goodhue and Thompson (1995) explain task-technology fit (TTF) theory states that technology is probably a positive impact on individual performance if the capabilities of technology match the tasks that the user must execute. Also, it focused on how well the technology used fits with the job it is intended to help. Teacher and student goals vary, so they must meet the needs of both to be effective. For example, the professor may need to utilize motivational communication with their students, whereas students may need to communicate a lack of understanding of the course content. Task-technology fit theory provided a theoretical framework to base how well various technologies aid in facilitating effective communication between teachers and students.

Gamification Motivating Computer Science Students Beyond Classwork

Researchers stated games motivate users to engage for extended periods. In educational contexts, researchers have examined the effects of adding game elements and concluded that they motivate students to put forth more motivation and effort in their coursework (Watson, 2018). Students interested give more energy and enthusiastic if the subject is relatable for them. When introducing computer science, teachers can assign practical lessons that students can not only identify but enjoy in their daily lives. For instance, students interested in gaming might be passionate about making one for themselves. They can create characters, storylines, and code to realize their very unique, original computer game, a well-curated set of gaming concept curriculum bound to get students hooked on learning to code.

In computer science, the number of students is shrinking, and the universities are reporting that over half of those students who initially choose computer science study soon decide to abandon it (O'Brien, Humphreys, McAuliffe, 2016). University administrators needed to adjust the pedagogies to keep students motivated and to keep them focused on continuing their studies in computer science.

Computer science students need both technical expertise and non-technical skills of collaboration and communication skills as they near their completion of the degree. However, it is difficult for students to achieve sufficient technical and non-technical skills practice within the confinement of a series of courses, and encouraging students to participate outside of course requirements can be daunting. This study reveals that gamification incorporating computer science courses such as leaderboards and badges do motivate students to go beyond course credit to practice both technical skills and essential non-technical skills to develop their programming disciplines further (Watson, 2018).

A Language Socialization Approach Toward Increased Retention in University Computer Science

The instructor of the introductory computer course required students to speak to each other in the class. The researcher investigated the speech spoken between the students, instructors, and peers. The researcher uses an ethnographic approach and uses the Language Socialization Theory and employing Politeness Theory as a way to understand students' grasp of academic concepts through conversational practice (Green, 2018).

Analysis of politeness demonstrated that students were more likely to ask the instructors for assistance (Green, 2018). Also, the researchers found frequent pauses indicate indirect speech acts. Between peers, the researcher found constant laughter and regular conversations. Students speaking to peers used follow-up to ensure clear communications, which they avoided with instructors. Women hesitate to answer when instructors asked them to volunteer to answer questions in front of the class. Students answering questions posed by peers spoke in complete sentences. Talk between peers seems to be accompanied by a significantly less reactive threat than that between students and instructors across several contexts, and programming requires more active construction of knowledge from students than do activities involving speaking to an instructor (Green, 2018).

Communication is a core value of programmers. Some female students who encountered difficulties tended to conclude a sign of their poor natural fit. Increasing the amount of pair work students and adding collaborative learning opportunities, are to create positive change in the learning of all students, and for those in underrepresented groups. Furthermore, the student learns to work with the audience, gauging reactions, and adapting content. Also, students refine their skills, incorporating and evaluating instructor feedback, and building delivery skills, the more ideas are presented, and the better the presentations.

Learning Outcomes and Employability Skills of Computer Science and Capstone

Computing curriculum offers coursework in a range of subject areas in anticipation that such knowledge will be useful to students' professional lives, provide employable skills in both academic and soft skills, and preparing students for the future workforce (Liu, 2018). A capstone project helps students to enhance skills learned from classes and make them transferable to any

setting. Also, the expected learning outcomes cover collaborative learning, experiential learning, and project-based learning.

This qualitative research explores both expected and need-to-be-enhanced learning outcomes and employability skills of the computer science major students through capstone projects. In the capstone course, students develop a solution that addresses a challenge that needs resolving. Also, students must synthesize what they have learned across the curriculum, concepts, and research methods. The study consisted of in-depth interviews with industry and community organization professionals. The study reveals interpersonal skills, analytical skills, personality, communication, collaboration, and teamwork as learning outcomes and employability skills (Liu, 2018). Also, subject matter experts indicated the benefits of senior capstone projects in support of employability skills.

Harnessing social and technical data mining to improve software development

Software development saw an increasing amount of collaboration and management done online. As software project complexity increases in size, communication, and cooperation increases between developers. The participation is not only technical but involves understanding the changing dynamics of the involved parties.

