

CTHE Portfolio

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Executive Summary

This portfolio reports my reflective and transformative journey through the Certificate in Teaching in Higher Education (CTHE) course offered by the Staff Development Centre (SDC), University of Colombo.

I believe that there are three aspects that a good teacher should possess: content competence, pedagogical competence, and motivation to teach. Joining the Department of Computer Science and Engineering, University of Moratuwa after working in the industry and after obtaining my PhD, I had more than enough content competence. I also had the motivation to teach, since I am a person who tries to do my best in every task that is assigned to me. However, I was not aware of any theories or modern technologies on learning/teaching/assessment. In short, I did not focus on any systematic or scientific way of teaching such as constructive alignment. Thus, I must confess that I lacked pedagogical competence, to a greater extent.

However, while following the CTHE course, I was introduced to many prominent pedagogical theories and practices. Intrigued by what was taught at the CTHE workshops, I also researched more on new knowledge related to the same, which brought me more pedagogical competence. Motivated to assist students to excel with my new found knowledge, I introduced 18 new changes altogether to my teaching/learning/assessment, as well as to my professional development, where only 7 such changes (Learning Agreements) are required to complete CTHE course.

These changes were implemented in two courses conducted at the Department of Computer Science and Engineering, University of Moratuwa. These two courses are CS2012 Principles of Object Oriented Programming, which is an undergraduate course and CS5612 Pattern Recognition, which is a postgraduate course. Apart from being taught at undergraduate and postgraduate levels, these two courses have different characteristics, which provided an excellent test bed to experiment with the changes. For example, in CS2012, I taught for 110 students on a weekday morning. As for CS5612, I taught 15 students on a Saturday morning. The undergraduates are full-time, and very much motivated by their grades, and target to graduate with a class. In contrast, the MSc students were studying part-time while working in IT (Information Technology) companies, and just wanted to obtain an MSc with a minimal pass. At the undergraduate level 99% the batch graduates on time, while only about 10% graduates out of the MSc students. This

clearly shows the difference in motivation levels. Moreover, CS2012 module started half-way through CS5612, which allowed me to experiment with the same change with two different class settings.

17 of the implemented changes are reported in this portfolio. Altogether, these changes have addressed all the SEDA (Staff and Educational Development Association) values and outcomes. I believe that I have demonstrated a high level of reflective practice while implementing these changes. The reflective logs written using the 4R process (reporting and responding, relating, reasoning, and reconstructing) vouch for that. In addition, for each change I planned to implement, I carried out an extensive literature survey to find out the success factors and potential failure points. My observations of the implemented changes are also compared against the previous work in the literature. Wherever possible, I took student feedback to measure the success of the implemented changes. In addition, I carried out self, peer, and student evaluations on my courses.

This portfolio spans through 7 chapters. First chapter gives an overview of myself, to set up the reader's mindset to appreciate the rest of the portfolio. Then next chapter provides my reflections on the CTHE course. The following three chapters discuss the changes I implemented to improve teaching, learning, and assessment in my courses, respectively. The sixth chapter revisits the reflective practice I demonstrated in the preceding chapters, and provides evaluation of my teaching. The final chapter discusses my self-evaluation on being an effective academic, my future plans, and my teaching philosophy.

To conclude, I am happy and proud that I put my fullest effort to complete the CTHE course up to a level that is much above the required level for successful completion of the same. Through CTHE, I have gained a vast knowledge related to pedagogy, which I am now using for the betterment of my students. Thus, now I can finally say that I now possess all the three aspects a good teacher should have. However, this is just the beginning – I will keep improving in all three aspects, thus serving my university, and country as a whole.

What I Learned and done from the CTHE Course

I learned many different theories related to teaching, learning, and assessment, such as constructive alignment, Bloom's Taxonomy, SOLO Taxonomy, active learning, Kolb's cycle, TDA model, 3P model, and 5E model. All these listed theories were applied in the modifications I did to my teaching. For example, with the understanding of the 3P model, I held a bridging workshop to improve the P1 stage of students to support their P2 stage.

At CTHE, process was emphasized over product. Thus, I used constructive alignment to organize my course delivery to make sure the students achieve the ILOs. Since I did not have a new course to design, I picked up an existing course that I am teaching and critically analysed and modified it to exhibit constructive alignment. Since attention span of students is limited, I designed lesson plans that interleaves different Teaching and Learning activities.

I learned the importance of active learning, and used many techniques such as in-class learning activities, home work, and getting students to ask questions, in order to improve active learning of students. I also experimented with giving handouts and other related material to students. Some of these in-class activities were carried out in small groups, because of the first hand experience I got from CTHE workshops.

I standardised evaluation using an analytic rubric. I also started giving formative feedback for in-class activities and also for practical submission. I gave timely feedback for summative assessments as well. I also carried out novel experiments such as open book examinations.

The most prominent practice that I adopted through CTHE is the reflective practice. This reflective practice is evident in this portfolio. In particular, I followed the IPUR (Identify-Plan-Undertake-Reflect) process in implementing the changes. As part of reflective practice, I started getting my teaching evaluated by a peer, in addition to my own self-evaluation. Rather than waiting till the end of the semester to get student feedback like I used to do earlier, I started getting mid-semester feedback as well. For many of the implemented changes also I took student feedback.

I really admire the organized and punctual nature of the course tutor. Thus, taking a small step towards being organized, I started using a to-do list and a Google calendar.

Acknowledgement

It is time to look back and pay my debts of gratitude to those wonderful individuals who supported me throughout my CTHE journey.

First and foremost, I thank late Dr Shrinika Weerakoon, former Director of the Staff Development Centre, University of Colombo, for accepting my request to follow the CTHE course. Moreover, I thank her for going beyond the traditional administrative role and making us feel special while at CTHE, for the time she spent on reading our portfolio chapters, and for all her encouraging words. Although you are no longer with us to read my words of gratitude, I know you are looking at us from somewhere, feeling happy about our performance.

My sincere gratitude goes out to Prof Suki Ekaratne, the tutor of the CTHE course, who is one of the best teachers that I have ever met. Thank you sir, for all the wisdom you gave us, and for showing us how an excellent yet humble teacher looks like.

Special thanks to the participants of CTHE-20 Friday batch, for all the good memories you left me with. Many thanks to my mates at group F8, Upul, Udeshini, and Rumiza, for all the knowledge and laughter we shared. Many thanks to my homework group, and especially to Chathuri from CTHE Monday group, who did the ‘courier job’ for me.

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My sincere gratitude goes out to all the students in CS2012 and CS5612 courses, with whom I experimented my planned changes. I hope I did not cause any inconvenience to you, it was all done with a good intention – to provide you a good learning experience. Thank you for all the valuable feedback given on the implemented changes.

I must also thank all the non-academic staff at the Department of Computer Science and Engineering, for their support. Special thanks to Ms Nisansala Samarasuriya, for the help on digitizing student feedback, and Mr Dinesh Bandara for all the documents he scanned for me. I also thank the non-academic staff at the Staff Development Centre, University of Colombo, for the support they have extended us, and especially for that morning tea and patty.

I thank my parents, and my mother-in-law for taking care of my son for me to attend CTHE workshops. Many thanks to my husband for all the patience and understanding he showed during this period, and all the support he gave.

Last but not the least, I thank my little son, the jewel in my eye, for his patience. I'm sorry I was writing this portfolio when I should have been cuddling you to sleep. But I hope you saw the courage and endurance your mother has, and would one day say 'I want to be like my mother'. I dedicate this portfolio to you my dear son.

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Acronyms

ACL Association for Computational Linguistics. 197

CA Continuous Assessment. 107

CDUCA course design under constructive alignment. 56

CILo Course Intended Learning Outcome. 54

CIMA Chartered Institute of Management Accountants. 5

CRA Criterion Referenced Assessment. 124

CSE Computer Science and Engineering. 6

CTHE Certificate in Teaching in Higher Education. i

DL4D Digital Learning for Development. 10

GCE General Certificate of Education. 5

GPA Grade Point Average. 49

GUI Graphical User Interface. 40

HoD Head of the Department. iv

HOLA Higher Order Learning Activities. 55

HOTS Higher Order Thinking Skills. 20

HRM Human Resource Management. 6

ICE Integrated Computer Engineering. 39

ILO Intended Learning Outcome. 24

IPUR Identify-Plan-Undertake-Reflect. 18

IT Information Technology. i

kNN k Nearest Neighbour. 107

LA Learning Agreement. iv

LLB Bachelor of Laws. 6

LOLA Lower Order Learning Activities. 55

LOTS Lower Order Thinking Skills. 20

MP Motivational Part. 21

NLP Natural Language Processing. 9

NRA Norm-Referenced Assessment. 124

OOP Object Oriented Programming. 8

PBL Problem-Based Learning. viii, 80

QA Quality Assurance. 162

RBL Resource Based Learning. ix, 84

RLL Reflective Learning Log. vii, 17

SDC Staff Development Centre. i

SEDA Staff and Educational Development Association. ii

Solo Structure of the Observed Learning Outcome. 19

SSTLA steps to select what TLAs. 56

TA teaching assistant. 44

TDA Transition-Development-Achievement. 26

TLA teaching learning activity. 54

Checklist

SEDA Mapping Document

Chapter 1

A Walk down Memory Lane

1.1 Introduction and Chapter Outcomes

This chapter provides an overview of my personal life, as well as my professional career as an academic, with a brief outlook into the future. At the end of this chapter, the reader will be able to identify my personality, and develop a mindset to appreciate the effort I have put into the rest of the portfolio.

1.2 The Poem that Changed my Life

About 15 years ago, while I was an undergraduate, I moved into a new boarding place. On the door of my bedroom, the previous tenant had pasted a piece of paper. Out of curiosity, I started reading it, just to find out it was a poem called “Do Not Quit”. I read it, re-read it, and read it several more times, because I felt that something inside me was being changed by that poem. I finally wrote it down. I could not remember the whole poem, for it was long. However, I could not get the very last line of that poem out of my mind, “it’s when things seem worst, you must not quit”. I used to be a person who got upset by even the littlest thing, and I used to be a person who always complained. However, once I made this poem’s advice the motto of my life, I was changed, not completely, but to a great extent. This poem kept me going through my hard times, gave me endurance to survive, and gave me determination and courage. I am so glad that I came across this poem when I was still young, and even today also, I know by going by the advice of this poem, I will make my CTHE portfolio, a great success.

Don't Quit

When things go wrong, as they sometimes will,
When the road you're trudging seems all uphill,
When the funds are low and the debts are high,
And you want to smile, but you have to sigh,
When care is pressing you down a bit-
Rest if you must, but don't you quit.

Life is queer with its twists and turns,
As every one of us sometimes learns,
And many a fellow turns about
When he might have won had he stuck it out.
Don't give up though the pace seems slow -
You may succeed with another blow.

Often the goal is nearer than
It seems to a faint and faltering man;
Often the struggler has given up
When he might have captured the victor's cup;
And he learned too late when the night came down,
How close he was to the golden crown.

Success is failure turned inside out -
The silver tint in the clouds of doubt,
And you never can tell how close you are,
It might be near when it seems afar;
So stick to the fight when you're hardest hit -
It's when things seem worst that you must not quit.

Author Anonymous

1.3 Early Childhood

I was born and grown up in a small village called Uduwa, which is about 6km from Horana, and about 42km from Colombo. Although 42km feels like a short distance today, those days, when transport system was not fully developed, we used to feel Colombo was so far away, where going in a train, going to the airport, or going to see the sea were luxuries.

So I grew up in a perfect village setting. We never had boundary walls around our land, and nor did many other houses. So we had an ample number of cousins and friends in the neighborhood to play with. My grandfather was a farmer. He was growing vegetables on a small-scale, was cultivating some paddy fields, and had small rubber, tea, and coconut plantations. So my life was spent running around in paddy fields, catching fish in the streams, going in search for wild fruits, and what not. It was the perfect childhood!

I am the eldest in the family, I have one brother, who is just 1.5 years younger to me. My childhood was spent with my parents, brother, and my grandparents who lived with us. My father was the breadwinner of the family, and my mother fully dedicated herself to daily household chores.

My family was enriched with Buddhist values. I could see the prominent Buddhist phrase ‘may all beings be happy’ being practiced at my home. My grandfather and mother were vegetarians. My grandmother did not throw out hot water without first cooling it down, saying that it might kill the worms in the ground. There were beggars who went from house-to-house those days, and they all were used to come to my home for lunch. We always had food left for at least one person. We used to worship lord Buddha together in evenings, and my grandparents chanted pirith every night before going to sleep. Even when I was about 6 years, I used to go to temple with my grandmother on Poya day to observe sil (a religious ritual). I believe the lives of my parents and grandparents, and the Buddhist philosophy I came across gave me most of the beliefs and values (described in Chapter 7) I now have as an adult.

Apart from my family, there was one very important person who influenced my life when I was a kid. That is my mother’s cousin, whom we called ‘maddu mami’. He was working in the Navy back then, and was 6-foot and well-built. For me, my brother and cousins, he was a hero. Not only because of how he looked, but also because of his character. He was a charity worker, non-smoker and a teetotaler. He hated superstitious

ideas such as horoscopes and gods, and he was a liberal thinker. Although he was away most of the time due to his service, we were very close to him. When we were in grade 3 or so, he started a kids society (Lama Samajaya) for us, and we named it “Dinithi Lama Samajaya”. We had weekly meetings, and were doing a magazine. Moreover, we organized many events, such as tree plantations, anti-drug campaigns, flower donations (dan sel) at temples, concerts, exhibitions, and many more. Looking back, I think all these had a major impact on my life. I still believe that the reason for me being teetotaler, an environmentalist, (somewhat of) an atheist, and my non-affiliation to any political party are results of the influence of maddu mami. And whatever the leadership skills I have, are those that got initiated from my kids society. It is interesting to see how our character is formed during our early childhood influences many of our actions as adults. For example, as discussed in Section 4.9.2, I did not want to unnecessarily print handouts, because it had a negative impact on the environment.

1.4 Primary and Secondary Education

I started schooling at Taxila primary college, Horana. I passed the grade 5 scholarship examination with a very high margin, and entered Visakha Vidyalaya, Colombo. Although I was not matured enough to understand the impact of education, or why I should study, from my very first day to school, I saw my father’s dedication in educating me. He was (and of course is) the hero of my life. I think this was one of the early reasons that I wanted to study hard. And also, with the high competition at Visakha Vidyalaya, I eventually determined that I will excel in my education. However, the first term of Grade six at Visakha Vidyalaya was a shock to me. At Taxila primary college, I was always the class first, and was teacher’s pet because of this. However, at Visakha, in the very first term, I was the 5th in class. I just could not take it. I still remember coming home and crying my heart out. And I started to study for the next term on the very same day! However, in the next term also, I was the 5th in the class, which I managed to accept calmly. Looking back, I think as a young child I learned a very valuable life lesson – no matter how hard you try, there can always be someone who performs better than you. But all you can do is to try your best, so that you will not have regrets later.

Moreover, even as a kid, I knew how to identify my weaknesses and put effort to

overcome them. One very good example is how I improved my English. In the first mid-term exam at Visakha Vidyalaya, I scored only 54 marks (yes, I still remember the exact marks). This was really embarrassing. My father also realized the importance of English, so he sent me to a teacher in my village. I was so passionate in learning English, and I think I became a headache to her. She had a nice collection of learning books, and I used to sit and do those exercises for hours, and my teacher did not have time to correct them. However, as a consequence, my English improved immensely, and for the end-of-term examination, I scored 80+. I also developed the habit of reading English story books. Starting with the books written by Enid Blyton, my reading passion expanded through book series such as Nancy Drew, Hardy Boys, all the way upto the books by John Grisham, Dan Brown, and Robert Ludlum.

Although I was a very much fun-loving person who was enjoying the life to the maximum, I always made sure that education is my number 1 priority. Consequently, I was the class topper from grade 7 to 13, and passed the GCE O/L (General Certificate of Education, Ordinary Level) examination with 7 Distinctions and 1 credit.

Then was a decision point: I had to select my stream of study for the Advanced Level (A/L). I had three options: Commerce, Bio Science, and Physical Science. I did not want to do Commerce, because even without doing Commerce, there were many courses such as CIMA (Chartered Institute of Management Accountants) that one could later follow. I did not want to do Bio Science to become a doctor, since I did not like the idea of spending the rest of my life in a hospital. So that left me with the final option: Physical Science. The funny thing is, Mathematics was my least favorite subject. Anyway, I thought I would give it a try. However, since I was with the pre-conception that Mathematics was difficult, I did find it difficult. So as usual, I was complaining to my father that I wanted to change into Commerce. He wanted me to wait till the end of the first term, and change. So I had to sit the end of term examination in Physical Science stream. To my surprise, I became the first in the class! So I thought to myself ‘if the student who is the last in the class has courage to do physical science, why can’t I?’ . Although this type of norm referenced assessment as done in our schools is discouraged now (as explained in Section 5.2.2), in my case, it was immensely helpful. Such norm referenced criteria gives us an indication where we stand with respect to others.

So that was it, and I went on to pass the Advanced Level (A/L) examination with three

A's (it was in our year that the three subject syllabus was introduced), and got entrance to the Faculty of Engineering at University of Moratuwa, the best Engineering faculty in the country. I was the 120th in the country. Again, I think I learned a very good life lesson – what makes things difficult is us thinking too much about them. If we just sit and do whatever required to achieve our goal, we would eventually achieve it.

1.5 Higher Education

First year at the Engineering Faculty of University of Moratuwa, was highly competitive, because students are assigned to different engineering fields based on their first year performance.

I did work hard, but so did everyone else. Consequently, I could not get into the field that was considered the best those days, but managed to get selected to Computer Science and Engineering (CSE), which was considered the second best. Although my three best friends got selected to the best field, it did not upset me. As discussed above, I think by then I have learned my life lesson – all you can do is to try your best, but you cannot control how others perform. Looking back, not getting selected to this best field was one of the best things that happened to me.

Although I was very much committed to studies, I was determined to engage in extra-curricular activities as well. I was an active Rotaractor, and was the secretary of many department level societies.

I graduated in 2005 with a first class, and was the 6th in my CSE batch.

1.6 Postgraduate Studies

On the day after my final year examination, I started working at an IT company. However, even with a job, I found it very difficult not to study, as I was trained to work hard. So I tried few options – I started a course on Human Resource Management (HRM). I finished upto the certificate level, and was the class topper there. However, I felt that there is nothing to learn in HRM, it is just common sense. Then I started studying for Bachelor of Laws (LLB) degree. I dropped out from that very soon. Being trained to solve Engineering questions, I found it extremely difficult to memorize court cases, and

the programming language used in legal books was so confusing.

Then I started following the MSc in Computer Science degree at the Department of Computer Science and Engineering, University of Moratuwa. I graduated in 2009, and was among about the 20% of the batch who completed the degree.

1.7 Industry Experience

After a very short career as a business consultant in a leading IT company in Sri Lanka, I changed my career path into a Software Engineer, and joined another IT company. During the employment at this company, I gained a lot of experience in software systems development and maintenance. However, after about three years, the job tasks started getting monotonous, and I felt my job was getting less challenging. At that point, I decided to try out something new, and decided to apply for PhD studies.

1.8 PhD Studies

I applied and won a PhD scholarship at University of Otago, New Zealand in 2009. I obtained my doctorate in 2013.

Doing the PhD was a life-changing experience. Both me and my husband were doing PhD. We went for PhD just after the marriage, so everything was new to us. Not only I was doing PhD, I had to do household work, and I had to learn to cook! It was a struggle at the beginning, but later I started enjoying cooking and learned new dishes by following recipes. Thus cooking, which once looked so difficult became a hobby. There was a very small Sri Lanka community there, and they were like family. There were many events, and there were many invitations for dinners. So we never felt lonely there. New Zealand is a beautiful country beyond words. So we travelled around the country quite often in our old car. I always think “those were the best days in our lives”.

My PhD supervisor was very inspirational. He was a perfectionist, very much dedicated to research. I learned the best of research from him. What I learned from him, from writing research papers to proper use of English (yes I did learn quite a bit of correct English from him), now I practice on my students.

1.9 Academic Experience

When I went for my PhD, I did not have any idea of what was in the bag for me – I just needed a career change. However, during my PhD studies, I found my passion – and I knew what I wanted to do in the rest of my life: I wanted to be an academic. So after the PhD, we returned to Sri Lanka. In 2014, I joined the CSE Department as a senior lecturer, and am working in this position upto now.

My son was just 4 months when I started my job. I could have stayed at home longer, but I really wanted to start working and make use of my PhD. My plan was to get a nanny to look after my son, with my father at home, as both my mother and mother-in-law were not in a position to help me. However, soon after starting work, reality struck me, very very hard. It was very difficult to find nannies, and even more difficult to retain them. Within 3 years, I had to change 14 ladies. It was a real tough time, and I wanted to quit not only once. But at every such time, I thought, ‘It’s when things seem worst that you must not quit’. Looking back, I am so proud that I had done well as an academic, while making sure that I looked after my son.

1.10 Teaching Experience

While I was a PhD student, I worked as a part-time tutor/demonstrator at University of Otago. However, my teaching career flourished after joining the CSE department. I joined at a time when there was a staff shortage at CSE. Therefore straight after joining, I was assigned to teach two full modules, Principles of Object Oriented Programming (OOP) at semester 2, and Object Oriented System Design at semester 3. Both these modules get over 100 students. As described in Section 3.3, the senior lecturer who was the coordinator for these two subjects before me was very supportive, and was guiding me in the first few semesters until I fully got hold of teaching. In addition, in the first two years, I was teaching Intelligent Systems and Information Retrieval.

