Teaching Statement

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My Teaching Philosophy

I regard teaching more than a scholarly activity; it is a sacred endeavor. The Apostle Paul lists teachers of God's words just after apostles and prophets in his letter to the church at Corinth. He regarded himself as a "teacher of the Gentiles in faith and truth" (1 Timothy 2:7). Although teaching CS in an academic setting is clearly not the same as communicating God's words, I believe the same kind of God-fearing attitude should be applied to CS teaching. Whether I am teaching an introductory programming class or an advanced computer networking class, I must handle it with care because I am in fact communicating my faith. I convey my faith through paying respect to the knowledge and technical skills, expressing my passion for what I teach and "preach," and actively engaging students to learn together with me. Every word, every body movement and facial expression, every response to the students' questions and challenges, and every illustration on the board communicate who I am as a Christ follower. Therefore, there is little difference to me whether I am teaching a Sunday school class or a CS class.

Teaching fundamental concepts and technical skills is relatively speaking not a difficult goal to achieve in CS teaching though it may take up a major bulk of the course work. However, the mission of a Christian university also includes promoting an integration of the subject and the faith. This part of teaching and learning is usually more challenging, and will take courage and wisdom. I would engage students to think critically about the position of technology in our Christian faith. Since technology can be regarded as one kind of God's creation (because it is created by man, and man is created by God), technology has inherent limitations on what it can or cannot do. It is also subject to God's sovereignty. I would also engage students in wrestling with the ethical and professional conduct issues connected to the use of technology. Although this area is not exclusive to Christian education, our motivation is different. We see our vocation as a channel to glorify God. Therefore, as believers we are held to a much higher standard in the way we use and develop technology and conduct ourselves in such a way that honors God and glorifies Him.

My Teaching Experience

I have accumulated 29 years of teaching experience in non-Christian education settings. The Hong Kong Polytechnic University is a public institution. Chung Yuan Christian University is a private Christian university in Taiwan. However, at Chung Yuan there is not much university-wide emphasis on the integration of faith and academic disciplines.

I taught all subjects in English at PolyU. Except a couple of existing subjects, I use English at Chung Yuan as well. I taught subjects on both undergraduate and graduate levels in the areas of fundamental CS subjects (Computational Thinking, Computer Programming, Embedded Systems, Computer Organization, and Data Structures and Algorithms), Computer Networking, Internetworking Protocols, Internet Infrastructure Security, Engineering Ethics and English Presentations. I am also teaching a general education class on Internet security and privacy to non-CS majors. In my PolyU teaching, besides the local students, many undergraduate students came from Mainland China and other parts of the world (e.g., Korea, Taiwan, Indonesia, Europe and North America). The students in graduate courses were mainly research students and

working professionals.

My Teaching Approaches

(**Active learning**) I believe that students will learn best if they actively engage themselves in the teaching and learning process. Studies have shown that active learners will have better learning outcomes than passive ones. I therefore put a lot of efforts into facilitating two types of interactions: teacher-student and student-student. My Student Feedback Questionnaire (SFQ) scores on "the staff member encouraged students to ask questions and discuss ideas in class" and "the staff memberencouraged students to find information on their own and learn independently" are usually very high.

I have used the following approaches to increase the interactions.
- Design in-class questions or small problems and ask the students to share their answers. Some students are asked to share their answers.
- If the classroom setup permits, the students are seated in groups. Each group is encouraged to work on problems together. A representative will be invited to share the group's answer. The more capable students are encouraged to help others.
- Since students are assessed using the criterion-based model, each student's performance will be assessed independently from others. Therefore, students can freely help others without jeopardizing their grades.
- I usually recruit the past students to be student helpers to help students solve in-class problems. The student helpers will lead them to solve the problems by themselves. Using students to help students is usually very effective, because the student helpers can understand the difficulty experienced by the students.
- I innovated a lecture-lab integrated approach to facilitate students' active learning. In this approach, I combine the laboratory activities with the lectures. Laboratory and problem solving will be performed right after the corresponding materials are covered in the lecture. More details will be provided through two case studies below.