Social Technical Congruence attempts to understand the synergies between technical development and communication (Carlson, 2015). They are reviewing the version control history and email list communication to help developers better understand the community. The researcher identifies commits that are impactful to the overall technical structure of the source

code. And the communication messages provide an input that a developer could be increasing

communicating and sharing functional dependencies.

Quantitative and qualitative analysis provide details about the socialization process

before the website developed through a pre-and post-survey. The ratings regarding the

socialization process and effective coordination were higher for the beginner participants as

compared to the experienced (Carlson, 2015). This study provides contributions to the field of

social-technical congruence.

Computer science professors are covering a large selection of information in such a short

period; often, students do not have the proper support level to turn when lacking understanding

occurs because the lack of support to provide quality instruction (Smart & Umbach, 2007). The

population of students is growing across America, returning to college to enhance their technical

skills as a way to stay ahead of the competitive curve. Yet, the support system is not well

established to help the returning students of all learning levels.

Smart et al. (2000) state that the differential effects of academics on student development

contribute a large part through student interactions with the professor. That is, professor essential

socializing agents for university students, and through the interactions with departmental staff,

students experience their learning and development.

Research Methodology

This qualitative study, through the phenomenological approach, was to explore students'
and professors' lived experiences through their effective use of communication tool Slack in
computer courses at one private university located in an urban city of New Jersey. This study
allowed the researcher to understand the students' and professors' perspective use of Slack
communication tool.

University students have a wide array of experiences, but for some, it has been a while
since stepping back to school, the group needs a support system to help with this smooth
transition. It is through these lived experiences that educational leaders have a better
understanding of communication between students and the professor.

Many professors bring knowledge of their field and passion for their learning spaces, but
they lack the teaching skills to communicate their knowledge to their students effectively. This
study explored the communication effectiveness between professors and students through Slack.
Also, this study used the interview method to explore how university students and professors
describe how they communicate most effectively.

A one-on-one, open-ended interview used to collect data from five university students and
one professor about their experiences using Slack as a communication tool in a computer science
course. The data analyzed for common themes that emerged from the university students' and
professors' experiences with Slack. The researcher noted all biases and assumptions before
conducting face-to-face interviews (Patton, 2015). The researcher was aware of biases, and
assumptions do exist, but these were set aside for the study. The meeting allowed the researcher
to foster relationships with each of the participants, allowing the researcher to further immersion

into the study. This immersion allowed the researcher to describe the participants' experiences

the way they experienced the Slack, aligning with the phenomenological approach (Creswell,

2018).

Population and Sample Description

The population of this study was composed of students enrolled in a private university in

an urban city of New Jersey. In 2016, 2,589 students enrolled at this university. The student body

is mostly representative of Hispanic students (34.2%) and black students (18.2%). About 63.8%

of the students are female, and 36.2% of the students are male.

The researcher used a convenience sampling strategy paired with a purposeful random

sampling strategy. The convenience sampling strategy invites all students enrolled in computer

science courses at the university to participate in the study. Next, the researcher applied the

purposeful random sampling strategy to select five student participants and one professor

participant. The purposeful random sampling strategy ensured participants used Slack as a

medium of communication within the computer science course. The first five students and one

professor who accepted the invitation to participate during convenience sampling and who met

the criteria outlined in the purposeful random sampling strategy selected for the study.

Site Description

The study occurred at the main university campus. Also, it is in an urban city of New

Jersey. The city has 265,549 residents with a median household income of $58,907. The

university found in 1872. Also, the achievement of the university includes partnering with 600

corporate and non-profit partners.

Site Access

After speaking with the university administration, the researcher was given access to use the main campus for the study. As a university employee, the researcher had the opportunity to share information about the study with the relevant gatekeepers. The primary gatekeeper is the dean of the STEM division. The dean provided access and consent to contact other gatekeepers at the university, including the chairperson of the Computer Science department (Appendix D). It was through these relationships with the gatekeepers that the researcher gained access to collect data using the interview research method. The researcher planned this study with the informal consent granted by the dean of the STEM division at the proposed site. Additionally, the dean of the STEM division has granted informal site access, and the researcher secured formal documents to confirm site accessibility.

Interview

The one-on-one, face-to-face, in-depth interview conducted with five student participants and one professor participant. The researcher met each participant at the site at a time and date that accommodated the participants' schedules. The researcher asked each participant for permission to record the interviews (Appendix F). Each interview lasted approximately 30 minutes recorded. The recorded interviews transcribed and later coded during the data analysis.