Principles of Object Oriented Programming is one of the subjects that I performed worst as an undergraduate. I got only a B+ for this module. The module was taught by a visiting lecturer. We never saw him outside lecture hours. He just came, did a 3-hour lecture, and disappeared. The practicals we had to do had nothing to do with OOP concepts, they were mainly on Java syntax. I still remember studying Java all by

myself after the semester examination, because I knew I did not get much knowledge by following that module. So it is kind of ironic that I had to teach a module that I myself did not perform well. However, since I had enough programming experience at industry and during my PhD, it was not that difficult to start teaching. However, I did have to spend a considerable amount of time polishing my knowledge on the theory parts. In a way, I think that it is good that I got this module to teach, because as explained in Chapter 3, I had a great responsibility to make sure my students get a better learning experience than what I got.

Currently I am teaching three modules in the MSc taught-course as well. These modules are: Pattern Recognition, Information Retrieval, and Natural Language Processing. All these are related to my research areas as well. Thus I enjoy teaching these very much. However, I must admit that none of these modules I have learned through a formal course. I developed them based on my research experience and by looking at other available material. In that way, I feel very proud that I could teach three new subjects that I myself enjoy. Through my research work, I keep collecting new knowledge in these subjects, and I always make sure I disseminate that information to my students.

1.11 Research Experience

What I enjoy most as an academic is my research. My PhD research was on Intelligent Virtual Agents. However, I did not like that research area much, as I did not see how the world could benefit from that type of research. However, part of this research involved some work on Natural Language Processing (NLP), which really interested me.

Therefore once I joined CSE, I selected Natural Language Processing and Computational Linguistics (which goes hand-in-hand with NLP) as my areas of research. Coincidentally, there was lot of interest at CSE for these two fields, and eventually I got to work with a team of other lecturers on this field.

In particular, I am very much interested in developing language computing tools and resources for our local languages, Sinhala and Tamil. Compared with English and other widely used languages, the amount of research done for language computing is very less for Sinhala and Tamil, and it is the least for Sinhala. Thus, if we do not act now, in times to come, these languages will slowly go out of use, simply because they cannot survive in

the cyber space. This is the main motivation for my involvement in this line of research.

Currently I am involved in a major project in this area to develop a machine assisted Sinhala-Tamil translation system for the Official Languages Department of Sri Lanka. I am also a founding member of the National Languages Processing Center at University of Moratuwa.

In addition, I am supervising projects on implementing a Parts-of-Speech tagger (to determine the class (noun, verb, etc) of a word), a morphological analyser (identifying how words are formed up using morphemes), and sentence similarity measurement, for Sinhala.

Some other NLP projects include sentiment analysis on customer reviews, automatic question answering, automatic ontology generation, automatic answer generation for Mathematics questions, and student feedback summarization. This last project, if completed successfully, would be beneficial to many academics.

In addition, I am working on another project to implement a problem-based online tutoring system for O/L Mathematics in Sri Lanka. This is a system to automatically assess and generate feedback for student answers given to O/L Mathematics questions. This project is funded by the Digital Learning for Development (DL4D) research grant from Canada, and three other University of Moratuwa Senate research grants.

I got the opportunity to start postgraduate supervision soon after joining CSE. Consequently, during the last four years, seven of my MSc students have already graduated. Currently I supervise 2 MPhil students, 2 full-time MSc students, and 10 part-time MSc students. I also supervised 6 undergraduate research projects (roughly about 20% of the batch) for the year 2017.

My research profile is something that I am very proud of. In my short career as an academic, I have published 47 papers, and 4 more have been accepted. I have a citation count of 123 as of December 2017, and h-5 index of 7 in Google scholar.

1.12 Administrative Experience

Compared to research and teaching responsibilities, my administrative responsibilities are much less. Currently I am a coordinator for semester 2 and 3 at CSE. In addition, I am the coordinator for a module that requires communicating with the industry in organizing

a workshop series for semester 3 students.

The main reason for less involvement in administrative duties is my dislike for it. With all sorts of politics that I see around me, I feel that it would be too much of a stress to get involved in administration. Moreover, I am very bad at remembering the rules and regulations of the university.

1.13 My Life as an Academic

My experience as an academic thus far has been very positive. After tasting the life at the industry as well, I am confident that I have finally found the best career path for me. The autonomy and flexibility that I enjoy as an academic are the main motivational factors in my job. Moreover, academic life, at least for me, is never monotonous. Every year, I teach a new set of students, and face new challenges.

It was a novel experience to work with the same set of lecturers who taught me. Seeing their dedication towards teaching inspires me to do my best for the students. The best return of being an academic is to see students coming with near zero Computer Science knowledge flourishing into excellent Software Engineers.

1.14 Looking Back

Looking back at my walk through life, I am very much satisfied, and I have minimal regrets. I grew up as a very hard working child. I gave my best at everything, and accepted the result without complaining. I can see myself as a very much goal oriented person. When I set up a goal, I somehow achieved it, be it getting into the Engineering Faculty, passing with a first class, or completing the PhD. However, my walk was never over a smooth ground. Coming from a lower middle class family, there were many hardships during schooling time. Since it was difficult to travel from my home to school, I had to live with my mother's sister. So until I completed my university, I was away from my home during week days. Being away from my parents meant that I had to do most of things on my own. Moreover, due to physical conditions, my mother could not go in buses. So as a girl I had to look into myself, and go everywhere alone. My father of course did his best, but there was a limit to what he could do. So from going shopping

to making arrangements for my wedding, I did all by myself. There were many times that I wished that my mother could accompany me. However, looking back, I see that by learning to take care of myself carved me into a very strong personality. Again, it is a very good life lesson for me, that everything happens for good, and you can change every challenge into an opportunity.

1.15 A Look into the Future

If I was asked who I want to be in 10 years of time: I would like to be recognized as a pioneer in Natural Language Processing for Sinhala, as someone who was instrumental in enabling language computing with Sinhala. I also dream of becoming an editor of a reputed journal in my research field, and also to deliver the key note speech in a prominent conference.

As a parent, I see myself as gearing my son to become a respectable citizen in the country, and to maintain the happiness in my family. As a daughter, want to give the best care to my parents.

1.16 Summary

This chapter provided an overview of myself: my personal life in brief, and my professional life in detail. I believe it gave a clear idea about my personality to the reader. This is the first time I ever wrote about myself (may be after grade 4), and reading it gives me a sense of achievement and satisfaction. This motivates me to do even better in the future, so that if I ever had to write about myself again, I would have lot more to write about me.

Chapter 2

My Reflections on the CTHE Course

2.1 Introduction and Chapter Outcomes

This chapter provides an overview of my journey through the CTHE course. It starts with a brief description of the pre-CTHE time, and how I was introduced to the course. Next, my perspective of the CTHE course is discussed in detail. Then presented is a detailed elaboration of many things I learned from the course, and how I was transformed into a better academic. It concludes with some suggestions to make CTHE even better in the future.

At the end of the chapter, the reader will be able to identify a participant's view of the CTHE course, and will be able to appreciate the effectiveness of CTHE in transforming naïve university lecturers into better academics.

2.2 The pre-CTHE Time

The beginning of my academic career is somewhat different to that of many other academics. I became an academic after working in the industry, and after completing my PhD. So I was well into my 30s, when I joined the Department of Computer Science and Engineering, University of Moratuwa as a senior lecturer on contract. By the time I joined permanent staff, I have already done a considerable amount of lecturing, both at undergraduate and postgraduate levels. Moreover, I have already done tutoring, plus had completed a short course on 'preparing for an academic career' at the same university where I did my PhD. So when I saw the condition in my permanent employment agree-

ment that I must complete an induction training course on teaching and learning, my only objective was to get an exception for it. However, my request was not approved by the university administration. During this same time, I received flyers on induction training courses conducted by few state universities in Sri Lanka. Not knowing what to select, I consulted my senior colleagues. And I got the same answer: “The course offered by the Staff Development Centre (SDC) of University of Colombo is very tough, but it is the best”. One colleague even stated that it was like following an MPhil degree! Anyway, not wanting to settle for something less than the best, I decided to follow that course. After a very swift communication thread with the coordinators of the CTHE course, I was all enrolled to the course. However, in my mind, I was asking myself, “is there anything new for me to learn, after all the teaching I have done? ”.

2.3 The First Day at CTHE

I was assigned to the Friday group upon my request, as I was teaching on Mondays. However, on the first workshop day, I had to be abroad. The coordinators allowed me to come to the Monday class just for that week. So I arrived at the University of Colombo SDC on 27th of March 2017, thinking “here I am, going to waste a full day, and many more days to come”. Despite this feeling, I felt something different about the workshop on the first sight – instead of a normal classroom where the chairs are arranged in rows, there was a group setting. Projectors were focused on both sides of the room, which made me think that the coordinators have been very thoughtful about the learning environment. Even better, we had name tags nicely organized in a box, and on the group table all the essential stationery, a dictionary, and a board displaying names of the group members were there. To my surprise, I noticed that even the paper clip was name-tagged. “Very well organized”, I thought.

Despite all these, I was still not convinced that I was going to learn anything new at the workshop. But it did not take long to change my pre-conception: all that was needed was the tutor’s introduction to the Bloom’s taxonomy, only the name of which I have heard before. And I realized how wrong I was, and was all ears to listen to what the tutors had to say.

2.4 The CTHE Course – My Perspective

2.4.1 The CTHE Course, an Overview

The CTHE course is accredited by the Staff and Educational Development Association (SEDA), UK. This attests the quality and the comprehensiveness of the CTHE course. A well-written portfolio that demonstrates the achievement of SEDA values and outcomes, brings SEDA accreditation to the participant.

The CTHE course is broken down into 17 sessions, which are organized under five different units. The first unit focuses on equipping participants with concepts related to teaching, learning, and assessment. This helps the participants in understanding what changes they could introduce to teaching, learning, and assessment in their courses. These changes are to be converted to Learning Agreements (LAs) (discussed below), and implemented in the courses they teach.

The second unit focuses on developing the reflective practice, i.e. how the participant should implement the proposed changes, and learn from her observations of these implementations. The second unit is taught just at the right time – when the participant starts to implement the tutor approved LAs in her course.

Later units focus on developing interpersonal skills of the participant, and on being an effective academic. Final unit is dedicated to seminar presentations by the participants in the CTHE course (discussed below). The final outcome of the course is a portfolio, which includes the participant's reflections on the changes she introduced to her teaching/learning/assessment (discussed below).

2.4.2 The Learning Environment

Throughout the course, the workshops were conducted in a group setting. Each group had 4-5 members, the ideal size of an effective group, as shown by many researchers (see Section 4.5.1). Some patterns in how group work was conducted could be noticed:

1. Ask participants to do homework individually, then get them to discuss their work in the group at the next workshop, and present the output of the discussion to the tutor during his table rounds (pyramid groups. See Section 4.5.1)
2. Give an in-class group activity to participants, and ask them to present their output

to the class

3. After discussing a theory/concept, allocate some time for the groups to discuss further on the same. The tutor does the table rounds, asking for any concerns the groups have. Important concerns/ideas raised by groups are discussed in the class by the tutor.

It was evident that each workshop was properly planned – an outline plan for each workshop was produced before the start of the workshop. Even though the adherence to this plan was not strictly followed sometimes (which, I believe should be the exact thing to do, as discussed in Section 4.3.3), the tutor was mindful enough to conduct the workshop in such a manner that there are enough lesson breaks, and fun activities. It was a clever blend of teacher-centric teaching and student-centric learning. Since the lecturing parts were well within the student's attention span (see Section 3.5.1), we never felt sleepy, even after the lunch.

As mentioned earlier, the classroom environment was very well organized, throughout the course. Every group had the stationary they needed, and common stationary was on a table in the corner. Projectors were mounted on both sides on the classroom, and there were wall mounted white-board for each group, in addition to the tutor's white board. To make sure that each participant is treated fair, the groups were rotated around the tables each week.

2.4.3 Learning Agreements (LAs)

As mentioned earlier, the CTHE participant is expected to introduce changes to the courses she teaches, based on the concepts she learned at the CTHE course. LA is the standard, formal way of proposing such a planned change. The LA form is designed in such a manner that the participant is forced to elaborate on the what/why/how aspects of the changes she wants to carry out – what is the type of change she intends to carry out, why that change is needed, and how the change should be carried out. In addition, the participant is encouraged to identify proven theories and techniques to improve teaching/learning/assessment, by having to identify success stories of similar change implementations in the literature. She is also required to clearly identify how the impact of the introduced change can be measured, thus making sure that the planned changes are

well-defined and specific, output of which can be measured.

LAs can be considered as a certain form of formative assessment (see Section 5.2.2). Participants are encouraged to prepare LAs based on concepts discussed in the workshops. Given that the participant produces LAs based on the concepts that she learned in the previous week, the tutor can get a clear idea of whether the participant has been able to interpret the concepts taught in the class properly, and whether she had been able to apply them in the LA. The mandatory script associated with the LA provides further evidence on this to the tutor.

A very important part of the LA is the requirement to identify the SEDA outcomes demonstrated, and the SEDA value supported by the LA. I think this is a clever idea, rather than waiting till the time of portfolio writing to identify what SEDA values and outcomes we achieved. When developing LAs, it is better to make sure that together, the LAs support all the SEDA values and outcomes. Although a minimum of 7 LAs should be produced, I believe that some more LAs have to be implemented by the academic to produce a comprehensive portfolio.

As further described below, the first three LAs I did without a proper understanding on what I am doing. However, when I realized the importance of achieving SEDA values and outcomes through our LA implementations, I created a chart that shows the mapping of my changes to SEDA outcomes and values. This way I could guarantee that I addressed all the SEDA values and outcomes.

As further described in Chapter 6, I got very intrigued about how much positive changes we could do in our teaching/learning/assessment. Thus I implemented 18 LAs (17 of these are reported in this portfolio), which is much above the required number of LAs to complete the course.

2.4.4 Reflective Learning Logs (RLL) and Reflective Practice

Reflective Learning Logs (RLLs) refer to the implementation part of the LAs. RLLs are an integral part of the professional development of the academic, both for self use and for showcasing to others (see Section 4.3.4). It contains the objectives of carrying out a proposed change, and observations of that implementation. Most importantly, it should record the lessons learned by the academic through the implementation process – based on self, student, or peer feedback the academic is able to decide what practices should be

continued, modified, or stopped, and what new practices should be added.

In particular, since most of the teaching methods (such as group work) are orthogonal to the subject matter, the lecturer can re-use the same teaching methods across teaching different subjects. Thus, recorded experience on using a teaching method in one subject can be used to better formulate the same teaching method in the other subject.

During the CTHE course, we were given the required knowledge on how to develop the reflective practice and how to write a reflective log. Using it as a base, I developed my own way of writing reflective logs. This I used when reporting the LA implementations. First, I describe the pre-CTHE practice, and elaborated what made me to identify the need for the particular change. I also describe the intended outcomes of the proposed change. Then I describe how the change is planned and implemented. Then I record my observations, and student feedback if any (I obtained student feedback for most of the implemented changes). Then I discuss the lessons learned while implementing the change, and the decisions I made. Finally, I take a step back and analyse the change as a whole, while relating my experience to what was recorded in related literature. Thus I believe I have developed my reflective practice through the IPUR (Identify-Plan-Undertake-Reflect, Section 4.2.2).

I feel very much satisfied with the way I have developed my reflective practice. As further described in Section 6.2.2, I have managed to develop my reflective practice into a sophisticated level.

2.4.5 The Portfolio

The portfolio can be considered as the grand finale of the CTHE course. However, just like Rome was not built on a day, the portfolio cannot be produced overnight. The participant should start working on the portfolio from the very first workshop onwards. Unlike a dissertation or a thesis, a portfolio contains many different documents, such as LAs, and student/peer feedback forms. If this material was not produced over the course, producing a comprehensive portfolio that demonstrates the support for SEDA outcomes and values becomes difficult.

The effort on constructive alignment in the CTHE course is very evident – first the new concepts in teaching/learning/assessment are communicated to the academic. The LAs should also focus mainly on teaching/learning/assessment. Finally, the main chapters

of the portfolio also refer to teaching/learning/assessment.

On the very first day at CTHE, we were told that we have to produce a portfolio at the end of the course. As students in Biggs and Tang (2007, p. 51) class, I felt threatened. Since I did not understand many of the things discussed in the first workshop, I was not sure whether I will be able to meet this expectation. However, being a goal oriented person as mentioned in previous chapter, I set up a new goal – to come up with a portfolio that will make me eligible to pass the CTHE course. Later on, when I learned that a high quality portfolio could achieve me SEDA accreditation, I set this up as my goal of following the CTHE course. As weeks went on, CTHE course started to make more sense, and I managed to figure out the changes I could do to my teaching/learning/ assessment in the form of LAs. I felt less threatened, and knew what my portfolio will be like.

I very much enjoy writing, so when I actually started to write the portfolio, it was a very interesting and pleasant experience for me. However, I must confess that I see ‘Surangika the researcher’ throughout the portfolio. As mentioned in Chapter 1, I am obsessed with research. Being trained as an Engineer who makes decisions based on facts and data, and as a practicing researcher, I had to put a considerable effort to personalize my portfolio. The tutor’s comments on my portfolio and my colleagues’ portfolios, and what he discussed in the class (such as there should be a link between the first chapter and the rest of the chapters) were very much beneficial. On the positive side, using my research experience, I was able to nicely connect my experience with the related literature, so that the portfolio is a nice blend of my experience and what I found from research.

2.5 What I Learned from CTHE

This can be categorized into three parts: (1) theories related to teaching, learning, and assessment, and their applications, (2) other important aspects related to teaching, learning, and assessment, and (3) things learned by observation from the way the course is conducted by the tutors.

2.5.1 Theories Related to Teaching, Learning and Assessment

Many different theories related to teaching, learning, and assessment, such as Bloom’s Taxonomy, SOLO (Structure of the Observed Learning Outcome) Taxonomy, active learn-

ing, and Kolb's cycle (which will be discussed in later chapters) were discussed in the class, and how to apply them in our teaching was also elaborated. For example, after learning about the Bloom's taxonomy, I analyzed the syllabus of a course that I teach, and an examination paper I have set. To my relief, both focused on Higher Order Thinking Skills (HOTS). However, we were advised that students should not be first tested on HOTS, without giving them Lower Order Thinking Skills (LOTS) – it has to be a gradual process. As described in Section 3.5.2, I used this advice when deciding the lesson plans for my courses.

2.5.2 Other Important Aspects Related to Teaching, Learning, and Assessment

1. The emphasis on process over product - I was focused only on the product earlier. In other words, I believed that the students should be able to apply the concepts they learn in the class in solving problems. However, I never properly thought of how this could be achieved. In fact, it is the smart skill of the lecturer in designing the learning process that could achieve that desired outcome, so I have learned.
2. The importance of giving instructional and motivational feedback to students. I also started giving such feedback, as discussed in Sections 5.4.2.
3. Importance of standardizing evaluation, in order to limit the discrepancies among how different people could grade answers to the same question. We were taught how to develop assessment rubrics, which I also started practicing for assessment that involved multiple graders (see Section 5.4.6).
4. The importance of active learning, where getting students engaged in activities that make them think and re-think about what they have learned. As discussed in Chapter 4, I tried out many different learning strategies to improve student learning.
5. Attention span of a student is about 10-15 minutes, so try to introduce lesson breaks at appropriate intervals. I kept this idea in mind when I was developing lesson plans (see Section 3.5.2).

2.5.3 Things learned by Observation

There were many things that I learned from the way the tutor conducted the workshop. In other words, the tutor was ‘practicing what he preached’:

1. Introduction of lesson breaks at appropriate times, to keep the attention of the students.
2. Giving some time to discuss among the groups, once an important concept was discussed (thus promoting active learning).
3. Not having a lecture session after the lunch break, but instead having a group activity that is fun.
4. Small activities to make students understand certain concepts. E.g. once the class was divided into two groups. One group was asked to organize themselves according to the time taken to travel to SDC. Other group was asked to organize themselves according to the amount of work they have done in their portfolio. With that simple activity, which of course was a great lesson break, we were taught how difficult it is to compare non-measurable outputs.
5. Making sure that the students were applying what was taught in the class when writing LAs (this could be applied to solving problems, in my teaching context). For example, rather than simply teaching the importance of positive feedback in the lecture, Motivational Part. (MP) of the script attached to LAs was carefully analysed by the tutor to make sure it was written on a positive note (this is a great example of promoting active learning). This in fact is kind of formative assessment, as discussed earlier in Section 2.4.3.
6. Importance of group work. This is what I enjoyed most during workshops. The synergy of the group was very evident. At each point, if one member could not understand what was just taught in the class, others always helped. So nobody leaves the workshop with any missing information. I have determined to use group-work-based learning activities in my classes, as much as possible. I really cherish the memories of my CTHE group. Upul, Udeshini, Rumiza and myself (see Figure 2.1) got very close to each other. Not only we learned together and helped each



Figure 2.1: CTHE-20 Group F8. From left to right: Rumiza, Udeshini, Surangika, and Upul

other, but we had lot of fun. We also met out of the workshops and practiced our seminar presentations.

7. Giving homework, and making sure students do them. Some homework assignments had to be submitted, and it was evident and the tutor was checking them. As for some activities, we had to discuss in the group at the next workshop, and the outcome of the discussion was checked by the tutor. So we had to do the homework. This is a potential solution to a problem that I have been having – if the students knew that their homework would be checked at the class, they will do it. And if time does not permit, save time by evaluating at the group level.
8. Being highly organized and punctual. This is what really impressed me, who is usually unorganized and not punctual. Everything was well-planned months ahead, so students had ample time to prepare to be in-line with the schedule. Every workshop was properly organized. So I also slowly fell into the correct path. For example, the scripts of my first LAs were written on a piece of paper torn away from my note book. But soon I started to type the scripts and kept them organized in my computer.