(**Thorough Understanding**) I also insist that each subject is taught thoroughly. Much of the learning problems today come from a lack of thorough understanding of the materials. Students rely on memorization, instead of understanding. Sometimes students are taught too much material rather superficially, but the most crucial concepts and principles are not treated in-depth. As a result, students may not have a solid foundation for taking more advanced courses later on. My SFQ score on "the assessments require me to demonstrate my knowledge, skills and understanding of the subject" is usually very high.

I have used the following approaches to increase the understanding of the subject materials.
- I design probing assignment questions that require a certain level of understanding. Whenever possible, I will give questions for which the answers cannot be found on the Internet. I also do not recycle previous assignment questions.
- Similar to the last point, the examination and test questions require different levels of understanding. The examination and tests are also open book. Lecture notes, assignment solutions and electronic books are available during the assessment. This arrangement encourages students not to rely on memorization.
- In the past years, I held tests and examinations in laboratories. All or some parts of the papers were done in the PC. For programming questions, they were asked to type in the programs on the PC. Therefore, they had to do the programming assignments by themselves in order to do well in the tests and examination.
- Since the courses I teach have very high practical values, I use class project for the

students to apply what they have learned to solve a practical problem. For introductory class, the class project requires students to apply their knowledge and practical skills to solve a bigger problem. For upper-class courses, students are often required to learn new skills and find/develop the right tools to solve the project problem.

Two Case Studies

In this section I will illustrate my teaching approaches through two undergraduate subjects: Problem-Solving Methodology in Information Technology (COMP1001) and Computer Networking (COMP2322).

Problem-Solving Methodology in Information Technology (COMP1001)
The grand means of the SFQ scores are 4.3/1.0 and 4.0/0.9 (mean/standard deviation) for the two COMP1001 groups. The scores are measured in a 5-point Likert scale. Almost all the international and Mainland Chinese students are somehow put in the same group that has a higher SFQ score. In the last time I taught this course in PolyU, I further improved the teaching approachand content in a number of important ways.

- I used two classrooms (N102/N103) equipped for highly interactive teaching and learning activities. All students are required to bring their notebooks for in-class exercises. In previous years the classes were conducted in the department's laboratories which restricted many kinds of interactive learning. It was also difficult to have the students see the blackboard writing clearly.
- Since I took up all the teaching this year (a Teaching Fellow used to help me with part of the teaching), I could fully integrate the problem-solving part and the Python programming part more tightly. I could adjust the teaching content according to the progress of the students' learning.
- I have recruited seven year-two and year-three students (who are local, Mainland Chinese and international students) to help me coach the students during the classes and the help sessions. Their help was very instrumental to my teaching, because I was given only two graduate students to help me. Since they did not attend this class before, I assigned them to only grading of assignments and tests.
- Same as previous years, I enhanced the students' learning by giving eight assignments, two two-hour tests and an individual class project. To cater for the diversity of the students' backgrounds, I used the same type of problem but with increased complexity. Moreover, I went through the previous class project in details in the class and provided them with my sample of project deliverables (reports and code).

Some favorable student comments below:
- *"He always encouraged us to come up with our own solutions rather than just following the solution provided by him."*
- *"He will answer the students very clearly and he is a kind person as well. His teaching skills helped us concentrate on the lesson."*
- *"He encourages us to think independently and work out the project by yourself. This benefits ourproblem-solving ability."*
- *"When my first course is COMP 1001, I have seen a great picture on the computer science, and you have showed us a lot about what computer science it is."*
- *"Assignments were thought provoking and required lots of skills which is useful. Good teacher and student interaction. Teacher assistants are very helpful."*
- *"Although I didn't have your course this semester, I always felt that you had a crucial influence on me. I didn't have any foundation of computing before college and I feel so glad that you are my enlightenment teacher in this field. Your last semester's course really impressed me and give*

me a good start of my study. It gave me an overview of computing and had a profound impact on me. It was really an excellent course especially to year 1 students. Even in this semester I always met some problems similar to the assessments you gave us. Thinking back, I am so grateful to all the things you've taught me."