The researcher has the following to guide the interview:

Interview Checklist

- Introduction
- Explanation of the Study

- Warmup Interview Questions

- Finish with the remaining interview questions

- Closing Remarks

Instrument description

The interview protocol included four open-ended questions for each participant (Appendix A) and the design to allow for probing questions. The interview administered to each participant on a different date. The researcher developed the interview questions in alignment with the purpose, approach, and research questions and use "Strategies for Qualitative Interviews" guidance from Harvard's Sociology department to write interview questions. Some aspects to consider when writing the interview questions include wording, the arrangement of the questions to allow smooth transition, and the level of difficulty of responding to the questions ("Strategies for Qualitative Interviews," n.d.).

Participant selection

Selected participants enrolled at the university as students and professors in computer courses, and have had at least use Slack as a communication tool for the classroom. During the interview, the interviewer had five student participants, and one professor reflect on the Slack communication tool. The sample size allowed the researcher to become fully immersed in the participants' experiences (Creswell, 2018), while the sample criteria provided the participants with many experiences to personally interpret during the interview. The sample based on purposeful selection, the randomization of the participants, selected added credibility to the study (Patton, 2015). The criteria for this study provided a sample of participants best helped the researcher understand their experiences with Slack as a communication medium between the

professor and the students (Creswell, 2018). The sample may not be age or gender diverse due to the sampling strategy.

The purposeful random sampling strategy ensured each student enrolled in a computer course, and the professor is an instructor of computer science at the site beginning in Spring 2020. The researcher did not want any previous interactions with students in these programs to influence the data collection. The first five students and the one professor who accepted the invitation (Appendix E) and met the criteria confirmed as participants in the study through both telephone and email communication. The time, location, and dates of the interviews confirmed individually with each participant through telephone and email communication.

Data collection

Data collected through the interview. Each interview recorded using a recording device. The recording device included an iPhone using the voice recorder tool on the device. Each participant asked permission to be recorded in the participant consent form (Appendix F). The researcher began the interview with an explanatory script to let the participants know what the study is about. The script was read out loud to each participant.

Data Analysis and Procedures

Once the interviews transcribed, the qualitative analysis began. The recorded interviews transcribed using Rev.com, an online transcription service. Each interview coded once all interviews completed. This strategy allowed the researcher to be immersed wholly in each participants' lived experiences.

The transcriptions analyzed by the researcher by encoding the data. The researcher analyzed the data from the phenomenological approach. The researcher used NVivo coding to honor the participant's voice, and the participant's exact words allowed for themes and concepts to emerge from the interview transcriptions.

The open-ended interview was administered over six weeks beginning after IRB approval (Appendix B). The researcher spaced each interview with one participant per day. Establishing relationships with the participants was critical to the phenomenological approach in this study. It is through these relationships the researcher interpreted the lived experiences of the participants (Creswell, 2018).

Potential risks

A few potential risks involved in this study are: (a) researcher bias; (b) delayed IRB approval; (c) absenteeism which would skew the data collection; (d) participants opt-out during the study; (e) delayed IRB approval; and (f) equipment issues.

CITI Certificate

See Appendix C

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Appendix A

Interview Questions for Students

1) What success have you encountered with the use of Slack as a communication tool?

2) What barriers did you experience when using Slack with the professor?

3) What communication challenges with the professor through Slack?

4) What are the critical features and functions of Slack?

Interview Questions for Professors

1) What success have you encountered with the use of Slack as a communication tool?

2) What barriers did you experience when using Slack with the student?

3) What communication challenges with the student through Slack?

4) What are the critical features and functions of Slack?

Appendix B

IRB Application

NJCU Institutional Review Board Application for
Review of Research Proposal

Email: IRB@njcu.edu

FOR OFFICE USE ONLY			
File Number			
Review Type	Exempt ☐	Expedited ☐	Full☐
PI			

Date of Submission

Proposal type:

■ Original   ☐ Revised*

*If this is a revised application, there is no need to complete the remainder of this form. However, please describe in detail the changes that you have made in response to the IRB's

concerns. _____

Principal Investigator	Laura Zieger, Ed.D.
Proposal title	A Phenomenological Study: Slack Communication Between Professor-Student Relationships in Computer Science
Proposed start date	January 1, 2020
Anticipated duration of research	12 months

Type of Research

☑ Student/Classroom project
☐ Faculty project
☐ Staff project
☐ External researcher project (All external researchers must have an NJCU sponsor.)

NJCU Investigators (Please list additional investigators as necessary.)

Principal Investigator (For all student research, the faculty advisor is the PI.)