9. Being consistently strict, yet being flexible. I have learned the value of being consistent with the rules we impose throughout a course. Normally, what happens is, I set rules, but I tend to forget to monitor them over time. When I do not act upon some students breaking the rules, the validity of the rule is no longer there. But in this course, students are periodically reminded of the rules, to make sure that no one breaks them. They are made aware that adherence to rules is consistently monitored. However, the tutors have made enough room for flexibility – like allowing to go out for small periods if necessary, and allowing joining the other group for some workshops.
10. Prompt response. All the LAs and portfolio chapter submissions are marked on time, and emails are answered promptly. As a student, I see how valuable this is to a student – it shows that the student is the top priority of the lecturer.
11. Praising students for answering the tutor's questions, and for raising questions or pointing out mistakes in material. This encourages students to actively involve in the learning activities in the class. I believe that this helps achieving student needs at the Esteem level in Maslow's need hierarchy. This can also be considered as a kind of reinforcement, as discussed in behaviorist approach to learning (see Section 4.2.1).

Some of these aspects such as giving prompt response to students I also practice to a greater extent. However, being a student made me sit on the other side of the table, and made me realize how important these aspects are, to a student. This is a very important realization that motivates me to continue my good practices.

2.6 Seminar Presentations

Seminar presentations deserve a special discussion, as it was something that I really enjoyed. When I got to know that we have to do a presentation, I first thought that it was just for the tutor to measure our ability to deliver a lecture. However, when I was listening to the presentations, I realized that the intention of the presentations was to get the course participants to share their experience on how they changed their teaching. And I think I really benefitted from the seminar presentations. From my group mate Rumiza's pre-

sentation and the tutor's elaboration on it (i.e. how to use tell-show-do process to make students learn), I was able to identify why the students could not show the expected performance in one of the learning activities (section 5.4.3). Another interesting idea was the effective use of flip classes. Abharna, who did that presentation highlighted how she motivated the student to learn a subject that is very similar to what I teach. In fact, this subject is none other than OOP, which I used to execute my changes. I think this is a very good idea to try out in my OOP module next year.

I am happy with my participation in the seminar presentations. I got involved in discussions with many of the presenters, and I believe that the whole class benefitted from it. I am satisfied with the presentation I did. My presentation was on "How I Used Handouts During Lectures to Develop Learning Skills in Data Science Students". I must confess that "Surangika the researcher" was evident in my presentation as well. I am the only presenter that used exact statistics to evaluate the effectiveness of the implemented change. On the positive side, I believe that I managed to keep the interest of the class, by asking small closed questions during presentations, and an open question after the presentation. I got a good response from the class.

2.7 ILOs of CTHE- Did I Achieve them?

I must admit that since till the end of the CTHE course, I did not bother to identify the ILOs (Intended Learning Outcome) for CTHE, although they have been given in the handbook. However, while thinking about getting my students to achieve ILOs, it just crossed my mind "I have been a participant at CTHE for 7 months. Have I achieved the ILOs of the course?". Then, with the help of the tutor, I located the ILOs in the handbook. Despite not knowing the ILOs till the end, I am happy to see that I indeed have achieved many of the ILOs. Evidence for this is available in the rest of the portfolio chapters. One notable ILO that I still did not achieve is identify and operate effectively in administrative tasks. As further described in Section 7.2.1, I have already identified that I should engage in administrative tasks. However, I never took any action towards getting more engaged in the same, simply because I do not like it.

2.8 Challenges and Opportunities

Despite all the positive things I learned from the CTHE course, the journey was not a smooth one. I faced many challenges as those listed below, but I am proud to say that I either managed to overcome them, or managed to convert them into opportunities.

1. Having no friends from the same faculty or department – I was one of the two staff members from the Engineering Faculty of University of Moratuwa to participate in this course. The other colleague from Engineering Faculty I got to know very late. But many other participants had colleagues from their departments. Those from nearby faculties could always go back to their departments for lunch. First I wished that I had the same opportunity. But later I realized that not having to go out during the lunch time indeed can be used as an opportunity – I started going to SDC library after lunch, and referred to available portfolios to get an idea on how to write the portfolio.
2. Difficulty in understanding pedagogical theories and concepts, since I am from an Engineering and Mathematics background – Luckily, one of my group members is from the field of Education. She, as well as other team members helped me. Group discussions on concepts taught in the class were invaluable.
3. Time management – Usually, I dedicate Fridays for research meetings. Since I had to keep Friday vacant for CTHE course, well in advance I re-scheduled all my meetings to other dates. I also informed the reason for change to my colleagues and students, so that they knew it was unavoidable. With a heavy teaching and supervision load, and being a working mother of a small son, allocating time for the course seemed to be really challenging at the begining. However, I started to make maximum use of whatever time I had - Tea breaks of the workshops were used to organize my material, and lunch breaks were used either to use the library, to write LAs, or to quickly clean my office email backlog. I did the homework just after the workshop, while the memory of the teaching was still fresh. So less time had to be spent on homework. I analysed my calendar carefully, and when I was not having much teaching load, I spent more time on preparing LAs and portfolio chapters, so that I will not get overloaded later.

4. Feeling lost at the beginning of the course – Coming from an Engineering background, I found it extremely difficult to digest the content discussed in the first few workshops. When the tutor asked us to do some activity, my first question to my group was “what are we supposed to do now”, or “what did he just say?”. From the discussions, I realized that many other participants were going through the same experience. However, after learning about the Transition-Development-Achievement (TDA) model, I was not surprised about my initial experience at all. I was simply going through a transition phase. However, exactly as the TDA model describes, the development phase soon followed, and without me even knowing, I was in the achievement phase, receiving very positive feedback on my draft portfolio from my tutors.

Similarly, I found it difficult to start on the portfolio. Thus I was extensively referring to the portfolios available in the library. First I cross-checked against multiple portfolios to get an overview of the chapters to be included in the portfolio. Then, before writing each chapter, I dug deep into the content of each portfolio chapter.

2.9 Suggestions to SDC for Course Improvement

1. Elaborate more on LAs and SEDA outcomes/values on the first workshop and again in a later workshop after participants got familiarized with the course.
2. Give soft copies of handouts. Once I was planning to go abroad and wanted to take my CTHE handouts with me. However, I had to decide against that because it is cumbersome. So if we have the softcopies, we can work on our portfolios from anywhere we want, without having to remember to carry the handouts around.
3. Introduce a photocopy service at SDC. Since we cannot borrow books to take home, and since some of us are coming from different universities, it is useful if we can take photocopies of relevant pages of books.
4. Use Moodle for communication. At University of Moratuwa, we completely rely on Moodle to a great extent, and I find it very effective.
5. As discussed above, I was lost at the very beginning of the course. This of course is explainable using the TDA model. However, the problem is, most of the important

concepts such as constructive alignment, and Blooms and SOLO taxonomies are covered in the very first workshop, and we miss most of this important content discussed by the tutor. Thus, I suggest that topics that are more familiar to us (such as assessment, effective presentations) should be discussed in the first few workshops, and later move onto the novel topics when we are in the development stage. Starting the lecture with a topic familiar to participants is a strategy proposed in the 5E model as well (see Section 3.2.4).

2.10 Summary

Reflecting back, I am very surprised to see how my perception on the CTHE course got transformed from seeing it as something forced upon me that put an unnecessary challenge on me, to seeing it as something that is a great opportunity to improve my teaching. I started this course with the intention of merely getting through it, but after seeing the portfolios put out for reference in the library, I have set up a goal to make my portfolio a part of the reference collection, by getting the SEDA accreditation. On the first day of the course, I could not even imagine how I could write even one LA. However, even before half-way through the course, I have managed to produce 18 LAs.

Being a student after more than 10 years was really challenging and interesting. Being a student made me more empathetic towards my own students.

As someone who firmly believes that everything happens for good, now I am happy that my university did not grant me an exemption to the induction training course. And finally, I would like to thank the CTHE course, first for showing me that no matter how good we think we are, we will always have room to improve, and also making sure that I did improve myself, as well as my teaching.

Chapter 3

Planning to Teach

3.1 Introduction and Chapter Outcomes

The outcome of this chapter is an analytical discussion of how I changed my course planning and delivery, mainly to support constructive alignment. All the changes described here are implemented on the undergraduate module “Principles of Object Oriented Programming” (CS2012). As described in Section 1.10, this module is one of the modules that I performed the worst during my undergraduate studies. Therefore I believe that I have a great responsibility in making sure that my students do not get any bad learning experience for this module. Thus I am happy that I could use this module to run my teaching/learning improvement experiments.

At the end of the chapter, the reader should be able to

- Analyse a syllabus and judge how much it supports constructive alignment
- Develop lesson plans in order to support constructive alignment

3.2 Theoretical Foundations

3.2.1 Constructive Alignment

Constructive alignment is a principle that can be used to systematically align teaching and learning activities, as well as assessment tasks in such a way that they directly address the intended learning outcomes (ILOs) (Biggs & Tang, 2007, p. 50) .

As the name implies, constructive alignment is based on two principles: constructivism in learning and alignment in the design of teaching and assessment. Here, learners themselves construct their knowledge through learning activities. The learning activities are specified by the ILOs in the form of verbs (further described in next section). When the learning activities are mandated by the ILOs, these activities naturally get aligned with the ILOs. In other words, if a certain ILO is to be achieved, the students should have carried out the corresponding learning activities. Aligning assessment with ILOs means that assessment should be set up in such a way that it verifies that students have actually achieved the outcomes.

In this context, the teacher mainly plays the role of a facilitator, in setting up a learning environment that encourages students in carrying out the learning activities. He is also responsible for setting up and carrying out the assessment.

As emphasized by Biggs and Tang (2007, p. 52) as well, I see that constructive alignment principle brings about a very important paradigm shift: rather than focusing on what topics to deliver, with constructive alignment, teachers are forced to focus on what and how students learn. If practiced properly, I think it will help teachers to stop worrying about “how to cover the syllabus”.

Biggs and Tang (2007, p. 54) describe four stages in course design under constructive alignment.

1. Describe the intended learning outcome in the form of a verb (learning activity), its object (the content) and specify the context and a standard the students are to attain.
2. Create a learning environment using teaching/learning activities that addressed that verb and therefore are likely to bring about the intended outcome.
3. Use assessment tasks that also contain that verb, thus enabling to judge with the help of rubrics if and how well students' performances meet the criteria.
4. Transform these judgments into standard grading criteria.

3.2.2 Intended Learning Outcomes (ILOs)

An ILO is a “statement describing what and how a student is expected to learn after exposure to teaching” (Biggs & Tang, 2007, p. 64). ILOs can be defined at three different

levels: institutional level, program level, and course level. In this portfolio, I only focus on course level ILOs. As the name implies, ILOs focus on student-centered learning rather than teacher-entered teaching. Thus, ILOs define what the student is able to perform at the end of teaching that could not be performed previously.

A student being able to ‘perform’ certain things, as described above, indicates that the student should be able to ‘carry out’ certain activities. In other words, what the student can ‘perform’ can be described in the form of verbs, and this is exactly what ILOs do. However, the grand questions remain: what are the verbs that we are going to use in our ILOs?, and can we define a hierarchy for these verbs in such a way that they refer to different levels of cognitive abilities of a student?

Moreover, we should be able to define a level of understanding of the student as a result of teaching and learning. Similar questions remain: ‘what’ are the different levels of understanding that we can expect from a student?

What the student should be able to perform, and the level of understanding to be expected from him, depends on the year level, and the subject matter. Despite this, two widely used taxonomies, Bloom’s taxonomy (Krathwohl, 2002) and SOLO (Structure of the Observed Learning Outcome) taxonomy (Biggs & Tang, 2007, p. 80) are available to define the levels of student performance and the level of a student’s understanding, respectively.

SOLO Taxonomy

SOLO Taxonomy is a general framework that helps teachers to structure levels of understanding according to the student’s year level, and the subject. SOLO Taxonomy captures the phenomena that as students learn, outcomes of their learning display stages of structural complexity. This increase is both quantitative and qualitative. Figure 3.1 shows the SOLO taxonomy. Here, the pre-structural stage refers to student completely missing what she is supposed to learn. In uni-structural stage, the student is able to understand only part of the many different concepts. A student in multi-structural stage is able to understand many different concepts, and when she is in the relational stage, she is able to make relations between the different components she learned. Finally, at the extended abstract stage, she is able to derive her own generalizations of the components and relations that she derived.

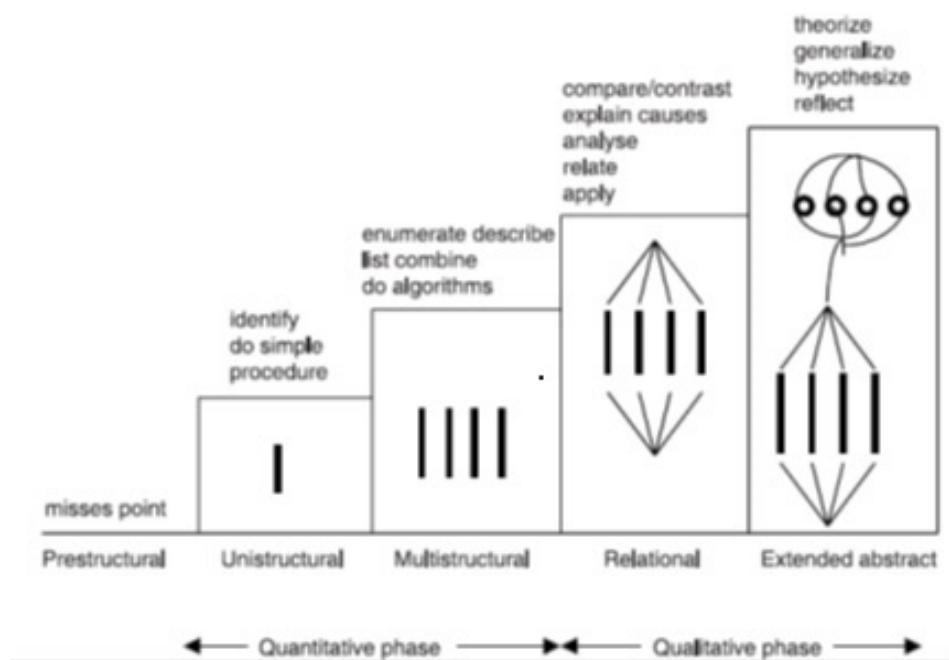


Figure 3.1: SOLO Taxonomy (source: (Biggs & Tang, 2007, p. 80))

What is important to understand here is that this increase in understanding is gradual – each level contains everything from the lower level, plus something more in addition. Moreover, when we go along from pre-structural to multi-structural, we see an increase in quantity – the student understands more and more individual components. However, at relational phase, the student tries to structure the components by deriving relationships between them. After that what occurs is a generalization of the structure she derived. Thus the latter two phases can be considered as qualitative, and in ILOs the main focus should be to these latter two phases. In order to define what the student should perform in order to get a particular level of understanding, SOLO taxonomy defines a set of verbs for each stage (except for pre-structural stage).

Bloom's Taxonomy

An alternative set of verbs is provided by the Bloom's Taxonomy. This taxonomy has more verbs than what the SOLO taxonomy contains, which can be applied for a wider range of learning activities (Biggs & Tang, 2007, p. 80). It refers to the types of thinking required in completing tasks or answering questions. These types can be broadly categorized into Lower Order Thinking Skills (LOTS), which contain know and understand (comprehension), and Higher Order thinking Skills (HOTS), which contain apply,

analyse, synthesise, and evaluate.

In most cases, verbs provided in relation to SOLO taxonomy can be interchanged with verbs in the Bloom's taxonomy. However, Biggs and Tang (2007, p. 80) argue that having a thinking skill such as 'understanding' could lead to ambiguity. In my opinion, SOLO taxonomy provides a much broader framework to construct ILOs and align teaching/learning and assessment accordingly. This is because it focuses on student's levels of learning (the end). This in fact is what should be measured rather than the student's levels of thinking, which is just a means to the end.

3.2.3 The 3P Model

In Biggs' 3P model of teaching and learning (Wiki, 2017), the 3Ps relate to: Presage as the learning characteristics existing prior to the learning engagement; Process as the student learning experiences, and Product as the overall student learning outcomes.

To elaborate further, presage refers not only to the prior knowledge that students may have, but also their expectations and behavior. Teacher also has a presage state, which refers to her competence, curriculum, classroom climate, assessment practices, etc. The process state refers to how individual students carry out learning activities, and finally product stage describes how students achieve the low- and high-level cognitive outcomes (I believe that these outcomes can, and should refer to ILOs).

According to the 3P model shown in Figure 3.2, there is a strong relationship between the student/teacher presage stage and the process stage. In turn, there is a strong relationship between the process and the product stages. In addition, the presage stage has an impact on the product as well. For example, if the student followed the course with a pre-conception that that particular module is difficult, she might end up achieving only the basic level of ILOs. Looking back at the time I was a student, I also have first-hand experience on this. As described in Section 1.4, I started to follow the Physical Science stream for my A/L with the pre-conception that Mathematics is difficult. As a result, I did find that Mathematics is difficult. There is a similar experience from my undergraduate level as well. All Computer Science students had to follow a module named "Signals and Systems" offered by a different department. For some reason, this module was mandatory, and no one was sure why. And the common understanding among the students was that no matter how hard we study, you get very low results for this module. So no surprisingly,

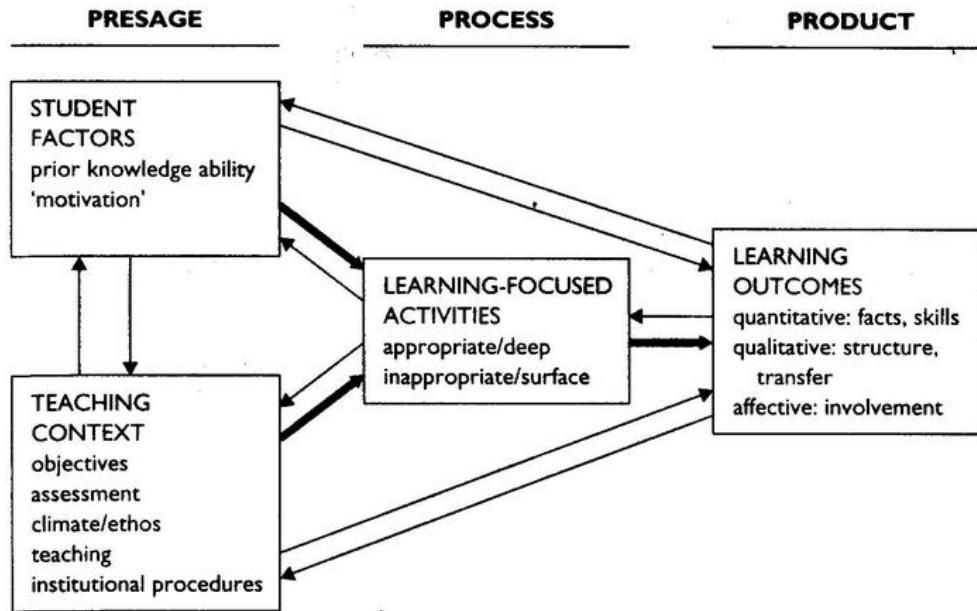


Figure 3.2: 3P Model (source: Wiki (2017))

I ended up getting a B- for this module, and so did many of my colleagues.

The 3P model provides a mechanism for students and teachers to reflect back to identify the changes that might have to be made to achieve the desirable learning outcomes. For example, when the teacher understands that many students have not achieved the ILOs, the teacher may decide to change the curriculum, and as a consequence, the learning activities the students have to carry out during process stage might also change.

I believe that the 3P model can be applied on a lecture basis as well. For example, based on the student's experience on the lectures already held for the particular module, she comes to the next lecture with a certain level of knowledge, and expectations. And if she could not perform well in (say) an in-class quiz, it would provide her some feedback on what she should be changing at the process stage, in the coming lectures. Student feedback received for my implemented change on giving mid-semester examination answer scripts to students provides a nice example for this (See section 5.4.2). There, the students commented that they believe that knowing the mistakes that they made in the mid-semester examination would help them to better prepare for the final examination.

3.2.4 The BSCS 5E Model

The BSCS 5E Model (Bybee et al., 2006), which is commonly known as the 5E model, can be used to frame the sequence and organization of programs, units, and lessons. Originally designed for the Biological Sciences and Curriculum Study (BSCS), the 5E model was initially targeting courses in Science stream.

The 5E model, as the name implies, has 5 phases: engagement, exploration, explanation, elaboration, and evaluation.

- Engagement: The teacher assesses the students' prior knowledge and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge.
- Exploration: This phase provides students with a common base of activities within which current concepts (i.e., misconceptions), processes, and skills are identified and conceptual change is facilitated.
- Explanation: This phase gets students' attention on a particular aspect of their engagement and exploration experiences, and provides opportunities to demonstrate their conceptual understanding, process skills, or behaviors.
- Elaboration: Teacher challenges and extends students' conceptual understanding and skills. Through new experiences, the students develop deeper and broader understanding, more information, and adequate skills. Students apply their understanding of the concept by conducting additional activities.
- Evaluation: This phase encourages students to assess their understanding and abilities, and provides opportunities for teachers to evaluate student progress towards achieving the educational objectives.

In my opinion, the 5E model addresses a different problem than what SOLO taxonomy is addressing. As described in previous section, SOLO taxonomy provides means for deciding what activities (verbs) students should carry out in order to achieve the ILOs. The 5E model provides means for the teacher to organize these activities as well as her teaching in such a way that students achieve higher levels of understanding.