- *"Here I would like to express my gratitude for your teaching in COMP1001. I entered this program with no any programming background, and I could truly feel my improvements from the first mid-term quiz till the final exam, in both skills and confidence perspectives. Although I just got B grade in this subject, not a very outstanding result, it is still quite inspiring to me as abeginner. The reminders before quizzes and exam were very heartwarming as well. You two are willing to answer every single question even the very minor one, with detail explanation and patience. Glad to meet you two in my first semester at PolyU, and this motivates me a lot to keep studying in computing. Hope to see you again!"*

Computer Networking (COMP2322)

The grand mean of the SFQ scores 3.9/1.1. Note that the variances of the SFQ scores are very high. Based on my interaction with the students, I found that the motivations of the students were very diverse. Some were very motivated to learn and did not mind spending more time. There were also other students who were not quite willing to invest their time in this subject. Moreover, the mean scores for "the staff member encouraged students to ask questions and discuss ideas in class" and "the staff member encouraged students to find information on their own and learn independently" are both 4.3.

I have adopted a novel approach to teaching this course. Traditionally, this course is taught by lectures and separate laboratories. The main disadvantage of this setup is that the students could not practice what they learn from the lectures promptly. I therefore adopted an integrated approach that combines the principles and practices. There are several aspects to this teaching approach:

- By having students bring their notebooks to the class, I could inject practical exercises throughout the lectures. By using various network measurement and diagnosis tools, and ready-to-use programs, the students could immediately practice and visualize the principles they learn from my lectures. These timely practices enabled the students to understand the abstract principles and to motivate self-learning.
- I also use both bottom-up and top-down approaches to mastering the principles of computernetworking. Note that either approach is used in a traditional teaching of this course. I adopted a bottom-up approach for teaching the principle parts, because it is a morelogical approach to teaching this complex subject. However, its disadvantage is that this limits the practice opportunity. At the same time, I therefore use a top-down approach to introduce practices, because practices from the top do not require networking knowledge.
- The success of this integrated approach depends on whether the students were able to complete the in-class exercises promptly. Otherwise, the teaching progress would be seriously hindered. I therefore recruited three year-three students to help me assist the 125 students to complete the exercises in each class and to have my three teaching assistants help me grade the assignments and tests. It turns out that quite a few students needed help from us to finish the exercises.
- For the class project, I have designed a new set of project questions. There are two parts to this project: setting up a WiFi router with Internet connection (65%) and setting up a WiFi bridge and a router with Internet connection (35%). We lent a Raspberry Pi to each group, and all they need was to use their notebooks to construct a simple IP network and a bridge-IP network. Through the given questions, the students were guided to find out

how the networks could be configured. They could also put what they learnt into practice.

Some favorable student comments:
- *"It was fun to learn the basic concepts of computer networking. Observing how the packets and information is passing between different hosts and how each component is doing their works were fun as well. It was also useful to learn how to use different programs such as Wireshark and some commands in terminal."*
- *"I love how Rocky is summarizing what we have learnt from the last lecture before the new lecture begins. It helps us recap and this should continue next time."*
- *"For 2 years, I have not seen any friendly professor as Rocky is. When I approach for a question, Rocky is very willing to answer and clarify the things that we do not know. It was a pleasure to have Rocky teaching us again. Moreover, Rocky is very passionate in his teaching that he always tries to give us more explanations and encouragements to involve more in the class. This motivated me a lot to read the textbook and finds out more information."*
- *"The exercise part would let me understand more the real situation and implementation of the related topic. The detail explanation for each topic could let me understand more the concept and clarify the misunderstand part in the book."*
- *"He was always well-prepared for the class and the explanations of the concepts were very clearby doing exercises during lecture."*
- *"Therefore, I'd like you know that I like the way you teach the course this semester. I retake this course this semester. Last time I remembered only the 7 layers and 404. However, I can understand the role of bridges and switches this time. For the protocols and the use of Wireshark, although I do not understand without any problems, I know the ways to solve them (the similar way to solve problems in the assignments and project). I quiet agree that what I remember is almost what I search myself. If it is possible, I hope that the way you teach students in this course can be adopted more or less in the department of COMP."*

Engineering Ethics at Chung Yuan

At Chung Yuan I helped develop 5 new modules on ethical issues in the use of information technology. In each module, I shared some thoughts from the Bible which I found relevant to the issues.