Name   Laura Zieger, Ed.D.
Department   Educational Technology
Telephone   201-200-3078
Email   lzieger@njcu.edu

Co-Investigator (including student researchers)
Name   Steven Wong
Department   Educational Technology

Telephone   917-622-8813
_____

Email   swong@njcu.edu
_____

Co-Investigator(including student researchers)

Name   _____

Department   _____
Telephone   _____

Email   _____

Co-Investigator(including student researchers)

Name   _____
Department
             _____
Telephone   _____

Email   _____

*Any NJCU investigator who plans to work on this project either with or for a Principal Investigator or a Co-Investigator at another institution must identify those investigators and their institutions.

External Investigators

Name   _____
Title   _____
Institution _____

Name   _____
Title   _____
Institution _____

Name   _____
Title   _____
Institution _____

Name   _____
Title   _____
Institution _____

NJCU Sponsor (if the researcher is not affiliated with NJCU)

Name   _____
Department   _____
Telephone   _____
Email   _____

Data Sources

Number of participants _between 5 to 8_____

How was this number determined (e.g., power analysis) _conveneince sample_____

Does this project require the collection of new data?   ■ Yes   ☐ No

    If Yes: How will participants be selected or recruited? _university students enrolled in computer science course__

    Will subjects participate on a fully voluntary basis?   ■ Yes   ☐ No

    Will subjects be compensated for their participation?   ☐ Yes   ■ No
        If yes: Please briefly describe the compensation.

_____

    Does this project make use of human tissue or cell lines?   ☐ Yes   ■ No

Briefly describe the research methodology(ies) to be used in this study (e.g., focus group, participant observation, survey, experiment).

Qualitative Method: Open-ended interviews
_____

Does this project use data that have already been collected for a non-research purpose or by another researcher?

    ☐ Yes   ■ No

    If yes: What is the source of the data?

_____

Are the data accessible in the public domain?   ☐ Yes   ■ No

If no: Are fields included that would allow identification of individuals, either directly or indirectly?
    ☐ Yes   ☐ No

If yes: Please explain briefly how participant confidentially will be safeguarded

_____

Participant Risks

Will participants be exposed to any stresses (e.g., anxiety, pain, etc.) or physical harm (e.g., injury, infection, etc.) in connection with this research?   ☐ Yes   ■ No

    If yes: Please briefly explain what risks may be involved in the research, what specific steps will be taken to minimize and monitor the risk, and what will be done to compensate and/or treat participants who are harmed by the research.

_____

Does the research design require that participants be deceived?   ☐ Yes   ■ No

    If yes: Please briefly explain why deception is necessary and what steps will be taken to reduce potential harm from this deception.

_____

Potentially Vulnerable

Populations Will this research involve:
Physically/Mentally Challenged Individuals

Young children (ages 0-13)	☐ Yes	■ No
Older children (ages 14-17)	☐ Yes	■ No
Senior Citizens (over age 65)	☐ Yes	■ No
Pregnant Women	☐ Yes	■ No
Prisoners	☐ Yes	■ No

If yes to any of the above: Please briefly explain how the rights of this (these) population(s) will be protected.

_____

Informed Consent

Will participants be fully informed about:

The voluntary nature of their participation and the freedom to withdraw without penalty at any time	■ Yes	☐ No
The purposes and procedures of the research	■ Yes	☐ No
Any reasonably foreseeable risks or discomforts	■ Yes	☐ No
Any benefits to them or to others from the research	■ Yes	☐ No
The extent to which confidentiality will be maintained	■ Yes	☐ No
The compensation and/or treatments available if injury occurs	☐ Yes	☐ No

(This question need only be answered for research that involves risks.)

Whom to contact for information about the research participants' rights and any research-related injury	■ Yes	☐ No

If the answer to any of the above is no, please briefly explain why the research requires
an alteration of the standard elements of informed consent.

_____

How will participants' informed consent be documented? Please check all that apply.

■Signature on written consent document
☐Signature on document to be read to the participants and witnessed by another party
■Written documentation of informed consent will not be obtained because one or more of the
following criteria is satisfied (check all that apply):

    ☐ The only link between the subject and the research would be the informed consent
    documentation and the primary risk is loss of confidentiality.

    ■ The risks to participants, including risks associated with the loss of privacy, are no greater than
    those ordinary encountered in daily life and the research involves no procedure for which written
    consent is normally required outside of the research context.

Who will obtain the informed consent from the participants?