3.2.5 TDA Model

Transition-Development-Achievement (TDA) model (Taylor, 2008) (see Figure 3.3) has been proposed as a guideline to design assessment for first year university students. However, I believe that this model carries a much general notion that can be used to describe the stages a student goes through while learning one module as well. Most of the time, the concepts in the new module are new to the students. So they are juggling with the information thrown at them. Once they are comfortable with the basic concepts related to the module, they are in the development stage, where they seek more knowledge. Finally, the students are in the achievement stage, where they have achieved most of the ILOs. Consequently, assessments conducted in the first phase should have a lower weight than that of the second phase, and assessment conducted in the second phase should have a lower weight than that of the third phase. Assessment in the first phase should be more towards formative, and continuous feedback should be provided to students to move them to the development stage.

As described in Section 2.8, I also had the personal experience in going through these three stages while at CTHE. Moreover, the assessment done at CTHE adheres to the TDA model – in the first few weeks (transition phase), we have to submit LAs, and they were assessed and feedback was given in the following workshop. Then (development phase), we submitted our draft portfolio chapters and we were given feedback. Finally, after completing all the workshops (achievement), we have to submit the portfolio.

3.3 Analysing the Curriculum for CS2012 – Principles of Object Oriented Programming

As mentioned in Section 1.10, soon after I joined the CSE department, I was handed over two undergraduate course modules to teach. One was CS2012, which was commonly referred to as OOP. This course has been already developed by a ‘senior’ senior lecturer. During that time, the Faculty of Engineering requested the subject coordinators to convert their course syllabi into ‘Outcome Based’ syllabus. There had been some workshops to educate the lecturers regarding that, but that was before I joined. However, this senior lecturer got me involved in this syllabus revision process. However, I must confess that I

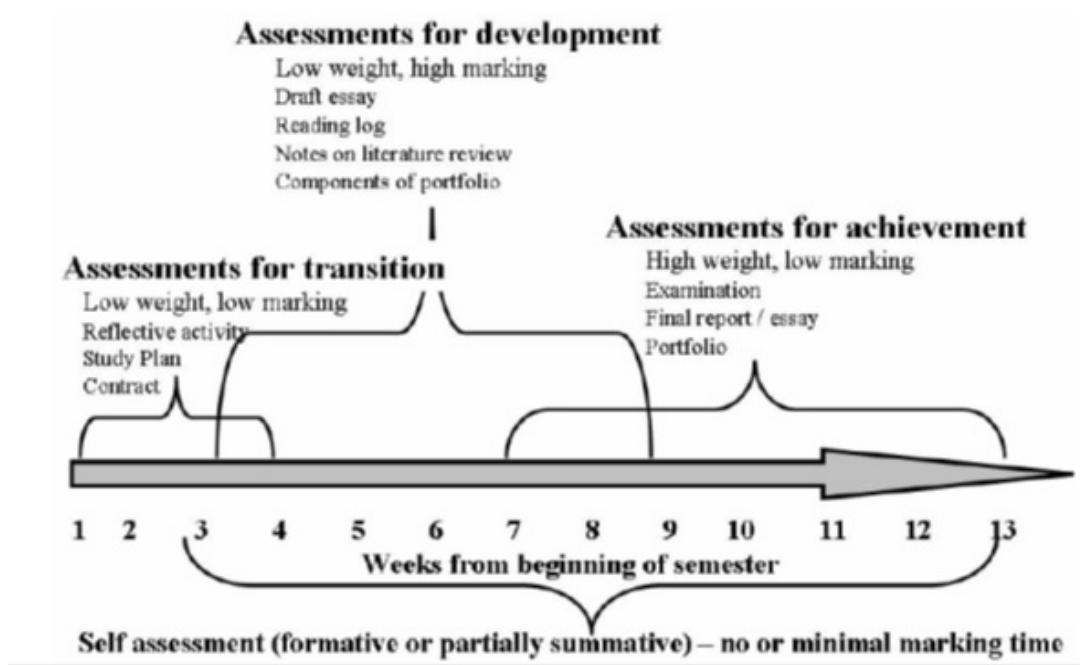


Figure 3.3: TDA Model (source: (Taylor, 2008))

was just an observer throughout the whole process. Now when I think about it, I am not at all surprised! I knew nothing that I know now. Therefore, with the new knowledge I gained through the CTHE course, I think it is the best time to re-visit the curriculum for CS2012, and provide my analysis on whether it is designed in such a way that it facilitates constructive alignment.

Both the old syllabus and the outcome based syllabus of CS2012 are given in the appendix A.1, and A.2, respectively. As can be seen, the old syllabus lacks any touch of constructive alignment. It does have some ILOs, 3 ILOs to be precise. However, they are more or less referring to the same skill. For example, the first ILO requires the student to decompose a system into objects, and the second ILO requires the student to compose a system using objects. So they are more or less like two sides of the same coin. And the final ILO is redundant – if a system is designed using the OOP principles as suggested by the second ILO, it automatically preserves maintainability and correctness.

The syllabus is just a list-down of the topics to be covered in the lectures. There is no direct alignment between the ILOs and the list of topics. For example, if we try to align the third ILO to the third topic “Object-oriented application development”, there the sub-topic “stream-based I/O and object serialization” has nothing to do with maintainability and correctness of an OO program. Stream-based I/O simply means how you

save/retrieve data to and from the persistent storage. It is not a technique/principle to guarantee maintainability and correctness of an OO program. The main problem is, the syllabus tries to cover too many topics, and some of them are not fundamental to OOP. Finally, this syllabus mentions nothing about assessment! Thus it is evident that the third component of constructive alignment is not even present in this old syllabus.

In contrast, the new syllabus exhibits constructive alignment. As can be seen, it has well-defined, distinct ILOs. According to Biggs and Tang (2007, p. 71), the number of ILOs per a course should be around 5, so the number of ILOs in the new syllabus is just right. It addresses four HOTS that a student should have: how to analyse a real-world scenario and represent it in the form of objects, how these objects should be programmed to communicate using the OOP principles (abstraction, inheritance, polymorphism, and encapsulation), how concurrency support should be programmed, and how to program objects to asynchronously communicate.

The topics are nicely aligned with the ILOs. Even just a quick match of key words in ILOs and topics confirms this. The topics elaborate more on what is needed to be taught/learned in order to achieve the corresponding ILOs. One notable difference between the old and new syllabi is that the latter has a less number of topics to cover. In contrast, the latter goes deeper into the selected set of topics, as each topic is covered in more number of weeks.

The new syllabus also describes the practical work – the learning activities the students should carry out to achieve the ILO. Here, in the practicals, students will complete different parts of a single individual semester project, and will demonstrate it at the mid-semester and end-of-semester evaluations. However, I see that there is some misalignment here. For example, there are practicals for Graphical User Interface (GUI) and persistent storage access. However, there are no ILOs related to these. The first practical is on “Introduction to object oriented programming, and familiarize with necessary software tools”. This also appears as not aligned with the ILOs. However, familiarizing with necessary software tools can be considered as changing the presage stage- without students knowing how to use the software tools to program, the rest of the practicals cannot be carried out. Therefore it is important that we have this practical. In fact, as described in Section 3.4.2, I converted this practical to a workshop.

The assessment components also focus on assessing whether the student has achieved

the ILOs. Quiz for ILO 1 and 2 is ideal, since it can give a scenario and ask students to decompose into objects and design the program using OOP principles. The demonstration of the project can be used to assess whether the student has applied OOP principles, concurrency control mechanisms, and event handling mechanisms in her programs. In addition, a report should be provided in relation to the last two ILOs. It is worth noting that all the ILOs are tested in at least two different assessments. However, one issue I now notice is that there is no assessment component allocated to the mid-semester project evaluation, although this is mentioned in the practicals.

3.4 Planning and Managing Course Delivery

3.4.1 Getting Ready to Teach CS2012 to the New Batch

Pre-CTHE Practice

Because of the tight work schedule I have, at the beginning of each semester, I simply use the previous year's syllabus and teaching/learning activities when I start teaching for the new batch. However, as mentioned in Section 1.13, each batch brings new challenges. Therefore it is important that I reflect on my teaching for the previous batch, and plan the course delivery to the new batch accordingly.

Objectives and Outcomes

The objectives of this change are:

1. To better align the weekly plan of this module with that of its parallel module Principles of Embedded Systems Programming.
2. To incorporate the experience gained and lessons learned from previous year's teaching to improve the course delivery for the new batch.
3. To prepare the weekly delivery plan for the course, and prepare the junior lecturer for the course.

The outcomes of this change are

1. A course delivery plan that exhibits better constructive alignment.

2. A better alignment between the two modules Principles of Embedded Systems Programming, and Principles of Object Oriented Programming.

Related LA: 16 (Appendix J.16)

Rationale

There are many reasons for implementing this change.

Now in my department, in addition to the Computer Science track (where I am teaching), there is an Integrated Computer Engineering (ICE) track. Parallel to OOP, a subject called Principles of Embedded Systems Programming is taught to ICE students. The senior lecturer who taught OOP before me is teaching this module to ICE students now. The core concepts in the two modules have a major overlap, however, especially in practicals, there are some differences, such as in the programming environments used. So it is very important that the delivery of the two courses is aligned as much as possible, to avoid students comparing the two courses.

During the CTHE course, I learned the value of reflective practice. Although I did not know about it when I taught CS2012 last year to record my experiences, I do have the student feedback on my teaching. If I analysed it, I would be able to get the student's perspective of what worked and what did not work for them.

Before the start of the new semester this time, the Faculty of Engineering requested all the subject coordinators to submit the ILO format syllabus and the weekly delivery plan to the undergraduate division.

The junior lecturer who was involved in teaching this course for the past two years resigned, so I was assigned a new lecturer. She just joined the department, and is very new to teaching. So familiarizing her with the subject, and assign her some duties based on the weekly delivery plan is also very important to the flow of the course delivery.

A look into the related literature also suggests that course planning is an important faculty role (Stark, 2000). Thus while focusing on improving the teacher's role as "classroom actor", she should also focus on being an effective "academic planner".

Process

First, as described in Section 3.3, I analysed the syllabus that was used for teaching the previous batch. Then I analysed the student feedback received from the previous batch.

Then I slightly modified the syllabus and prepared the weekly plan with the junior lecturer. Finally, I discussed my weekly delivery plan with the senior lecturer who is teaching the Principles of Embedded Systems Design.

Observations

As already discussed in Section 3.3, I have identified few issues in the current syllabus:

1. There are practicals for Graphical User Interface (GUI) and persistent storage access, which are not aligned with ILOs.
2. There is no assessment component corresponding to the mid-semester project evaluation that is mentioned in the practicals.

I made the following observations while going through student comments (I only discuss points worth noting):

1. The additional tutorial class (that focused on problem-centered learning activities) was very useful to students.
2. Having GUI design in the semester project distracted students from practicing with the fundamental OOP concepts. (As discussed above, analysis on the current syllabus also revealed that GUI programming is not related to ILOs).
3. Some students struggled at the beginning, because they do not know Java (the language used for OO programming).
4. Last two topics (concurrency and event handling) should be elaborated more.
5. Doing in-class coding and design exercises is very good, but more in-class exercises should be done.
6. Some coding activity on top of the project should be given for students to practice the fundamentals.
7. Practical were not very effective since there was no submission due after each practical other than the mid-semester and end-of-semester project submissions.
8. Having the final project evaluation after the final examination helped students to put more effort on completing the project.

9. Lecture notes should have more details.

Decisions Made

I took the following decisions:

1. Continue to do the additional tutorial classes if a free time slot can be found in the time table.
2. Remove practicals related GUI and persistent storage access and give more time to practice the core concepts. These two practicals do not align with the ILOs, and students reported GUI programming distracted them from learning the core concepts.
3. Conduct a Java workshop at the beginning, to support students who are struggling with learning Java.
4. Discuss more practical examples, especially for the last two topics.
5. Plan lessons in such a way that more in-class exercises are discussed.
6. In addition to the practical work, give an optional small coding activity as homework.
7. Get students to submit the code after each practical, and assess the code. Then in the next lecture, elaborate more on the previous topics that students are struggling with.
8. Add 15% of marks to the mid-project evaluation.
9. Continue to evaluate the semester project after the final examination.

However, I decided not to add too much details into the lecture sides, despite some students requesting that. As described further in Section 4.6.6, when students are given all the content in the hand outs, this could de-motivate them from coming to lectures.

After the discussion with the junior lecturer, we decided that she should attend the first set of lectures conducted by me. This would help her to get an idea of how the module is taught, and she could help in the problem-based in-class activities. Then we prepared the initial weekly delivery plan and she was assigned to teach the very last topic, which is the

easiest of all the topics. The weekly delivery plan is in accordance with the list of topics and time allocation in the syllabus.

Then I discussed this delivery plan with the other lecturer teaching the parallel subject. In previous years, he has also used Java as the programming language for the course, but this time he has decided to move to C language. However, I believe that for my module, Java is the best option. So I decided to stick with Java.

Since these two modules are optional, students should be able to come to lectures and practicals of both the subjects before deciding on which subject to select. However, lecture and practical slots for the two subjects are just the same. To make matters worse, the first Monday morning lecture cannot be held due to the orientation program happening at that time. Therefore we agreed that we take two 1.5hr lectures during the first Monday and Wednesday practical slots (The CS2012 batch is much large than that of the parallel module. The former gets about 110, and the latter about 20. So the CS2012 practicals are broken down into two and they have practicals on two different dates. This has been the standard practice for many years) to give an overview of the two subjects to the students. This would help them to decide on which subject to take.

When I informed the other senior lecturer that I am planning to have a Java workshop, he also agreed that it is a very good idea. He also decided to have a C workshop. Again, since these workshops were to be carried out in the first week of the semester, we had to allow all students to come to both workshops. Luckily, in the first week of the semester, there are no practicals for other subjects. Thus, Friday morning 4 hours were taken for the workshops. Both C and Java workshops ran in parallel (more information about workshops can be found in Section 3.4.2), but each workshop had two sessions, where the same content was repeated in both sessions. The batch was divided into two. First half went to Java workshop and second half went to C workshop, during the first session. Then for the next session, they had to go to the other workshop.

The modified syllabus is given in Appendix A.3, and the prepared weekly delivery plan is given in Appendix C.1.

Analysis

This change demonstrates the value of student feedback. A very good example is the GUI implementation part that was part of the practicals. This was out of the ILOs, and

students complained that it distracts them from learning the core concepts, i.e. achieving the ILOs.

Also, I believe that this change also demonstrates the reflective practice, although I did not specifically maintain any log last year. Looking at student feedback helped me recall many issues I faced last year, and this year I have planned to take many initiatives to overcome those.

3.4.2 Conducting a JAVA Workshop – Modifying P2 Stage in 3P Model to Address P1 Stage

Pre-CTHE Practice

CS2012 subject is focused on teaching the fundamental concepts of OOP. However, for students to practice OOP, they need to write computer programs using an OO programming language. Currently, we recommend students use Java for this. However, the basic Java programming (e.g. how to define variables, data structures, control loops, etc) is not taught due to lack of time, and students are expected to learn these by themselves.

Objectives and Outcomes

The objective of this change is to introduce a Java workshop for students before the semester project, so that every student will have at least the basic familiarization with Java.

The outcome of this change is all the students having the basic Java knowledge to develop Java programs with Object Oriented programming principles.

Related LA: 18 (Appendix J.18)

Rationale

With the availability of online tutorials and private IT institutions, some students, by the time they come to university, have learned Java. Some students enthusiastic in computer-related work even do programming as a hobby. However, less privileged students who have no access to personal computers or the Internet do not get this opportunity. And this is the much larger group.

Therefore, there is a huge discrepancy among the Java knowledge of students who come to follow this course. Since most of the students do not know Java, they find it difficult to do OO programming, in order to practice applying the fundamental OOP concepts. This was highlighted in student feedback as well (see section 6.3.4). Thus, conducting a Java bridging workshop will help those with a low Java proficiency. This type of bridging courses are common for subjects such as Mathematics (Gordon & Nicholas, 2013)

Process

There are many online Java tutorials. Among those, the tutorial provided by tutorials point (<https://www.tutorialspoint.com/java/>) is highly regarded among the programming community. Therefore I asked my junior lecturer to refer to this and prepare a tutorial for the workshop. I checked this workshop tutorial and instructed the junior lecturer to do certain modifications. The students have learned basic programming concepts (variables, control loops, etc) in their semester 1 using a different programming language (Python). Therefore the idea of this workshop is to teach students how to program these concepts in Java.

Although I wanted to run a 6-hour workshop, due to many problems (as discussed in Section 3.4.1), I had to plan only for a 2-hour workshop. The junior lecturer conducted the workshop. Two teaching assistants (TAs) assisted students during the workshop. I had a brief meeting with the junior lecturer and the two TAs, and explained about the workshop. After the workshop also I had a brief meeting with them.

Observations

According to the TAs, about 90% of the students did not know Java. However, they were very keen to learn. However, there had been some students who wanted the TAs to trouble shoot their program to catch the errors in the code.

Another important thing they noticed was the knowledge difference between those who know Java and those who do not. Those who know Java finished the workshop earlier than the rest. This is a challenge I have to face throughout the course – how to make sure the weak students learn, while not making the good students bored. I guess this is a common problem when teaching any subject, however it is more prominent in CS2012 since some students are already ahead of others knowledge-wise.

Student Feedback on the Change

Questionnaire 3.1 was given to students. Figure 3.4 shows a sample student feedback form.

Questionnaire 3.1: Java workshop

1. Did you find the Java bridging workshop useful? yes, to a greater extent/ yes, to some extent/ not at all

2. Will you recommend having this workshop for your junior batch, next year?
Yes, definitely/ Maybe/No

3. Please write down any feedback you have on the workshop

89 students handed over the filled feedback forms. Except for 6 (6.7%) students, all the students thought the workshop was useful, at least to some extent. I looked into the comments written by one of these students who thought the workshop was not useful, and the reason for his response was evident. She already knew Java, so a beginner's workshop was not useful for him. 87 out of 89 (98%) students recommended (80 (90% definitely recommended) the workshop to be held for the next batch. Those who have not recommended the workshop have not given any comments for the third question, therefore it is not possible to determine the reason for this feedback.

This result is not what I quite expected – the majority of the students found that the workshop was useful only to some extent, although I expected they would find it very useful. Therefore I analysed the student comments given to question 3. It revealed that some students found that the course was too advanced for a beginner, and some said it was too fast. Again, this highlights the problem I face in teaching this course –there is a considerable knowledge difference between the students at the presage stage. While some students did not find the workshop useful because they already have the required knowledge, some found it too advanced. Therefore it is difficult to design a course delivery that caters to all levels of knowledge groups. Some students have complained that certain fundamentals were not elaborated enough, while some other requested to have a full-day workshop, as the time was not enough to cover all the fundamentals. Some complained that individual attention given to each student is not enough, since we had three TAs per session. However, TAs complained (see above) that some students expect them to find the

1. Did you find the Java bridging workshop useful? Yes, to a greater extent/ Yes, to some extent/ Not at all
2. Will you recommend having this workshop for your junior batch, next year? Yes, definitely/may be/ No
3. Please write down any feedback you have on the workshop

*I think this workshop gets more successful in next time, if you can do this for more time period ~~and~~ with more explanations.
But this is excellent idea to remember ^{me} java again.*

Figure 3.4: A sample student feedback form for Java workshop

errors in their program, which was not something the instructor was supposed to do.

Also I noticed that some student responses were contradictory. For example, some students said that they found the workshop useful to some extent, but they say that the workshop should definitely be held for the next batch as well. Since some of these students have not provided any comments for the question 3, it was not possible to determine the reason behind their responses.

Lessons learned

Two hours is definitely not enough to cover the Java fundamentals. Also at the beginning, more TAs should have been employed for the workshop to give more support for the students.

Not having a question in the questionnaire to measure the initial Java knowledge level of students was a mistake.

Decisions Made

1. Should include a question in the questionnaire to measure the initial Java knowledge of the students was a mistake.
2. Given that students benefited from the workshop at least to a certain extent, I will hold the same for the next batch. Moreover, I should give a try to organize a longer workshop. May be the workshop could be run on a weekend. However, these decision have to be taken when the new batch is about to come.

3. Depending on the availability of TAs, should try to employ more TAs for the workshop.
4. Refer to the course hand book of semester 1 Python programming fundamentals course (which has been designed for beginners), and re-structure the Java workshop accordingly.

Analysis

This change is a perfect demonstration of considering the 3P model in teaching – I tried to change the P1 stage to support P2 stage. It is important that we try to get all the students into the same basic knowledge level, otherwise some students might find it difficult to catch up.

Again, I want to highlight that with respect to this subject, there is a clear difference of knowledge levels of students at the P1 stage.

Finally, this change demonstrated that careful attention should be paid when designing questionnaire, otherwise analyzing student responses might be difficult.

3.4.3 Getting the Maximum from Teaching Assistants (TAs)

Pre-CTHE Practice

I add the practical instructions to Moodle each week, and the instructors are supposed to give Java-related help to students. I do not meet them weekly to get their feedback on the conducted practical, or to give them specific instructions for the upcoming practicals.

Objectives and Outcomes

The objective of this change is to be able to issue specific instructions to TAs on how they should support students in a given practical, and the intended outcomes of the practical by considering their views too. The other objective is to identify specific issues the TAs and the students face during a practical.

The outcome of this change is a better learning experience for the students during the practicals, which would better help them achieve the module ILOs.