<u>Is ethical hacking always ethical?</u>
- "Beloved, never avenge yourselves, but leave it to the wrath of God, for it is written, 'Vengeance is mine, I will repay, says the Lord.'" (Romans 12:19)
- "And Jesus said, 'Father, forgive them, for they know not what they do.' And they cast lots to divide his garments." (Luke 23:34)
- "But the Lord sits enthroned forever; he has established his throne for justice, and he judges the world with righteousness; he judges the peoples with uprightness." (Psalm 9:7-8)

<u>Are social media responsible for spreading fake news?</u>
- "Do not tell lies about others." (Exodus 20:16)
- "Don't spread harmful rumors or help a criminal by giving false evidence." (Exodus 23:1)
- "The LORD hates every liar, but he is the friend of all who can be trusted." (Proverbs 12:22)

<u>Is the right of being forgotten a human right?</u>
- "Then he adds, 'I will remember their sins and their lawless deeds no more.'" (Hebrews 10:17)

- "For if you forgive others their trespasses, your heavenly Father will also forgive you, but if you do not forgive others their trespasses, neither will your Father forgive your trespasses." (Matthew 6:14-15)
- "Be kind to one another, tenderhearted, forgiving one another, as God in Christ forgave you." (Ephesians 4:32)

Can mass surveillance be made ethical?
- "Woe to those who decree iniquitous decrees, and the writers who keep writing oppression, to turn aside the needy from justice and to rob the poor of my people of their right, that widows may be their spoil, and that they may make the fatherless their prey! What will you do on the day of punishment, in the storm which will come from afar? To whom will you flee for help, and where will you leave your wealth?" (Isaiah 10:1-3)

Should facial recognition technology be banned?
- "But the Lord said to Samuel, 'Do not look on his appearance or on the height of his stature, because I have rejected him. For the Lord sees not as man sees: man looks on the outward appearance, but the Lord looks on the heart.'" (1 Samuel 16:7)

Students' feedbacks on two questions:

Q6 These five topics help me become aware of the ethical issues underlying the use of these technologies.
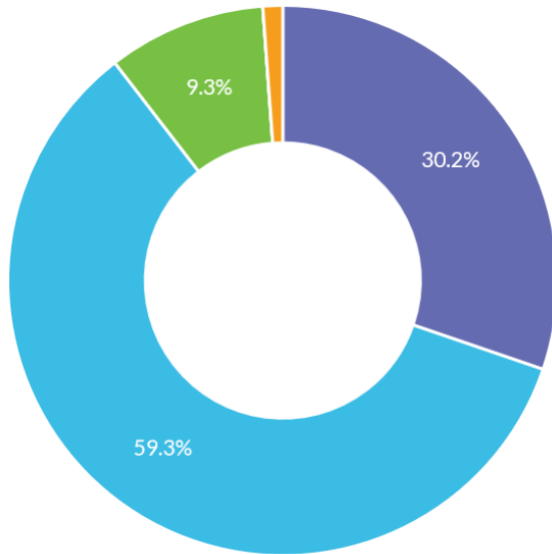Multiple Choice
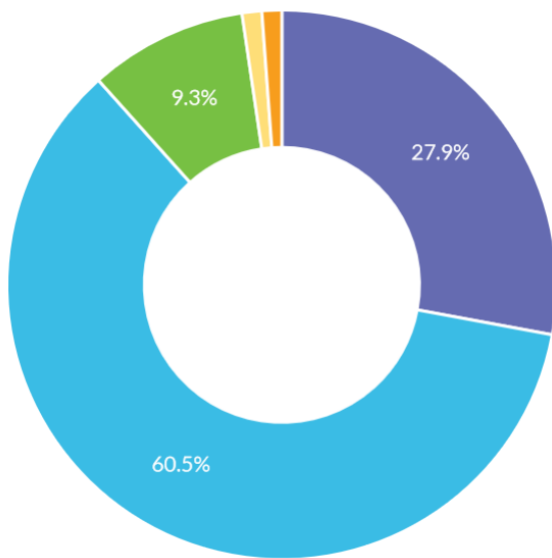
Choice	Total
Strongly agree	24
Agree	52
Neutral	8
Disagree	1
Strongly disagree	1

Q8

The materials presented by Rocky are helpful for me to understand the underlying ethical issues.

Multiple Choice

Choice	Total
● Strongly agree	26
● Agree	51
● Neutral	8
● Disagree	0
● Strongly disagree	1