☐ Principal Investigator
☐ Co-Investigator
☐ Sponsor (in cases where PI is not affiliated with NJCU)
☐ Other
■ Not applicable

Please include your protocol summary (5 pages maximum) and your recruitment materials (as applicable).

External Reviews and Funding

Has this protocol been reviewed by an Institutional Review Board or Human Subjects Review
Committee at another institution(s)?   ☐Yes ■No

If yes: At what institutions(s)?

_____

What is its status?   ☐Approved   ☐Rejected   ☐Pending (or provisionally approved)

Has this protocol been submitted for Federal Funding?   ☐Yes   ☐No

If yes: Agency or Organization:_____

      Submission Date: _____

      Funding Start Date: _____ ☐Anticipated ☐Actual

      Contact Person: _____
    Contact's Telephone: _____

Has this protocol been submitted for any other types of funding?   ☐Yes   ■No

If yes: Agency or Organization: _____

Submission Date: _____
Funding Start Date:

_____   ☐Anticipated   ☐Actual

Contact Person: _____
Contact's Telephone:

_____

Proof of NIH or CITI Certification
Please provide documentation of current CITI and/or NIH certification in human subjects research for all researchers involved in this project.

Certificate of Agreement

The signatures of all researchers involved in this project must be provided.

I certify that I agree to comply with the requirements of both NJCU and the Office for Human Research Protection (OHRP) of the United States Department of Health and Human Services as described in 45 CFR §46.

                                  11/29/2019

_____   _____
PI Signature   Date

                                    11/29/2019

_____   _____
Co-PI Signature   Date

_____   _____
Co-PI Signature   Date

_____   _____
Co-PI Signature   Date

_____   _____
Co-PI Signature   Date

Please submit the completed application and accompanying documents as one document or pdf to IRB@njcu.edu and kresch@njcu.edu.

All applications must be submitted by the NJCU faculty or staff member who is serving as the Principal Investigator (PI). Neither students nor external researchers may submit an application.

Appendix C

CITI Certificate

CITI PROGRAM

Completion Date 25-Oct-2019
Expiration Date 24-Oct-2022
Record ID 33765900

This is to certify that:

Steven Wong

Has completed the following CITI Program course:

Social & Behavioral Research - Basic/Refresher (Curriculum Group)
Social & Behavioral Research (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

New Jersey City University

Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wab62c446-494e-487b-a31a-7ad176af5ff2-33765900

Appendix D

Letter of Permission to Chair of Computer Science to Conduct Interview in University

Nov 15, 2019

Alberto LaCava, Ph.D.
Chair, Department of Computer & Information Sciences
Saint Peter's University
2641 Kennedy Boulevard
Jersey City, NJ 07306

Dear Mr. LaCava:

I am a doctoral student from New Jersey City University, located in Jersey City, NJ. I am conducting dissertation research to explore the Slack communication between the students and professor of a computer science course.

I want your permission to research at Saint Peter's University, Jersey City, NJ. I will follow all policies set by the university and will share the findings from the research with the university. If this is an acceptable proposal, please reply to my email at swong@njcu.edu. I am looking forward to hearing from you. Thank you.

Sincerely,

Steven Wong

Doctoral Student

Appendix E

Email/Phone Script to Invite Participants to the Study

Hello, can I please speak to [student's name/professor's name]

My name is Steven Wong, a doctoral student from New Jersey City University, located in Jersey City, NJ. I am conducting dissertation research to explore the Slack communication between the students and professor of a computer science course.

I am calling you because your enrolled in a computer science course that is going to be part of a research study to explore the Slack communication between the students and professor of a computer science course.

Participation in the study requires that you enrolled in a computer science course of Spring 2020 and that your professor is using Slack as a communication tool for the course.

Please note that participation is voluntary and you may withdraw at any time.
Thank you in advance for your participation. Please contact me at swong@njcu.edu or call me at 917.622.8813 if you have any questions.

Appendix F

Letter of Permission from Participant to Participate in the Interview

Nov 15, 2019

Dear Participant:

I am a doctoral student from New Jersey City University (NJCU), located in Jersey City, NJ. I am conducting my dissertation research at Saint Peter's University. The focus of my research is to explore the Slack communication between the students and professor of a computer science course

I am seeking your permission to participate in the survey. While performing the research study, all university policies followed and the information collected would be kept confidential. Also, I will use a voice recorder to record the interview; the interview will be kept confidential. You have the right to discontinue the participation at any time of the research project. If you have any additional questions before the study, please ask for clarification. Thank you for your assistance.

Steven Wong
Doctorate Student

I grant permission to participate in the research study. Please sign below.

_____

Participant's Signature