Related LA: 12 (Appendix J.12)

Rationale

As described in Section 3.4.1, some students have complained that practicals of CS2012 were not effective. I also feel that practicals were conducted in an ad-hoc manner, and the TAs were not properly prepared for practicals. On the other hand, making the TAs aware of the ILOs and how practicals are used to achieve them, and showing them by example how student feedback and our own experience are taken into consideration in the form of reflective practice, I can help them grow as academics. As academics, it is our duty to prepare and nurture the next generation of university teachers (Nyquist & Wulff, 1996).

Process

For CS2012, 4 TAs and the junior lecturer are used – 2 TAs will support each lab, and the junior lecturer coordinates the practicals. These TAs are my MSc students. They all have industry experience – they all have programmed in Java, so they are experts in Java. So is my junior lecturer. My plan is to hold weekly meetings with the TAs before each practical. I held the first meeting to give them instructions on how to help in the Java workshop. I instructed them not to simply give the answers to students, but to help them to figure out the answer themselves. I also shared the workshop material with them in advance, for them to prepare for the workshop.

On the second meeting, I asked for their experience with the workshop, and gave instructions about the next practical, which starts the semester project. Also I shared the project and practical descriptions with them in advance, so that they can be well prepared for the practical. I specifically instructed them that they should not help the students to write the program for the semester project. Their duty is to help the students with Java and OOP fundamentals.

From the third lab onwards, I divided the students into groups, and assigned each group to one of the TAs. The TAs should informally assess the student submission to each practical, to make sure that the students have achieved the ILOs. Each TA is assessing the same set of students each week, so they can easily monitor how individual students learn and how their levels of understanding improved over time. This guarantees that each student gets individual attention, and we being able to pinpoint students who are struggling. More on this change is discussed in section 5.4.4.

Observations

The TAs reported that some students are expecting them to simply give the answer, or find the error in their programs. Some were even trying to exploit the TAs, by getting help from different TAs at different times. They also reported that most of the students did not know Java, but they were eager to learn. Another observation was that students are not following standard coding practices.

One important feedback I received from a TA was that few students are complaining that they do not want to do Computer Science and Engineering, but they are forced by their parents since they had a very high GPA (Grade Point Average) in the first semester. I was completely taken aback by this information! This is a serious concern, which should be immediately addressed.

Lessons learned

I should have informed the students that TAs are just there to help, but not to solve all their Java programming issues.

Coding practices should have been covered in the Java workshop.

Decisions Made

During the TA meeting we decided that students assigned to each TA should sit together, so that the same TA would assist them throughout. This would make it difficult to reach to different TAs and get more support than they should ask for.

Also I shared a coding convention document, and instructed the TAs point students to that document when they notice non-standard programming practices.

I informed the Head of the Department (HoD) regarding the issue with students who were forced to do CSE. The HoD also informed the undergraduate division. However, the undergraduate division informed that students cannot change their field now. Therefore we decided that we should talk to these students and show the positive side of CSE. I raised this concern with other colleagues as well, via an email communication (see Appendix G.5).

Analysis

I believe that as a senior lecturer in the department, I am giving an opportunity for my junior lecturer and TAs to grow into better academics. In particular, the junior lecturer gets the responsibility to coordinate and run the practicals, which is a very good learning experience for her. Students are more opened to TAs than to senior lecturers. I think that is why some students shared their grievances with the TAs.

The TA reporting about students forced to do CSE is the best example to show the importance of this change. Had I not called up the TA meeting and asked for their experience in the previous workshop, I (and the department) would have never heard of this situation. Consequently, these students would continue to live in misery without any advice from senior staff.

3.4.4 Discuss ILOs in the First Class

Pre-CTHE Practice

When I start teaching a new batch, I do not present the ILOs to the class, because I thought that students will not be able to understand them.

Objectives and Outcomes

The objective of this change is to make the students aware of what they should be able to ‘perform’ (the learning outcomes they should have achieved) at the end of the course. The intended outcome of this change is students identifying the learning outcomes they should achieve at the end of the course.

Related LA: 13 (Appendix J.13)

Rationale

I believe that this is a very fundamental requirement to enable constructive alignment in our courses. According to Biggs and Tang (2007, p. 52), in constructive alignment, we should be able to define the ILOs the students should achieve, in the form of verbs that they can perform. If a student is made aware that she is supposed to achieve a certain ILO, she will carry out suitable learning activities. When presented ILOs at the beginning of the course, students will be able to get a clear idea of what is expected from them,

and the interconnection between different ILOs. In other words, students will see the purpose of the learning activities that are carried out in the class, and would appreciate their usefulness and benefit.

Process

Explaining ILOs to students, in my opinion, is a chicken-and-egg problem. They might not be able to understand ILOs if they do not know anything about the subject. On the other hand, for the students to know what they are supposed to learn, it is important that they know the ILOs for the module. Therefore I explained the ILOs at the end of the first lecture. In this lecture, the main purpose was to introduce the OOP paradigm shift to students, and highlight the difference between the two parallel subjects. So I added visually appealing slides that explain the ILOs, and how teaching and assessment are aligned with the ILOs. As can be seen Figure 3.5, I tried to use very simple title names. I informed the students that this information can be found in the CS2012 syllabus that I have uploaded to Moodle.

Student Feedback on the Change

In the beginning of the next lecture, I distributed Questionnaire 3.2 and checked whether students remember anything about the ILOs that were discussed in the previous lecture.

Questionnaire 3.2: Discussing ILOs

1. Were the learning outcomes for this course discussed in the previous lecture?
2. Did you refer to the syllabus in Moodle to get more information about the learning outcomes?
3. How many major learning outcomes are there for this course?
4. Write down the learning outcomes that you remember (at least the key words).

In total, 124 students (the first two lectures were attended by students from both CSE and ICE streams) submitted their answers to the questionnaire. A sample student response is shown in Figure 3.6. Many students have not answered the question 4. So I replaced

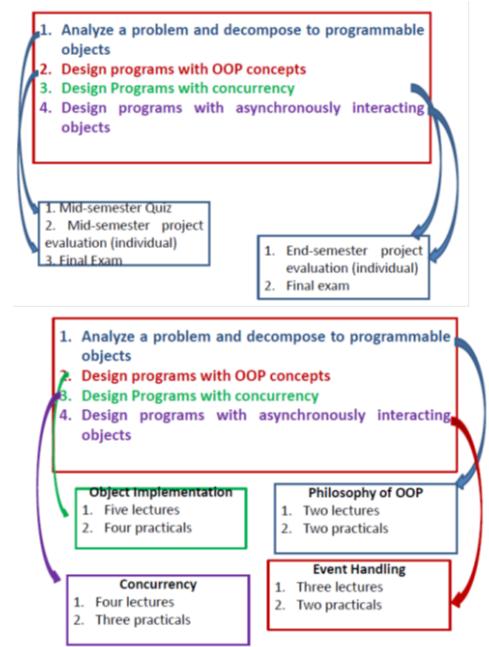


Figure 3.5: PowerPoint slides that describe ILOs and their relationship to teaching/learning and assessment

these empty responses with the value “I don’t know” for easy data analysis. Similarly responses that contained any other value than 4 as the number of ILOs for question 3 were replaced with the value “some other value than 4”.

While many students have at least remembered that ILOs were discussed in the previous lecture, interestingly there were 16 (13%) students who did not even remember that ILOs were discussed, despite me spending quite a long time discussing the ILOs. Only 37 (30%) students have bothered to go and refer to the syllabus in Moodle. Only 22 students out of 124 (17.7%) remembered the exact number of ILOs. 88 (71%) gave a number other than 4, and 14 (11.3%) said they do not remember.

83 (67%) students have not written any answer for question 4. Only 27 (21.8%) students remembered at least a key word related to ILOs. Only one student remembered two ILOs. Some have confessed that they do not remember although they read about the ILOs.

These results show a gradual decrease of the amount of details a student had been able to remember: although many have remembered that ILOs were discussed, they could not remember the specific detail – the number of ILOs. None of the students could remember the exact list of ILOs.

- | |
|---------------------------------------------------------------------------------------------------------------|
| 1. Were the learning outcomes for this course discussed in one of the previous lectures? Yes/ No |
| 2. Did you refer to the syllabus in Moodle to get more information about the learning outcomes?
Yes/No |
| 3. How many major learning outcomes are there for this course? 04 |
| 4. Write down the learning outcomes that you remember (at least the key words).
<i>* Principles of OOP</i> |

Figure 3.6: A sample student response to ILO questionnaire

Lessons Learned

I must admit that I learned a life lesson as a teacher through this change – no matter how much content we try to deliver to students through our teaching (i.e. by “telling”), only a fraction of it goes to their heads. If they could not remember the ILOs despite me discussing them for a long period, they would not remember other theories that I discuss. This highlights the need for facilitating active learning (and go through the “tell-show-do” process) in our courses, as discussed in next chapter.

Decisions Made

Since discussing ILOs only at the first lecture is not effective, I decided to highlight the intended ILO corresponding to each lecture, every week.

Analysis

This change provides the perfect example of how ineffective our teaching could be, if we simply try to pump in content (i.e. by “telling”) to a student’s head. Students might remember few abstract details, but are unable to record any low-level details. This change also reminded me of the difference between Susans and Roberts discussed by Biggs and Tang (2007, p. 8). Although the course syllabus was uploaded to Moodle and students were asked to read it, only a few bothered to do it – others are simply happy only with what they get from the lecture, and are not bothered to explore more.

Moreover, this change proves that my initial hypothesis could be correct – that discussing ILOs with the students at the beginning of the course is not effective, because they might not understand them. However, I have managed to figure out a solution to this as well – discuss the ILO corresponding to each week at the beginning of the lecture.

3.5 Lesson Planning

A lesson plan can be used to record the set of activities the teacher intends to carry out during a lesson. Farrell (2002) defines a lesson plan as “a systematic record of a teacher’s thoughts about what will be covered during a lesson”. According to the author, lesson plan is the end result of a complex planning process that includes the yearly, term, and unit plans. In my opinion, lesson plans are the lowest-level stage of the institution plans for producing graduates.

3.5.1 Importance of Lesson Planning

According to Farrell (2002), having a pre-designed lesson plan gives more confidence to the teacher, to learn the lecture material better, to enable lessons run smoothly and to anticipate problems before they happen. On top of this, I believe it helps the teacher to focus on how to organize the teaching/learning activities in such a way that ILOs are achieved by the students.

Most importantly, careful lesson planning enables to retain student attention throughout the lesson. It is a well-known fact that students’ attention is limited. Thus, many people find it difficult to carry out a passive task for a long period without losing attention (Gibbs & Habeshaw, 1989, p. 26). As shown in Figure 3.7, students’ attention starts to drop after 15 minutes.

Thus, a lecture should be planned in such a way that tasks are interleaved to change the attention of students. Some such tasks are giving a time to ask questions, giving small in-class activity to work on individually, and discussing a given topic with the neighbor. According to Gibbs and Habeshaw (1989, p. 28), simply introducing some tasks will not help – rather, the lecturer should be clever enough to introduce interesting tasks (teaching learning activitys (TLAs)) that the students see as useful to achieve ILOs.

In the CTHE course, the set of steps to select what TLAs to use in a lesson was discussed:

1. Identify the ILO verb that requires design of TLAs.
2. Consider it as the CILO (Course Intended Learning Outcome) verb.
3. From the lower part of the Bloom’s taxonomy chart, locate where the above identi-

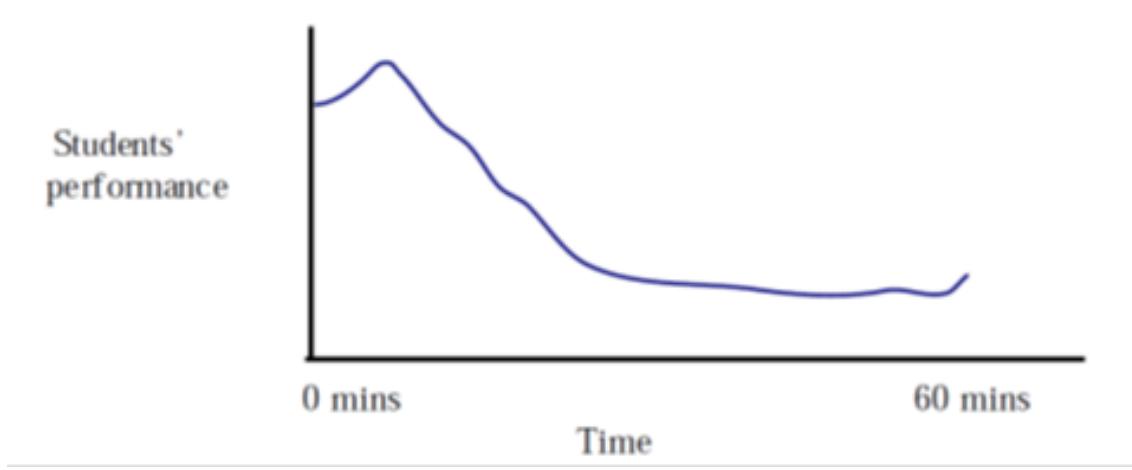


Figure 3.7: Students' performance over time in passive learning (source: (Gibbs & Habeshaw, 1989, p. 27))

fied verb is shown, and then its Bloom's level of learning.

4. Staying at the same column, climb that column and examine all the TLAs applicable to that column.
5. Select one or two feasible TLAs to try out.
6. Select a suitable preceding ILO verb, and further preceding verbs. Select matching TLAs for these verbs from the chart, so that the LOLA (Lower Order Learning Activities) and HOLA (Higher Order Learning Activities) are leading to the CILO.

3.5.2 A Lesson Plan that Demonstrates Facilitation of Constructive Alignment

Pre-CTHE Practice

I never properly planned my lectures. All I did was to determine the content that should be covered during the lecture, and prepare the PowerPoint slides accordingly. To be honest, I have never heard of the concept of ‘lesson planning’ before.

Objectives and Outcomes

The objective of this change is to properly plan a lesson in such a way that student attention is retained throughout the lecture, while making sure that the teaching/learning

activities are organized to help students achieve the corresponding ILO for the lesson.

The outcome of the change is students achieving the corresponding ILO for the lesson.

Related LA: 14 (Appendix J.14)

Rationale

As already discussed above, lesson planning has many benefits. In addition to that, lesson planning for CS2012 will be very useful for me to coordinate the classroom activities with my junior lecturer, who was also present during the lecture.

Moreover, I expected that lesson planning would help me to properly finish the lecture on time, which is a problem that I usually face.

When I have to teach the same module in the next year, I can re-use the lesson plan with appropriate modifications based on my reflection on executing the same.

Process

When I learned about lesson planning at the CTHE course, I immediately started to apply it in my lectures. In this section, I present only one example that clearly demonstrates how constructive alignment was facilitated in my lecture through careful lesson planning.

In fact, instead of planning simply for one week, I did the lesson planning for two consecutive weeks. In Section 3.2.1, I described the four stages in course design under constructive alignment (CDUCA). Here, I use part of these stages in my lesson planning. Moreover, in Section 3.5.1, I described the steps to select what TLAs (SSTLA) to use for LOTS and HOTS. I used this process as well in lesson planning.

The corresponding ILO for the first two weeks is “analyse a problem and decompose to programmable objects”. I believe that by focusing on ILOs instead of individual weeks in lesson planning supports constructive alignment better.

The first step in CDUCA and SSTLA are more or less the same: we need to identify the ILO verb that requires TLA design. For the selected ILO (which of course is a CILO), the corresponding verb is decompose (opposite of compose). This verb falls under the Synthesis level in Bloom’s taxonomy (selecting the level that the CILO verb belongs to is the third step in SSTLA). In addition to decompose, this CILO contains an implicit verb as well – program. In the Bloom’s taxonomy discussed at CTHE, this verb is not available (may be because it was not a popular verb during the time this taxonomy was

introduced). However, I believe that it also falls under Synthesis level. In order to achieve this CILO, I decided to use a creative exercise where students are given a scenario and asked to decompose it into objects, and another exercise where the student has to write a computer program to solve a problem in a given scenario (this refers to the fourth and fifth steps in SSTLA).

Now, according to SSTLA, we need to find preceding verbs that develop LOTS and HOTS of the student that lead to the CILO verbs (sixth step in SSTLA). For a student to be able to decompose and program a given scenario using objects, she should be able to analyze the given problem. In Bloom's taxonomy, this verb falls under Analysis, a HOTS. In order to analyse, the student should be able to identify objects, their properties and behavior. Finally, she should be able to identify relationships between objects and the interactions between objects. The prominent verb here is identify, which falls under the LOTS level comprehension in Bloom's taxonomy. However, this identification should happen at two levels – first the student should be able to identify object properly. Only after that she can identify relationships between objects. Before the students can identify objects, they should be able to recognize the need for the object-based approach for programming. Thus, the starting verb to achieve the CILOs is recognize. Figure 3.8 shows how the student is made to achieve the ILO by gradually improving her thinking skills across the levels in the Bloom's taxonomy.

Now, the lesson plans for the two weeks should be developed to address these verbs in such a way that active learning is facilitated through the correct blend of TLAs (final level of SSTLA, and second step in CDUCA). Lesson Plan I was developed for the first week (Note that the first lecture was planned only for 1.5hrs, since it was conducted during a practical slot, along with the lecture for the Embedded Systems Programming. See section 3.4.1). The corresponding presentation for the first week is given in Appendix D.1.

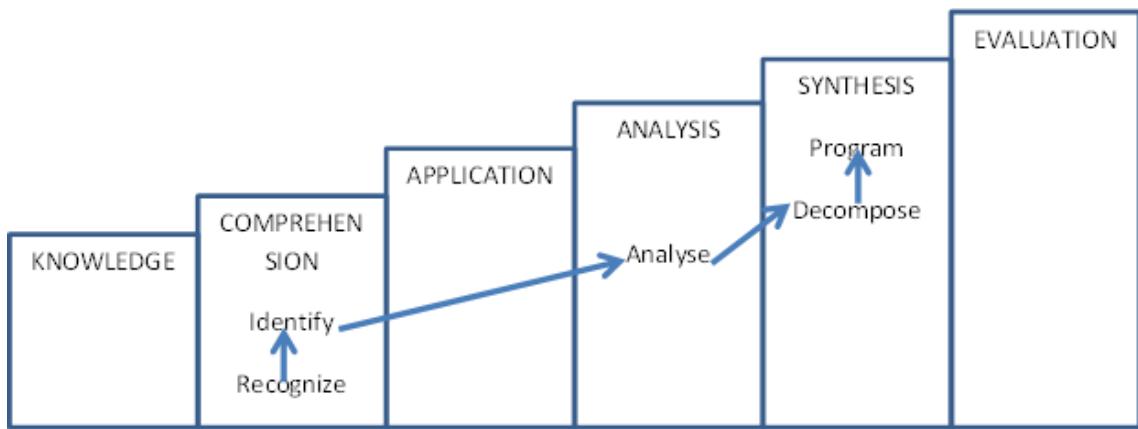


Figure 3.8: How a student is gradually moved across the Bloom's taxonomy to achieve the CILO

Lesson Plan I

1. Exercise to understand why programming they learned in Semester 1 is not enough – 15 mins
2. Lecturer emphasizing why the simulation in the given example cannot be implemented with simple procedural programming - 05 mins
3. Lecturer discusses the concept of objects- 05 mins
4. Students identify objects around them- small exercise - 15 mins
5. Theory discussion by lecturer on identifying classes, attributes and methods of objects - 10 mins
6. exercise to identify classes, attributes and methods of objects- 15 mins
7. theory discussion on how to analyse a given scenario and identify objects and relationships- 5 mins
8. small exercise to look for objects in a given scenario- 5 mins
9. Introduction to Java programming using a simple Java program- 10 mins

The TLAs shown in Lesson Plan I are organized in such a way that the students are engaged in the set of interconnected verbs in the order identified above.

- Recognize the need for object-oriented approach for programming:
 1. Exercise to understand why programming they learned in Semester 1 is not enough – In this exercise, I asked students to assume that they are going to simulate their own computer game. I picked a game as an example, because many students are interested in playing computer games. The description of this game was given to students in the form of a printed hand out (See Appendix E.1). Before starting the exercise, I asked students to give a name for their game. This is to create a sense of ownership to what they are doing, and to make them interested in their work. Then they had to identify the entities that would be there in the game, and try to represent the game using the procedural programming that they learned in semester 1.
 2. Then a teaching activity where I emphasized why the given simulation cannot be implemented with simple procedural programming. The game had warriors, and for warrior names I used characters from the famous movie Lord of the Rings. Then I asked students whether they have heard of those warrior names, just to retain their interest.
- Identify objects, classes, attributes, and methods
 1. First I introduced the concept of objects.
 2. Concept of objects comes from real-life. Therefore I asked the students to identify objects in the classroom (See Appendix E.2). Again, my hope was that the students would be able to relate the concept of object orientation better, when they see its connection with real-life.
 3. Then I had a teaching activity that discussed the concepts of classes, attributes, and methods. From my past experience, I remembered that students find it difficult to distinguish between class and objects. Therefore I used the analogy of a student – we have one student class, but multiple objects of that class can be created for each student in the class.
 4. Then I gave an exercise to students to think of an object, and identify its class, attributes, and methods. With this activity, the identify LOTS should be completed. Before moving students from here to the next HOTS analyse,

I should know whether all students have reached the LOTS identify. Therefore I collected the answer to this exercise, to informally assess them (see Section 5.4.3).

- Analyse

1. Then I had a small teaching task to tell them how to analyse a given scenario and look for objects in a given scenario
2. The students were then given a small scenario and were asked to analyse it to find objects in it. This, and activity 7 are meant to prepare students for the learning activity corresponding to decompose, which would happen in next lecture.
3. Finally, I had another small teaching activity to show them the structure of a basic Java program, in preparation to move them to the HOTS program, in the next lecture.

As mentioned earlier, my junior lecturer was also present in the lecture, to assist students. Along with the lecture plan, I provided her the lecture slides and other learning material in advance, so that she could be better prepared to assist in the learning activities.

After the end of the first lecture, I asked my junior lecturer to informally assess the student answers to the exercise, and send me a report of the common misconceptions. This refers to the third step in CDUCA. There were a considerable number of common misconceptions. More on this will be discussed in Section 5.4.3.

Lesson Plan II was used for the second week. The original plan was to have three group-based learning activities. However, since it was important to clear the student misconceptions related to the LOTS before moving into HOTS, I decided to spend time on establishing LOTS related to previous week. Thus the first teaching activity was added. Although it appears as 20 minutes of teaching, during that period, students carried out few small learning activities, so the teaching part did not make them bored. Thus this activity took about 30 minutes. Based on the mid-semester student feedback, some students found this very useful (see Section 6.3.4). Since it was apparent that there was no time for three learning activities after that, I dropped the last learning activity and gave it as homework. Anyway, it would not affect the student achieving the ILO for the first two weeks, since this last activity was meant to prepare the students for the next week.

Lesson Plan II

1. Discuss about common misconceptions from last week - 20 mins
2. Group learning activity 1 – identify objects, and their relationships (swimming competition scenario) - 30 mins
3. Group learning activity 2 – program the game scenario discussed in lecture
1- 40 mins
4. Group learning activity 3 - identify abstract relationships between classes (newspaper simulation)- 30 mins

The first group learning activity is focused on achieving the HOTS decompose. The scenario used for this is given in Appendix E.3. Finally, the next group learning activity is focused on achieving the other HOTS related to the ILO – program. The scenario used for this is given in Appendix E.4. This scenario is a simplified version of the scenario used for the in-class activity done in lecture 1, because I wanted the students to see that the process of object oriented programming naturally flows from the concepts of objects in real life into objects in their computer programs. These two activities were carried out as group-based learning activities, and more on these two activities can be found in Section 4.9.1.

The junior lecturer collected the student answers to the two in-class exercises – one answer from a group.

Observations

The usefulness of lesson planning was very much evident during the lecture. I took a printout of the lesson plan to the lecture, and referred to it to make sure that I am effectively managing time. When I was taking more time than expected, I was already making plans to shorten the next activity.

This lecture was held in two sessions (because I needed to have group-based activities), one session (morning 8.15-10.15) for the first half of the class, and next session (afternoon 3.15-5.15) for the second half of the batch. Normally, in my previous classes, I have seen many students sleeping in the morning session. When asked why, they confess

that they have been traveling from homes in the morning, and had to wake up very early in the morning. 3.15-5.15 slot is also a very bad time to teach. Our time tables contain no lectures during that period, but only practicals. Despite all these, no student was sleeping in the class! During the second group activity, I left the room unannounced, and returned after about 10 minutes. I was expecting a classroom full of noise and laughter, but to my surprise, the students were busy with their group work.

Lessons learned

Through this change also I learned two very important lessons: (1) that we should not be too ambitious and try to do many learning activities during one lecture. (2) We should plan, but at the same time we should be willing to change. For example, if I had stuck to my original lesson plan for the second week and tried to cover the last activity as well, I would have had to cut short the first two learning activities, and consequently, students would not have learned what they are supposed to learn.

Decisions Made

Having experienced the usefulness of lesson planning, I intend to carry out the same in my future teaching as well.

Analysis

In this section, I described how lesson planning can be effectively used for constructive alignment. I clearly showed how the steps of constructive alignment for course planning could be accommodated for lesson planning. Also I demonstrated how the student thinking is gradually moved from LOTS to HOTS based on Bloom's Taxonomy so that they finally reach the CILO. Moreover, I argued that it is better to construct lesson plans for multiple weeks, because it makes it easier to plan in such a way that the movement from LOTS to HOTS appears smoothly over the weeks. Not stopping there, I demonstrated how lesson plans could be developed for multiple weeks, in order to make student gradually achieve ILOs.

Gradually developing the thinking skills of students is important because at the beginning students are in a transition phase (according to the TDA model). If they are asked to carry out HOTS during this phase, they will get confused. Thus, during the transition

period, LOTS are achieved, and by the time we get them to achieve HOTS, they are in the development or achievement stages.

Also this change demonstrated that sometimes we might not be able to stick to the initial lesson plan, and we must be willing to change our plan during the lecture (see Section 4.3.3). This practice was evident in the CTHE workshops as well, as described in Section 2.4.2.

The teaching activities were limited to 10 minutes in one go, thus ensuring that student attention is retained. The learning activities that were used demonstrate active learning (see Section 4.2.3). With the introduction of proper lesson planning and selection of correct TLAs, I think I have solved one of the five problems I identified in teaching and learning –that students falling sleep during the lecture.

Finally, I believe that this lesson plan also demonstrates the application of the 5E model (see Section 3.2.4). The first learning activity of the first week promoted engagement, because that activity, by asking students to program using what they learned in the previous semester, made connections between past and present learning experiences, exposed prior conceptions, and organized students' thinking towards the learning outcomes of current activities. The teaching activity that followed promoted exploration, because it facilitated conceptual change – the paradigm shift to object-oriented thinking. Then the next learning activity further promoted exploration, because it facilitated students to explore the environment around them and see it in the form of a set of interacting objects. My next teaching activity promoted explanation, because I picked one object (student) that most students identified and used it to elaborate the concept of classes, properties (e.g. student has a name), and methods (e.g. student attends lectures). Finally, evaluation happened after the lecture, which helped me to identify the student progress towards achieving the corresponding ILO. By discussing the misconceptions identified during evaluation in the next class, I also encouraged students to assess their understanding and abilities.

3.5.3 A Weekly Plan that Demonstrates Gradual Development of Student Understanding according to the SOLO Taxonomy

The best example for this is how I designed my lesson plans to get the students achieve the second CILO: Design programs with OOP concepts. There are four fundamental OOP concepts: inheritance, abstraction, polymorphism, and encapsulation. Here, the first three

concepts are inter-connected. In other words, we cannot even talk about abstraction and polymorphism if inheritance was not there. Thus, the first three concepts should be taught in the given order. I focused on each of these concepts in individual weeks. However, slightly different to the SOLO taxonomy, I did not wait till the end of four lessons to get them identify the connection between these four concepts. Instead, as shown in Figure 3.9, I drew the connection as and when I teach a new concept. Each vertical bar corresponds to one OOP concept. Note that the link that goes to the encapsulation concept is smaller than the other three, simply because its connection with other three concepts is not that strong.

Similar to the lessons plans discussed in the previous section, I developed lesson plans in such a way that the students learn to apply each OOP concepts in a gradual manner (i.e. by starting from describing each concept). However, the details are not discussed here.

At the end, I took a very simple scenario, and wrote the program for it and showed them how a computer program can be designed for a given scenario using the OOP concepts. This process can be referred to as "Tell-Show-Do". Then I gave them an activity to design a computer program a given scenario (see Appendix E.4). I got the TAs to formatively assess the student submissions. It was evident that some students had the difficulty in relating polymorphism with the other concepts. This was evident from the student mid-semester feedback as well (see Section 6.3.4). One student wrote "until lecture of Abstraction it was easy to understand and after that from polymorphysim it was little hard to understand the theory". So I gave another activity to develop another computer program.

3.5.4 Preparation of presentation

In the CTHE course, factors for effective presentations were discussed. Therefore, I decided to spend some time on analyzing my presentations in general, in order to make sure they are effective with respect to the factors given at CTHE.

Some notable things that are missing in my PowerPoint presentation were the introduction of session objectives/outline, and summarizing the lecture session at the end. Moreover, I never try to link the presentation with next week's lecture. More on this is discussed in Section 6.3.2.

On the positive side, I use many visual aids/animations, and use colors highlight im-

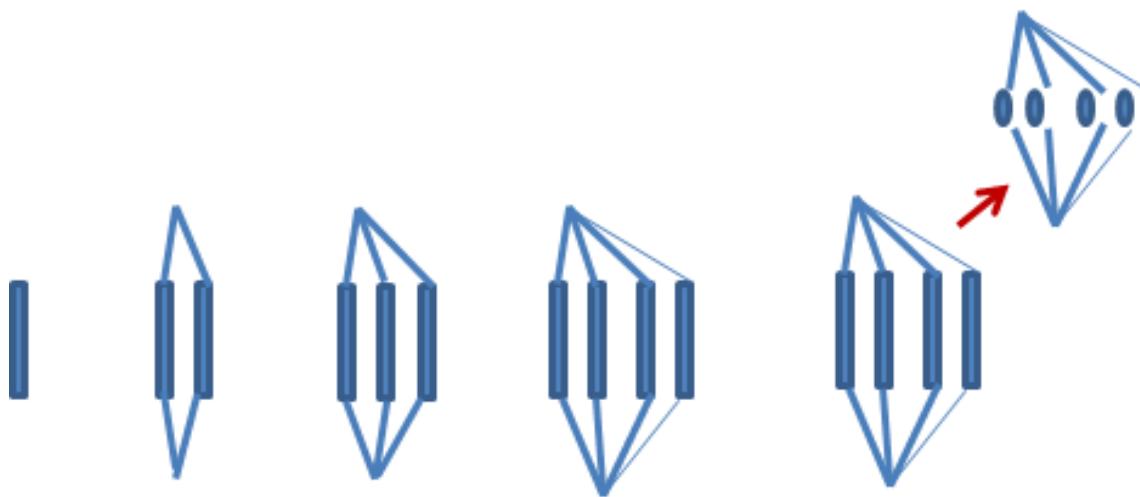


Figure 3.9: How the student learned OOP concepts, according to the SOLO taxonomy

portant point. More on this appears in Section 6.3.2. In next section I discuss one particular change that I implemented with respect to increase the effectiveness of my presentation.

3.5.5 Signposting

Pre-CTHE Practice

Currently, my presentations include only the slide number at the bottom.

Objectives and Outcomes

The objective of this change is to add a progress bar to the bottom of the slides, which will indicate which part of the lecture is currently being conducted, and how much is left to cover. The expected outcome is a reduction of student anxiety, by letting them know how much is there for the lecture to finish.

Related LA: 15 (Appendix J.15)

Rationale

As a member in the audience, I have seen some presenters using such progress bars in their presentation. Personally, I have felt that such kind of signposting is very much useful in reducing the anxiety of the audience, as they know where they are in the presentation, and for how long the presentation is going to continue.

Gibbs and Habeshaw (1989, p. 42) also note that what many lectures lack is not good content, but good signposts “about what content consists of, what is coming next, what has just been completed...”.

Process

I added a progress bar to the bottom of the slides, as shown in the presentation in Appendix D.1. In each slide, the bar progresses in proportion to the size allocated per slide. In addition, where the bar would end (i.e. end of the presentation) was marked in red.

Student Feedback on the Change

At the end of the lecture, I gave Questionnaire 3.3 to the students. Figure 3.10 shows a sample student response.

Questionnaire 3.3

1. Did you notice the colored ribbon at the bottom of the slides? Yes/No
2. If you said yes to question 1, how often did you notice it? At each slide/at most of the slides/at few of the slides
3. If you said yes to question 1, did you find that progress bar useful to determine where we are at the lecture? Yes, very much/ yes, a little/ Not at all
4. Do you think that knowing where we are in a lecture is useful in reducing the uneasiness (anxiety) of having to sit through a long lecture? Yes very much/ Yes a little/ Not at all/ I don't know

122 students provided their responses. Interestingly, it can be seen that majority (100 (82%)) of the students have noticed the progress bar. Out of those, 46 (46%) have noticed in many of the slides, and 27 (27%) noticed it in few slides. This could be taken as an indication that many students are paying attention to the slides. 48 (47%) students found that signposting indeed is useful, 28 (27.5%) found it somewhat useful, and 26 (25.5%) did not find it useful. However, knowing the current status of the lecture progress has not helped much in reducing anxiety during the lecture. Interestingly, 10 (8.2%) students

1. Did you notice the colored ribbon at the bottom of the slides? Yes/No
2. If you said yes to question 1, how often did you notice it? At each slide/at most of the slides/at few of the slides
3. If you said yes to question 1, did you find that progress bar useful to determine where we are at the lecture? Yes, very much/ yes, a little/ Not at all
4. Do you think that knowing where we are in a lecture is useful in reducing the uneasiness (anxiety) of having to sit through a long lecture? Yes, very much/ yes, a little/ Not at all/I don't know

Figure 3.10: A sample student answer to the signposting questionnaire

have indicated “I don’t know” for this final question. I have a feeling that those students did not know the meaning of the words anxiety or uneasiness, to answer the question.

Decisions Made

Since student response for this change is on positive side, and since the repetition of the process is very trivial (I just have to re-use the macro I used to create the progress bar), I have decided to add the progress bar to my future lecture as well. May be, since the students now know the purpose of it, they may benefit better.

Analysis

This is a very simple change that I experimented with. But it is good to see that students had a positive experience. This shows that some of the changes we implement do not have to be very complex or time consuming to positively affect students.

3.6 Changes I Have Done During CTHE

I carried out many changes with respect to my teaching during CTHE:

1. Analyse student feedback from the previous batch, and discuss with the lecturer who is teaching the parallel module to decide on the changes that can be done to the syllabus, and the course delivery plan.
2. Conduct a Java workshop targeting students who do not have any Java knowledge. Here, I am changing the P2 stage of the 3P model to address P1stage.

3. Have weekly meetings with TAs in order to identify the specific problems students face, and also to give instructions on the next practical.
4. Discuss course ILOs in the first class.
5. Design lesson plans for consecutive weeks to make sure students achieve a specific ILO.
6. Design of lesson plans according to the SOLO taxonomy.
7. Add a progress bar to the PowerPoint slides as an indication of the status of the lecture. This was done with the intention of reducing anxiety of students by making them aware of the status of the lecture.

3.7 Summary of SEDA Outcomes and Values Addressed in the Chapter

3.7.1 SEDA Values:

1. Developing understanding of how people learn:

Section 3.4.2 Conducting a Java workshop – This change helped me to identify that there is a huge discrepancy between the Java knowledge among students, and that affects how they perceive the course delivery. For example, those who knew Java found that the Java workshop was not useful, but those who did not know Java found the workshop too advance.

Section 3.4.3 Getting the Maximum from Teaching Assistants – This change helped me to get the TAs to tell me the problems students face when learning to program using Object Oriented concepts. It also helped me to identify how students try to find shortcuts by trying to get the TAs to do the work for them. I instructed the TAs not to let this happen, otherwise the students would not be learning through the learning activity in the practical.

Section 3.4.4 Discuss ILOs in the first week – This change made me realize that no matter how much we try to pump in content to a student's head through our teaching; only a fraction of it goes into their heads.

Section 3.5.2 A lesson plan that demonstrates facilitation of constructive alignment
– Through this change I tried to facilitate active learning. Also, the learning activities were organized in such a way that the student is moved smoothly from LOLA to HOLA to achieve CILO. I also note that due to the way the TLA were organized in the lesson plan, students were actually engaging in learning activities and they were not bored.

2. Practicing in ways that are scholarly, professional and ethical:

Section 3.4.4 Discuss ILOs in the first week – Students have a right to know what they are supposed to achieve at the end of the module. It is the lecturer's responsibility to make sure that this information is communicated to them. This requirement is achieved through this change.

Section 3.5.2 A lesson plan that demonstrates facilitation of constructive alignment
– Developing lesson plans is considered a very standard practice in teaching. Thus with this change, I make sure that I conduct my teaching in a professionally accepted way.

3. Working with and developing learning communities:

Section 3.4.2 Conducting a Java workshop – The idea of this workshop was to develop Java programming skills of students, so that they can easily grasp the OOP concepts.

Section 3.4.3 Getting the Maximum from Teaching Assistants – With the help of the TAs, I was able to identify specific learning problems faced by students during practicals.

Section 3.5.2 A lesson plan that demonstrates facilitation of constructive alignment
– In this lesson plan, students were gradually moved from LOLA to HOLA so that they would achieve the corresponding ILO.

Section 3.5.3 A Weekly Plan that Demonstrates Gradual Development of Student Understanding according to the SOLO Taxonomy - In this weekly plan, students learned the individual OOP concepts, and then the relationships between them.

4. Valuing diversity and promoting inclusivity:

Section 3.4.2 Conducting a Java workshop – The level of Java knowledge of students varies a lot. The intention of this workshop was to bring up the Java knowledge of weak students to a level that helps them to better learn OOP.

Section 3.4.3 Getting the Maximum from Teaching Assistants – The weekly meetings helped me to identify problems faced by different students. Identifying students who did not want to do CSE is the best example for this. I was not aware of such situations before. However, since this student was identified, we could try to make show him the positive side of learning CSE and make sure he enjoys what he learns.

Section 3.5.5 Signposting the presentation – There could be students who just do not have the patience to sit through a lecture. Therefore, by making them aware of the progress of the lecture, I believe that their anxiety could be reduced even by a little bit. Student feedback on this change also confirmed that indicating the lecture progress does help to reduce anxiety.

5. Continually reflecting on practice to develop ourselves, others and processes:

Section 3.4.1 Getting Ready to Teach CS2012 to the new batch – I reflected on my teaching the same subject for the previous batch by going through student comments. I also analysed the CS2012 syllabus to make sure it supports constructive alignment.

Section 3.4.3 Getting the Maximum from Teaching Assistants – Meeting TAs every week helped me to identify specific problems faced by students and TAs. Also, by making the TAs aware of the ILOs and how practicals are used to achieve them, and showing them by example how student feedback and our own experience are taken into consideration in the form of reflective practice, I help them grow as academics.

3.7.2 SEDA Outcomes:

1. Use a variety of methods for evaluating your teaching

For the changes implemented in the sections Conducting a Java workshop, Discuss ILOs in the first week, and Signposting the presentation, I collected student feedback.

The feedback forms contained multiple choice questions, and questions that required students to write their comments. Responses to the former gave a clear visual representation of the responses. I also analysed student comments to get more insights.

2. Inform your practice with relevant strategy, policy and quality considerations

Section 3.4.1 Getting Ready to Teach CS2012 to the new batch – I discussed my weekly delivery plan with the lecturer who is teaching the parallel module, in order to make sure both subjects delivery roughly the same content. Also I discussed the weekly delivery plan and the lesson plans with the junior lecturer, in order to educate her on the whole delivery process.

Section 3.4.3 Getting the Maximum from Teaching Assistants – Before each practical, I discussed it with the TAs. I informed the learning activity the students should carry out during the practical, and the type of help the TAs should provide to the students.

Section 3.4.4 Discuss ILOs in the first week – I informed the students what I expect them to achieve at the end of the teaching of CS2012.

3. Use a range of methods of teaching and supporting learning, assessment and feedback, appropriate to the learners, subject and context, including use of appropriate technologies

Section 3.4.2 Conducting a Java workshop – The Java workshop was organized to support students who do not have any knowledge on Java.

Section 3.4.3 Getting the Maximum from Teaching Assistants – One purpose of weekly TA meeting was to identify problems faced by students. For example, if the TAs report that the students could not properly carry out the learning activity of the practical because they did not understand what was discussed in the lecture, I can elaborate more on that in the next lecture. Also, I advised the TAs on how they should support students during the labs.

Section 3.5.2 A lesson plan that demonstrates facilitation of constructive alignment – Rather than me talking for two hours in the lecture, I planned the lecture in such a way that teaching and learning activities were nicely interleaved with each other.

The learning activities included both individual and group activities. Since no teaching session was longer than 10 minutes, student attention could be retained.

Section 3.5.3 A Weekly Plan that Demonstrates Gradual Development of Student Understanding according to the SOLO Taxonomy - In this one, I paid special focus on how to get the students to derive relationships between the individual OOP concepts.

4. Contribute to the design, planning and evaluation of courses, modules or programmes

Section 3.4.1 Getting Ready to Teach CS2012 to the new batch – I identified some issues in the previous syllabus and fixed them so that the syllabus now better adheres to constructive alignment. I planned the course delivery well ahead, and discussed it with the other lecturer to make arrangements on how to synchronize the delivery of the two courses.

5. Create a learning environment that includes student support and guidance

Section 3.4.3 Getting the Maximum from Teaching Assistants – I assigned students to TAs and got TAs to give feedback to submissions of those students on a weekly basis.

Section 3.5.2 A lesson plan that demonstrates facilitation of constructive alignment – The lesson plan was designed in such a way that the TLAs nicely guided the student from LOLA to HOLA in order to achieve ILOs.

Section 3.5.5 Signposting the presentation – The progress bar in the PowerPoint presentation gave an indication to students about the progress of the lecture. Students found that this kind of signposting helps to reduce their anxiety during a two-hour lecture.

3.8 Chapter Summary

This chapter provided a detailed discussion on how I planned the delivery of CS2012 to the new batch. Planning happened at the module level, where I developed the weekly delivery plan, as well as at the lesson level as well, where I planned the delivery of each lesson in

the form of lesson plans. How practicals can be well planned with the help of TAs was also discussed. I discussed how I achieved constructive alignment in my CS2012 course as a whole, and in individual lessons. I also addressed the 3P model – how P1 stage can be changed to support P2 stage.

Chapter 4

Learning as an Active Process

4.1 Introduction and Outcomes of the Chapter

Intended outcome of this chapter is a detailed analytical discussion on the changes I implemented with respect to improving active learning by students in my courses. Selection of each of these changes is justified by evidence from related literature. My experiences and observations while implementing the changes are also related to observations in the literature. To experiment with changes on learning, I selected two modules: CS5612 - Pattern Recognition (a postgraduate course), and CS2012 - Principles of Object Oriented Programming (an undergraduate course).

At the end of this chapter, the reader will be able to identify the effectiveness of the active learning strategies I used.

4.2 Effective Learning – Theoretical Foundations

Education, higher education in particular, has come a long way from simply considering learning as a teacher-centric delivery of the lecture. Many theories and concepts have emerged over the years, which focus on formulating methodologies for effective learning by students. Some such prominent theories are discussed below, along with implications of one theory/concept over the others.

4.2.1 Learning Theories

What exactly do we mean by ‘learning’? Many researchers presented theories that describe how humans learn, and some of these are centuries old. Here I discuss two such prominent theories: behaviorist approach to learning, and constructivist approach to learning.

Behaviorism

Behaviorism describes learning as an observable change in the behavior. This new behavior is acquired based on environment conditions. There are two types of conditioning: classic conditioning, and operant conditioning. The former occurs when a natural reflex responds to an environment stimulus. In the latter, this response to a stimulus is reinforced. If the reinforcement is positive, the response becomes more probable in the future.

There are many criticisms on this theory, and the main one being that it disregards the activities in mind. Moreover, how new patterns are learned by human mind is also not explainable under this theory.

Despite its limitations, behaviorism is a simple theory that can easily be used in classrooms. For example, by giving positive reinforcements (i.e. incentives), a student can be motivated. These reinforcements can even be something simple as a positive gesture. Another example is giving motivational feedback to students, as discussed in section 5.4.2. Moreover, I believe ILOs can also be explained using this theory. If a student achieved an ILO, she should be able to perform an action (referred by a verb) that she could not perform before. Thus, the student can demonstrate a new behavior (such as ability to analyse something) that can be observed, and of course be measured through assessment.

Constructivism

According to this theory, we construct our own understanding of the world by reflecting on our experiences. This understanding can be in the form of rules or mental models. Thus, learning is the process of adjusting our mental models to accommodate new experience.

From what I understand, SOLO taxonomy (Section 3.2.2) has some relationship to constructivism theory, if not that it is derived from constructivism theory. According to constructivism, learning is a search for meaning, and this meaning requires understanding

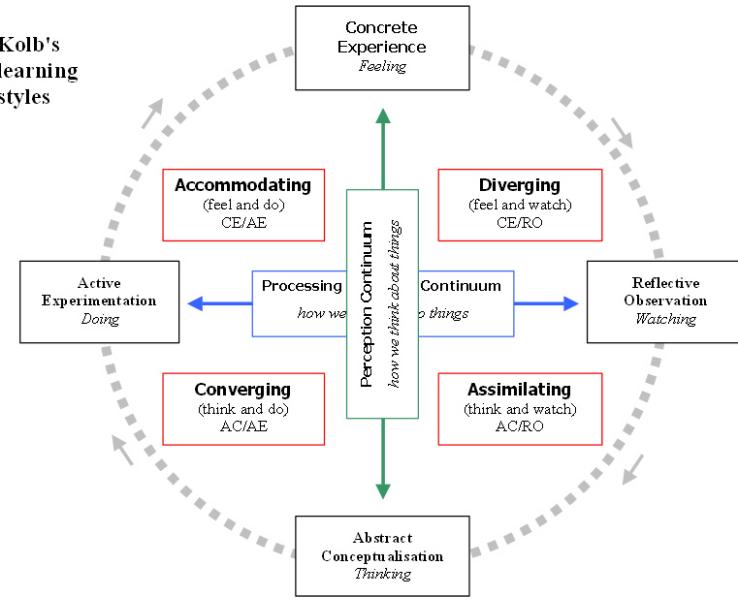
both wholes and parts. These parts cannot be applied in isolation, but should be in the context of the whole. This is the same idea promoted by the SOLO taxonomy. In the relational stage, the student is required to identify the relations of the parts rather than taking them individually. Of course, the basic understanding of each part can be learned in an individual basis. However, the comprehensive learning occurs when relations of parts are drawn upon. Moreover, this theory requires an individual to construct their own meaning of what they experience. This is similar to the extended abstract stage in SOLO taxonomy, which requires the student to create her own generalization out of relations she derived.

4.2.2 Kolb's Learning Cycle

Kolb (1985)'s Experiential Learning Cycle (Figure 4.1) is a well-known theory that argues that adults learn from their experiences in natural settings. Kolb also emphasizes the close connection between learning and problem solving. Kolb's learning cycle has four phases: concrete experience (feeling), reflective observation (reflection), abstract conceptualization (thinking), and active experimentation (doing). Kolb's learning cycle is referred to as the IPUR (Identify-Plan- Undertake-Reflect) cycle as well. I think that Kolb's learning cycle also has a strong relationship with the constructivism theory on learning. The steps of this cycle are analogues to the process in learning as described by constructivism theory.

However, not all the learners in a class would go through this cycle in the same manner. Thus, Kolb categorizes learners according to four different learning styles:

- Accommodators (activists) – Learn best when they are fully involved, thus enjoy activities such as simulations and case studies. They are intuitive problem solvers but rely on others for information and analysis.
- Convergers (pragmatists) – Interested in finding practical applications of ideas. They enjoy solving problems, and prefer technical tasks over social/interpersonal issues. They are more concerned with abstract concepts than their practical implications. Thus laboratory experiments or fieldwork are the best suited learning activities for them.
- Assimilators (theorists) – Prefer conceptualizing new ideas and models. Thus they



© concept david kolb, adaptation and design alan chapman 2005-06, based on *Kolb's learning styles*, 1994
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Figure 4.1: Kolb's Learning Cycle (Source: (Pollack, 2016))

learn better with lectures and papers.

- Diversers (reflectors) - Prefer to learn by observing and making sense of experiments. Thus they enjoy lectures and tend to record their thoughts in learning logs. They are imaginative and are interested in people and their emotions. Thus, different types of learners would find different phases of the learning cycle more interesting.

4.2.3 Active Learning

Bonwell and Eison (1991) defined active learning as anything that "involves students in doing things and thinking about the things they are doing". These "things" could range from lower order thinking skills such as reading or discussing, to higher order thinking skills such as analysis, synthesis, and evaluation. Over the years, researchers have argued in favor of facilitating active learning in university classrooms (D. W. Johnson, Johnson, & Smith, 1998; Meyers & Jones, 1993) and much research has shown that students prefer strategies promoting active learning to traditional lectures (Prince, 2004).

Bonwell and Eison (1991) have described the following common characteristics associated with active learning strategies:

1. Students are involved in more than passive listening
2. Students are engaged in activities (e.g., reading, discussing, writing)
3. There is less emphasis placed on information transmission and greater emphasis placed on developing student skills
4. There is greater emphasis placed on the exploration of attitudes and values
5. Student motivation is increased (especially for adult learners)
6. Students can receive immediate feedback from their instructor
7. Students are involved in higher order thinking (analysis, synthesis, evaluation)

I believe that active learning is in-line with Kolb's experiential learning cycle. In other words, active learning activities let students to experiment with concepts that they learned, which inherently makes them think about the experiences they gain. This in turn shows the link between active learning and constructivism theory. Moreover, giving immediate feedback to students is a form of reinforcement, thus it can be considered as operant conditioning in behaviorism theory.

4.3 From Theory to Practice - Getting Students to Actively Learn

4.3.1 Types of Active Learning Strategies

Over the years, many different active learning strategies have been practiced by university lecturers. These include drama, role playing, problem solving, group discussions, simulations, and many more (Silberman, 1996). While strategies such as drama could be applied only for certain type of subjects, other strategies such as group discussions can be applied for a wide variety of subjects.

4.3.2 Supporting Active Learning of Different Types of Learners

However, I believe that a lecturer should not blindly apply learning strategies for the sake of promoting active learning. As discussed in Section 4.2.2, Kolb (1985) has identified

four different types of learners, and their preferred learning styles. Moreover, according to the Maslow's hierarchy of needs, different students can have different needs. Thus, when designing teaching and learning activities, the lecturer should be wise enough to provide a blend of activities such that at least a part of them would suit each type of learners. This blend could be considered during one lecture (i.e. interleaving different learning activities during a lecture), as well as across lectures for a given course (i.e. try out different activities in different lectures).

4.3.3 Identifying the Correct Blend of Active Learning Strategies

Section 4.3.1 pointed to literature that discussed active learning strategies. Also, section 4.3.2 emphasized the importance of catering to needs of different types of learners. Given these large number of possibilities and constraints, a lecturer could find it daunting to select the correct blend of active learning strategies. However, as discussed in Section 3.5.2 we should select a scaffolding approach in selecting the learning activities in such a way that the student is gradually moved from LOTS to HOTS. Section 3.5.2 provided a very good example of this, where a student was moved from "identify" LOTS to "program" HOTS in a gradual manner through a series of learning activities.

Moreover, the lecturer should be flexible enough to change her lesson plan based on the cues she picks up from the students. For example, if students are struggling with an in-class activity, it could be more useful to stop the activity, and re-explain the concept. Or the lecturer could decide to have a question answering round to identify the common misconceptions the students have, which prevented them from actively engaged in activities. This was practiced extensively in the CTHE workshops. As discussed in Section 2.5.3, sometimes the tutor spent more time in answering student questions and clarifying the content he just covered, and as a consequence, some activities in the lesson plan could not be carried out.

In Section 3.5.2 also, I discussed a similar experience I had where I had to drop one learning activity since the first learning activity took more time than expected.

4.3.4 Reflective Practice – Never Make the Same Mistake Twice

Reflective practice, discussed in Section 2.4.4 could provide assistance in selecting the correct blend of learning strategies for a given context. When the lecturer records her

experience and observations on the implementation of active learning strategies, she could easily relate to this experience in other similar contexts. This helps her to easily learn from her experience. For example, if a certain course is offered just once a year, by the time the lecturer has to teach the same subject for the next batch, she would have forgotten her experiments and the experiences with the previous batch. However, if a reflective learning log was maintained, she could easily formulate the lesson delivery plan for the new batch, based on the decisions she made from the previous batch. How I made use of reflective practice is discussed in Section 6.2.2.

4.4 Problem-Based Learning (PBL)

4.4.1 What is PBL?

Kolb (1985) says that learning and problem solving are closely related (see Section 4.2.2). Samson (2015) says that active learning and PBL are very much related.

According to Hmelo-Silver (2004), PBL is focused, experimental learning organized around the investigation, explanation, and resolution of meaningful problems. Students have to define what further knowledge they require in order to address the problem, and then undertake the required research they have identified to apply that research towards the presentation of outcomes. This clearly shows that PBL makes students to think about what they are doing, to get them to actively learn.

Problem-based learning is predominantly used in medical education (Azer, 2001; Hung, Jonassen, Liu, et al., 2008). However, success stories of PBL have been reported from different fields (Allen, Donham, & Bernhardt, 2011; Bernstein, Tipping, Bercovitz, & Skinner, 1995; Klegeris & Hurren, 2011; Mills & Treagust, 2003) as well. Hung et al. (2008) argue that PBL could be the most innovative instructional method conceived in the history of education.

Kwan (2009) and Hung et al. (2008) define several characteristics of PBL. PBL is student-centered and problem-focused. It gets students into self-directed and self-reflective learning, where they work in small groups to explore open-ended real-world problems. Tutors simply play a facilitator role. Finally, learning outcomes emphasize on process skills and learning attitudes in addition to content knowledge

4.4.2 Issues with PBL

Azer (2001) summarizes the commonly found issues with applying PBL, particularly in professional sciences. A notable issue is the amount of time required to implement PBL activities. As discussed in Section 4.9.1, I also faced this problem while having a PBL activity. That is why it is important to prepare a lesson plan, as discussed in Section 3.5.1. Not only time, more resources will also be required. Moreover, it requires changes in the assessment, and students tend to ask for more feedback. Designing appropriate questions could also be challenging.

4.5 Group Work as an Effective Way of Learning

Group work has always been hailed by lecturers, educationists, and researchers alike in promoting active learning. I had very good firsthand experience of the effectiveness of group work at CTHE, where all the workshops except one were held in group-based classes (see Section 2.5.3). There I witnessed many active learning strategies been executed in groups.

4.5.1 Types of Groups

Few group types based on how the groups function can be commonly found in the literature (Gibbs & Habeshaw, 1989, p. 49–51):

Pyramid groups – First students work alone, then they discuss in pairs, and finally draw conclusions in fours. This is a potential solution to eliminate free riders.

Buzz groups – Students are required to discuss in pairs.

Syndicate groups – Several groups work in parallel on the same problem. Later, a class-level plenary is arranged to which the syndicate groups report.

From these three, the first group type was extensively practiced during the CTHE course (see Section 2.5.3). For example, first the students are asked to (say) read a material alone, then they have to discuss in groups, and then they have to present their ideas to the class. Even syndicate groups were also tried out, e.g. to get the class to read different chapters of a text book and then discuss their findings with the class.

Group characteristics can also be categorized based on the size of the group. Table 4.1 (Jaques, 2000) clearly shows how group characteristics change with the size of

Number of Members	Changing Characteristics
2-6	Little structure or organization required. Leadership fluid.
7-12	Structure and differentiation of roles begin. Face-to-face interaction less frequent.
12-25	Structure and role differentiation vital. Sub-groups emerge. Face-to-face interaction difficult.
25-?	Positive leadership vital to success; sub-groups form: greater anonymity. Stereotyping, projections and flight/fight occur

Table 4.1: Group Characteristics grouped by number of members in the group
(Source: (Jaques, 2000))

the group. From the CTHE course experience, I can comment that 2-6 group size works well, and is more practical, at least for a medium-sized class. In the CTHE course, we had 4-5 member groups most of the time. Personally, I feel that getting the students to work in the same group across many classes is very advantageous, since the group members gradually develop a sense of belongingness, and intrinsically start to help each other. I also have experience on this through CTHE. Our F8 group (see Section 2.5.3) was a very tightly connected one, and we always helped each other. When we could not understand the learning theories, Udeshini, who is from the discipline teaching, volunteered to find a undergraduate level notes and explained the theories to us. Upul scanned all those notes on behalf of us.

4.5.2 Importance of Group Work

According to Gibbs and Habeshaw (1989, p. 70), students gain a lot from working in groups – rich ideas emerge through group discussions, and co-operative activities within a group brings many personal and interpersonal benefits.

During one of the group discussions at the CTHE course, our group was able to identify the usefulness of group work to address student needs categorized according to Maslow's hierarchy of needs – Students who have higher levels of needs such as accomplishment could benefit by group work through the sense of achievement they gain (say) by being the group leader or by helping weaker students. Those who are at the lower levels of hierarchy will feel secure, because now they have their colleagues to help them out, not only to complete the problem-based task, but also to get clarifications on the concepts that they do not understand. As discussed in Section 4.9.1, my students also reported the possibility of getting doubts cleared by colleagues as an advantage of group work.

As further discussed in Section 4.9.1, group work also encourages students to ask

questions from the lecturer.

4.5.3 Issues with Group Work

Issues of group work can be described in the perspective of both tutor and the student. Hendry, Ryan, and Harris (2003) carried out a comprehensive study on identifying the frequency of occurrence of different problems associated with group work, in both perspectives. Interestingly, for most of the problems, the frequency as perceived by the tutor and the student is nearly same. For example, having quiet students who rarely contribute to group discussions, students being absent/arriving late for group work, some students being dominative have been reported as frequent both by tutors and students. We also have first-hand experience on this from our CTHE course as well. For example, when one group member was absent, it was evident that the group discussions are not rich as they used to be. As for the dominating student, many a time I felt that I am dominating the group discussions, and try to be mindful in refraining from it.

In contrast, problems such as bullying within groups, groups rushing through the assigned work, and group just looking at the surface of the problem have been reported as less common by both students and tutors. In my opinion, we can derive an interesting conclusion from this reported observation: even though there are individuals who may be at extreme ends, the group as a whole has the drive to work towards their common goal in a comprehensive manner.

4.5.4 Problem Solving in Groups

When looking at the literature, PBL has most of the time being presented as going hand-in-hand with working in groups. For example, Hung et al. (2008) describe the steps of the PBL process, and the first step of this is students forming groups and stating to reason through the problem. There can be an individual learning component, but students have to share their individual learning with the group and re-visit the problem together. Finally, students integrate their individual learning. Kwan (2009) lists working in small groups as a characteristic of PBL. The author also highlights that PBL outcomes now commonly include teamwork and leadership skills, in addition to traditionally expected outcomes such as problem solving skills and critical thinking. This also implies that researchers see that PBL is executed in small groups. Effective collaboration skills, which is one of the

five main goals of PBL as identified by Hmelo-Silver (2004) can be achieved only if the students work in a group. In addition, empirical evidence is also available to show the effectiveness of PBL in small groups (Cockrell, Caplow, & Donaldson, 2000; Samson, 2015).

4.6 Resource Based Learning (RBL)

4.6.1 What is RBL?

Hannafin and Hill (2007) define resource-based learning as “the use and application of available assets to support varied learning needs across contexts”. Resources could include many things such as learning material and human resources. However, here I only focus on learning material such as books and handouts, when I refer to RBL.

4.6.2 Advantages of RBL

According to Brown, Smith, and Smith (1996), if the students engage with learning resources in an active way, they might develop deeper approaches to learning. Moreover, the authors claim that RBL could make students independent, life-long learners, because it helps students to take responsibility for their own learning needs. If students can learn by resources, the lecturer can omit discussing the related material in the lecture, and the time saved by this can be used to answer student questions, and to help those who are struggling.

4.6.3 Disadvantages of RBL

If the lecturer does not carefully select the material, or if she asks students to find the material themselves, this could overload students (Brown et al., 1996).

In both cases, there is a risk of students relying in out-dated material. This is specially the case with fast changing fields such as Computer Science or Software Engineering.

A further disadvantage of lecturer provided material is that it might constrain the student experience – students might not bother to find any new material since they believe the lecturer knows the best, when it comes to selecting relevant material.

Finally, as any other technique, the lecturer must not over-do RBL. If the students are asked to learn everything by referring to resources, they might not see the benefit of coming to the lecturer, which might impact the human connection between the lecturer and the students (Brown et al., 1996). Thus, I believe that the lecturer should carefully plan the use of RBL, to avoid any negative effects of the same. Brown et al. (1996) also highlight the importance of providing appropriate learning activities to students to engage with the provided learning material.

4.6.4 Giving Handouts during Lectures

In Section 4.6.3, two broad types of learning material were introduced. Out of these, giving handouts during lectures falls into material provided by the lecturer. Preparing handouts could be a time-consuming task, because it is important to include only the right amount of essential information in the handouts. Due to the amount of time involved in developing handouts, some lecturers may tend to re-use the handouts prepared in previous years. However, this runs the risk of providing out-dated information to students, as discussed in Section 4.6.3.

As pointed by Badger and Sutherland (2004), a handout could refer to overhead acetates printed out, PowerPoint slides printed out, or even a volume of material collected from different selected sources. The latter is the approach followed in the CTHE course.

4.6.5 Advantages of Giving Handouts

Badger and Sutherland (2004) have observed that many lecturers indeed give out handouts before or during lecture. The advantage of the latter is it requires the students to attend the lecture and add their own notes to the handout provided. The advantage of the former is, the students are given time to go through the material and come to the lecturer prepared.

The main advantage they note is the ability in aiding student note taking. Kiewra (1985) found that if lecturers give students handouts (in the form of partial outlines), the note taking of students improved.

Hartley (1976) carried out a very interesting experiment on examining relationships between the design of lecture handouts, students' note-taking practices, and student performance. At an abstract level, the author reports that students who had handouts recalled

better than those who did not have handouts. Moreover, he reported that students with incomplete handouts initially had a better recall than those who had full handouts and those who did not have handouts. However, in the long run, recall of lecture content by partial handout group showed no significant difference over full handout group.

Although Hartley (1976) would not have known about PowerPoint slides when he conducted his experiment, I believe that his observations are equally valid to PowerPoint slides. Nicholson (2002) reported that students liked PowerPoint lectures with handouts of the slides, as each slide clearly showed the key points and thus clarified the structure of the lecture. Revell and Wainwright (2009) reported that students liked handouts with gaps because it encouraged them to be more attentive in lectures.

4.6.6 Disadvantages of Giving Handouts

Giving handouts before the lecture might discourage the students from coming to the lecture, as they tend to over-rely on the given material. In fact, Revell and Wainwright (2009) reported that this is a concern that many lecturers have. To mitigate this problem, some lecturers attempted to make handouts more like worksheets by leaving gaps, as described above.

4.7 Getting Students to Ask Questions

4.7.1 Overview

As discussed in Section 3.5.2, to direct students into higher order learning activities, it is important that the lecturer makes sure that the students are comfortable in lower order thinking skills (LOTS). One possible way to check this is by questioning. Questioning is two-fold: lecturer asking questions from the students, and students asking questions from the lecturer. In the former, the lecturer can only test the student's knowledge in few particular areas/concepts. Moreover, once one student answered the question, the teacher might not bother to worry about whether rest of the class knows the answer. In contrast, in the latter, given that students do ask questions, the lecturer can clarify a multitude of points related to the material he discussed in the class.

4.7.2 Importance of Student Questions

Researchers have identified a multitude of benefits of student questions, both to students and the lecturer. Chin and Osborne (2008) provide a comprehensive list of advantages, after reviewing the literature.

Benefits for students:

1. Provide an indication that students have been thinking about the ideas presented and have been trying to link them with other things they know.
2. Activate prior knowledge of students, focus their learning efforts, and help them elaborate on their knowledge.
3. Enable students to focus on content, main ideas, and checking if content is understood.
4. Are a first step towards filling their knowledge gaps and resolving puzzlement.
5. Allow students to articulate their current understanding of a topic, to make connections with other ideas (in relational stage of SOLO taxonomy), and also to become aware of what they do or do not know.
6. Are an important aspect of both self- and peer-assessment.
7. Important in developing problem-solving and decision-making, and critical/higher order thinking skills of students.

Benefits for Lecturers:

Student questions are also helpful to lecturers in prompting reflective thought and student engagement (Chin & Osborne, 2008). A study carried out by Aguiar, Mortimer, and Scott (2010) showed that questions made by students are important in providing feedback from students to the teacher, which enables adjustments to the teaching explanatory structure.

4.7.3 Types of Student Questions

Scardamalia and Bereiter (1992) distinguish two broad types of questions: basic information questions and wonderment questions. Basic information questions can be further

categorized as factual and procedural. Factual questions require only recall of information and are often closed questions. Procedural questions seek clarification about a given procedure or probe how a task is to be carried out. Wonderment questions are often aimed at explanation or at resolving discrepancies in knowledge.

4.7.4 Getting Students to Ask Questions

Van Zee, Iwasyk, Kurose, Simpson, and Wild (2001) point out a number of factors that enhance students' questioning:

1. Elicitation moves by the teacher encouraging students to ask questions
2. Subject matter with which students have acquired some familiarity
3. Comfortable discursive classroom environments
4. Small group collaborative work

In particular, the first and third factors are important in making the students feel secure before risking an important question – student does not want to appear stupid in front of the class by asking what she thinks is a silly question. We have first-hand experience on the effectiveness of these factors, at the CTHE course. As discussed in Section 2.5.3 The CTHE tutor was very friendly, and students are very much encouraged to ask questions. When a student raises the hand for a question, the tutor goes near him, so that the student does not have to shout across the classroom. Moreover, the lecturer stays in the class even during tea and lunch breaks, and answers student questions. If student questions are emailed, he replies promptly. I believe that working in a group environment in CTHE also encouraged us to ask questions - whenever the team members could not agree on something, we always used to consult the tutor.

Getting students to ask questions is not an easy task, and according to my experience, there are students who never ask a question in the class. As a solution, Etkina (2000) has asked students to write the questions they have as a homework activity. Another solution is to take anonymous questions from students. Barkhuus (2005) presented a system that enables students to ask questions electronically and anonymously in-class. Barnes (1997) also used simple web-based applications to take anonymous student questions. He notes that anonymous questions encourage a wider group of students to ask questions.

4.8 Effectiveness of Homework

4.8.1 Overview

According to Cooper, Robinson, and Patall (2006), homework can be defined as “tasks assigned for students by school teachers that are meant to be performed during non-school hours”. Homework is an integral part of learning. According to Cooper et al. (2006), homework can be of three types:

1. Homework that provides the student with an opportunity to practice or review material that has already been presented in class.
2. Homework that introduces material to help students obtain the maximum benefit when the new material is covered in class.
3. Homework that involves the transfer of previously learned skills to new situations.

4.8.2 Benefits of Homework

Cooper et al. (2006) also list benefits for high-school students that appear to be valid in university context as well. These can be broadly categorized as immediate achievement and learning (such as better retention of factual knowledge, better critical thinking, concept formation, and information processing), long-term academic benefits (such as improved attitude towards institution, better study habits and skills, and more leaning during leisure time), and non-academic benefits (such as greater self-direction and discipline, better time organization, and more independent problem solving).

4.8.3 Disadvantages of Homework

Cooper et al. (2006) also provide a list of disadvantages of homework, which, most of the time is due to having to do excessive amounts of homework. These include loss of interest in academic material, physical and emotional fatigue, denial of access to leisure time and community activities, and cheating. Thus, similar to RBL (see Section 4.6), the teacher should be very mindful when giving homework.

4.8.4 Effectiveness of Homework in Higher Education

Conflicting findings have been reported by researchers related to the effectiveness of homework at university level. For example, while Peters, Kethley, and Bullington (2002) reported that homework has a negative impact on student performance, Rayburn and Rayburn (1999) reported the opposite of the same. Weems (1998) reported a mixed observation – performance of above average students improved with homework, but the performance of average and below average students did not increase.

In my opinion, this suggests that simply measuring the performance against the amount of homework given is not effective. Rather, it should be measured against the amount of homework completed by students and the skill level of students, because different students have different levels of commitment and attitude. In fact, these experiments should be designed in such a way that they consider all the parameters involved, such as amount of homework, frequency of homework, type of homework, and whether homework is assessed or not (Paschal, Weinstein, and Walberg (1984) reported that only assessed homework increased student performance of school children). However, I am not aware of such comprehensive study of homework at university level, although the same is available for school level (Cooper et al., 2006).

4.8.5 Making Homework Effective

In Section 4.8.3, it was discussed that it is important to properly design homework, in order to use it as an aid to improve student performance. In this context, Vatterott (2010) identified five fundamental characteristics of good homework:

1. Purpose: All assignments should be meaningful, and homework should not be given as a routine. In other words, when designing homework, the lecturer should have constructive alignment in mind. Most importantly, students should be made aware of the purpose of the assignment.
2. Efficiency: Homework should not take an inordinate amount of time and should require thinking
3. Ownership: feel connected to the content and assignment. This could be achieved by giving flexibility for the student to select the assignment.

4. Competence: Students should feel competent in completing homework, which suggests that different versions of the homework might have to be given to different students depending on their competency levels.
5. Aesthetic appeal: The homework should appear interesting to the student

4.9 Facilitating Active Learning in my Courses

4.9.1 In-class Group-based Problem Solving Activities

Pre-CTHE Practice

Although in all my courses it is very important for the students to learn how to apply the learned theories in solving problems, I have not addressed how to give this skill to students in a methodical manner. Sometimes I give a problem-solving activity towards the end of the class, and most of the time students do not have time to complete it, and I do not have time to discuss the answer to the given problem.

Objectives and Outcomes

The objective of this change applied to my CS2012 (Principles of Object Oriented Programming) course is to get the students to apply the learned programming fundamental concepts in solving real-life problems. I also intend to make this a group-based problem solving activity. Thus this has traits similar to PBL (see Section 4.5.4).

The outcome of this change is students achieving the corresponding HOTS, which lead them to achieve the ILOs.

Related LA: 02 (Appendix J.2) (when I submitted the LA, I just planned to give a learning activity at the end of teaching concepts. But later, I decided to carry out the learning activity in groups because of my first-hand experience on benefits of group-based learning at CTHE).

Rationale

As mentioned in Section 4.2.2, Kolb (1985) says that learning and problem solving are closely related. Moreover, in Section 4.4.1, the benefits of PBL were discussed, while in Section 4.5.2, benefits of group work were discussed. In my opinion, for PBL and group

work, their benefits outweigh the disadvantages. Thus these two learning strategies are worth practically exploring.

Moreover, from my experience from CTHE workshop, I found group-based learning activities extremely useful (See section 2.5.3).

Process

I started giving a small problem solving activity after teaching even a simple concept. In this section I only discuss the activities that I carried out in groups.

As mentioned in Section 3.5.2, for this experiment, I divided the class into two sessions, since the class size was 110 and the room was not enough for students to sit in groups.

As discussed in the objectives section above, these group-based PBL activities were used to help the students achieve the HOTS of “decompose” and “program”. These two learning activities are given in Appendices E.3 and E.4, respectively.

There was no prior group division. I just asked the students to make groups. Since this was the second lecture, many students did not know each other. So I tried to mix the students as much as possible. I also tried to get at least one girl per group, and asked Tamil students who were sitting together to go to different groups. This was done to get the students to communicate in English.

I used a pyramid group approach (see Section 4.5.1) – i.e., while sitting in groups, the students first attempted the activity individually, then I asked them to discuss among the group and prepare a group answer. Figures 4.2 and 4.3 show how students work individually, and how they discussed among the group, respectively.

In the first session, I got a representative from each group to write their answer on the board for the first learning activity – each group was improving the answer that was already there in the board. Figure 4.4 shows a student adding her group’s contribution to the solution on the board. In the second session, I wrote the answer on the board myself, but asked from each group for their input.

For the second learning activity related to “program” (where students had to write code), I did not ask the students to come to the board, because it is too much time taking to write the code on the board.

Finally, I collected the group answers for both activities, for formative assessment.



Figure 4.2: Students working individually, within the group



Figure 4.3: Students discussing their individual answers to develop the group answer

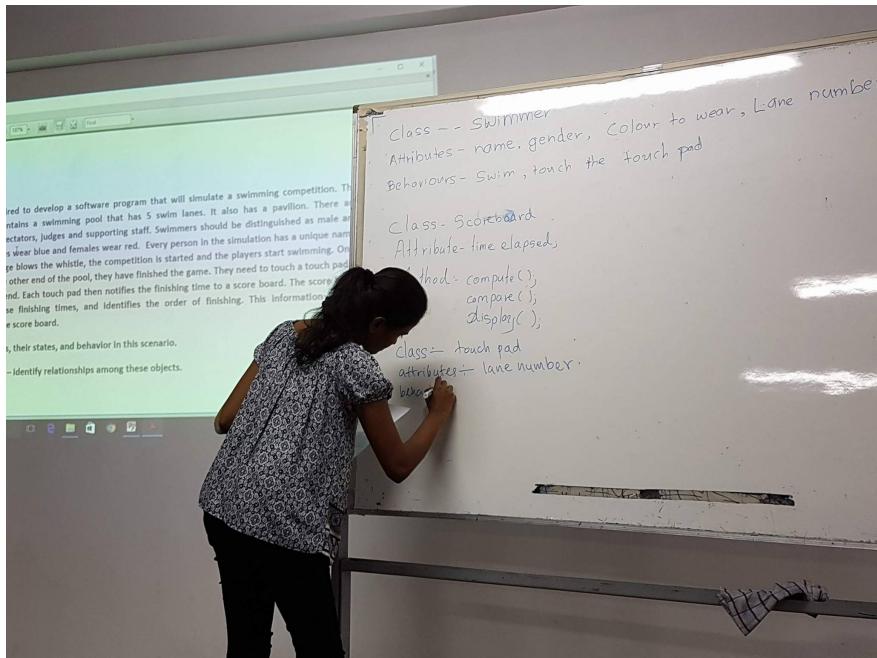


Figure 4.4: Student adding her group's contribution to the solution on the board

More details on this can be found in Section 5.4.3.

Observations

As already mentioned in Section 3.5.2, the students participated in the group-based learning activities very enthusiastically, even when I was out from the lecture room.

One issue I noted with getting students to write their answer on the board is that it is very time-consuming. That is why I did not get students to the board during the second session. When I discussed this issue with the colleague who did the peer evaluation for me (see Section 6.3.3), she suggested to use a traditional projector for students to come and present their code, the type of the projector used in CTHE workshops. I thought it is an excellent idea! The solution to my problem has been right under my nose all the time, but I did not see it until the peer pointed it out!

Moreover, I noticed that the class-room setup is not in the favor of group-based learning. As shown in Figure 4.3, the chairs were too big, and students could not easily communicate with all the other members. As a result, they communicated with the nearest members most of the time.

Another issue I noted was the time taken for the students to make the groups initially. Since students wanted to sit with their friends, I had to get involved in making groups.

Student Feedback on the Change

Questionnaire 4.1 was given to students to get feedback on group-based learning.

Questionnaire 4.1

Last week you carried out individual activities. This week you carried out group activities.

1. Out of these two, which method is more effective for learning?
2. What are the advantages of group-based learning that you experienced today?
3. What are the disadvantages of group-based learning that you experienced today?
4. Do you have any suggestions to make group-based learning more effective?

In total, 91 students submitted the filled questionnaire. Figure 4.5 shows a sample student response. 83 (91.2%) students clearly preferred the group-based activities, while 2 (2.2%) preferred individual activities (may be those who were already familiar with Java) and 6 (6.6%) preferred both. However, the two students who preferred individual activities have not answered the third or fourth questions, so it is not possible to determine why they did not like group-based activities.

Then I summarized the student feedback to second question, to know why they preferred group-based activities. Following is the summary:

- Get new information from other members - share knowledge
- Improve communication skills
- Can clear the doubts
- Less boring
- Get to know batch mates
- New ideas/knowledge emerge through brainstorming

It is interesting to see that this feedback is in-line with the advantages of group work discussed in Section 4.5.2. For example, Gibbs and Habeshaw (1989, p. 70) also noted

Last week you carried out individual activities. This week you carried out group activities.

1. Out of these two, which method is more effective for learning?

both of them

2. What are the advantages of group-based learning that you experienced today?

I could find some new information about the oop subject

3. What are the disadvantages of group-based learning that you experienced today?

Nothing

4. Do you have any suggestions to make group-based learning more effective?

ask questions to each others

Figure 4.5: Sample student form submitted as response to the group-based activity questionnaire

that new rich ideas emerge through group discussions. As noted by Gibbs and Habeshaw (1989, p. 70), personal and inter-personal benefits of group work are also there : personal benefits – improve communication skills, inter-personal benefits – get to know batch mates. Moreover, it can be seen that my effort to mix students when creating groups has been effective – it made students to sit with others than their friends, so they got to know new batch mates. Since there were Tamil students in the group, they had to communicate in English, which improve their communication skills. Also, as some students mention, with group-based activities, lectures become less boring.

As mentioned in Section 3.4.2, there are students who are already familiar with OOP concepts. When getting students to work in groups, those students can help weak students, which helps students accomplish their needs according to Maslow's hierarchy of needs. This is an additional benefit of group work as discussed in Section 4.5.2.

Not many have given the disadvantages of group-based activities. Table 4.2 shows the disadvantages, and the number of students who raised that issue.

It can be seen that some students perceived a common problem associated with problem-based learning – that it takes too much time (see Section 4.4.2). The issue with free riders has also been noted by some students. However, not everyone participating in the group discussion could be due to the bad physical arrangement of the group, as I mentioned

Issue	Number of Students
Takes too much time	8
Unnecessary talking	1
I did most of the work	1
Everyone does not involve	1
Language issues	1
Same people work together	1
Cannot fully assess my level	1
Difficult to communicate with some students	1

Table 4.2: Disadvantages of Group-based Learning, according to student feedback

earlier.

We have noted that there are some students who are very weak in English. May be those are the students who do not communicate. This shows another side of group work that we did not see – some students might feel threatened or at a discomfort during group-work, if they cannot communicate in English. This is a huge concern to our department as well, and there are discussions among staff on how to deal with these students.

Also, it appears that my attempts to create mixed groups have not worked for some groups – because it seems like that some students have managed to sit with their friends.

It is interesting to see that some students have given suggestions for improvements. Two students have asked to reduce the size of the group, may be due to the difficulty in reaching to all the members, as I also noted above.

One student has requested to make groups randomly and effectively. I guess this student, like me, noted that group formation took unnecessarily long time.

Another student has requested that if we are to have group-based activities, we should use the same group formation across all lectures. Interestingly, this is the CTHE practice as well. I guess this is because, when working with the same group, the students develop a sense of belongingness towards the group, just like we did in the CTHE groups (see Section 2.5.3).

Lessons learned

I think it is very important that I create the groups in advance, and ask the students to sit in the given group, as done at CTHE. This will save time during group formation. Group discussions are not effective with the type of chairs we have in the lecture rooms.

Decisions Made

I am very much in favor of group-based learning activities, due to my own experience at CTHE. Student feedback also asserted that group-based learning is effective. Some have requested to have group-based learning activities in the mid-semester feedback as well (see Section 6.3.4). However, for group-based activities to be effective, I should have a larger lecture hall, or should be able to have two lecture slots to break the class into two. Until these requirements are satisfied I will not carry out group-based activities. So I have decided to raise these issues during staff meeting, so that I can carry out group-based learning activities at least for the next batch of students.

In addition, I will make the groups in advance, and make sure they are randomly created. I will discuss with the Head of the Department to see if we could get a projector.

Analysis

This change proved that group-based learning activities is a potential solution to one of the five learning-related issues I identified – students falling sleep during lectures (see Section 3.5.2). As commented by students as well, group-based learning activities make lectures less boring. I believe that there should be changes at the university level to make group-based learning effective. For example, there should be lecture rooms similar to CTHE room, for lecturers who wish to carry out group-based activities. Also large batches should be broken into sub-groups, and correspondingly, lecture slots should be allocated in the time table.

4.9.2 Giving Complete/Partially Complete Handouts

Pre-CTHE Practice

I never gave handouts earlier in my lectures. Being an environmentalist, my justification for this was, if many students do not make use of the hand outs, it would be a waste of

paper. Come to think of that, I never even bothered to find out whether students actually made use of handouts or not.

Objectives and Outcomes

The objective of this change is to identify whether the learning process of students is positively impacted by giving completed or partially completed handouts (printed PowerPoint presentation slides).

Since the CS5612 Pattern Recognition class for postgraduate students has only 15 students, this class was the best option to experiment with giving handouts, because I would not have to print a large number of handouts.

The outcome of this change is an improvement in student note taking skills, skills in being attentive to the lecture, and the skill in working out Mathematical questions.

Related LA: 05 (Appendix J.5)

Rationale

In Section 4.6.5, I clearly argued with empirical evidence from literature that giving handouts, incomplete ones in particular, improved student recall, at least in the short-term. Moreover, PowerPoint handouts with gaps have been considered to be more effective by lecturers, as it encourages students to come to lectures , while students were also reported to prefer the partially completed handouts.

Process

First four weeks I did not give any handouts. Then I wanted to experiment with giving partially completed handouts. So I had to decide what to remove from the slides I used in previous semester. However, this was not very difficult since in most of the slides, some Mathematical calculations were included. When I was teaching, I used animations to load these calculations, so that I could first give the student a chance to calculate the answer, before showing the answer. So I removed the mathematical calculation parts from the slides.

The lecture was at 8am in the morning, and I went to the university at 7.55, planning to print the handouts. However, when I was just about to print, I realized that I have not properly removed some calculations from the slides. It was my mistake not to properly

check the final pdf after removing the calculations. Therefore I had to spend some time to get this right, so I was late to start the lecture.

Also, being the environmentalist, I did not want to print 15 copies of the presentation, since normally about 10-11 students turn up for the class. So I printed only 11. Interestingly, that week 14 students came to the lecture. So I had to pause the lecture twice to get more printouts.

Changes introduced on the Second week:

I was prepared well in advance for the second week, with the lessons learned from the first week. I prepared three versions of the presentation: one with the full content to be uploaded to Moodle after the lecture, the second one with animations added to some content to be used as the presentation to be played in class, and the third one with the animated content removed to be printed as handouts for students. Therefore there was no problem before the lecture in getting the handouts ready.

However, there was a problem with preparing the three versions of handouts “well in advance”. This is because, when I referred to the slides the night before the lecture date, I decided to slightly change some parts of the presentation. Therefore I had to change all three versions of the presentation.

After giving the partially completed handouts for 4 consecutive weeks, I gave the full handout. So I get the chance to compare the three options: no handouts, partially completed handouts, and full handouts.

Observations

Figure 4.6 shows students making use of the handouts to solve a Mathematical problem. Figure 4.7 shows how students are adding their own notes to the partially completed handouts.

During this same time, I collected student mid-semester feedback on the course (see Section 6.3.4). There, one student requested to print handouts in landscape mode. Therefore I did that in the coming week, and asked students what they preferred. Most of them preferred portrait mode. Then one student requested to make the slides bigger, so that the full space in the paper could be used. Then only I realized the problem: the Mathematical equations in the printout were very small, and there were barely readable. However, I am yet to find a way to increase the size of the slides.



Figure 4.6: Students Making use of the Handouts to Solve a Mathematical Problem



Figure 4.7: A Student Adding his own Notes to the Partially Completed Handout

Student Feedback on the Change

To assess student responses to the change, I gave Questionnaire 4.2. In this questionnaire, I focus on the three skills that I intend to see students developing with the help of handouts:

1. Skill in taking down notes
2. Skill in being attentive to the lecture
3. Skill in working out Mathematical examples

The first three questions in the questionnaire focus on these three skills, respectively. The final one takes the student recommendation on the type of handout that should be given in my next course.

Questionnaire 4.2

NH – No Handout, IH Incomplete Handout, CH Complete Handout

1. Order(best to worst) NH, IH and CH according to the ease of taking down notes
2. Order(best to worst) NH, IH, CH according to the ease of following the lecture
3. Order(best to worst) NH, IH, CH according to the ease of learning how to work out the mathematical examples
4. Which option do you want to follow in the coming courses?

11 students completed the given questionnaire. Table 4.3 summarizes the responses of these students. Figure 4.8 show a sample student answer for the questionnaire.

7 (63.6%) students think that having the full handout helps them in taking down notes, while 3 (27.3%) preferred incomplete handouts and 1 (9.1%) preferred no handouts for the same. I believe that this is because the amount of information they need to note down is less, when the complete handout is given. Otherwise, they have to spend more time in writing down notes.

Similarly, 8 out of 11 (72.7%) students think that having complete handouts help them to be more attentive to the lecture, and the remainder preferred incomplete handouts. This

note taking	following lecture	mathematical calculations	recommendation for future courses
IH, CH , NH	IH, CH , NH	IH, CH , NH	IH
CH, IH, NH	CH, IH, NH	CH, IH, NH	CH
CH, IH, NH	CH, IH, NH	CH, IH, NH	CH
IH, CH , NH	CH, IH, NH	IH, NH , CH	IH
CH, IH, NH	CH, IH, NH	CH, IH, NH	CH
CH, IH, NH	CH, IH, NH	IH, CH, NH	CH
IH	IH	IH	IH
CH, IH, NH	CH, IH, NH	CH, IH, NH	IH
CH, IH, NH	IH, CH , NH	IH, CH, NH	IH
NH, IH, CH	CH, IH, NH	CH, IH, NH	CH
CH, IH, NH	CH, IH, NH	CH, IH, NH	CH

Table 4.3: Summary of Student Feedback for the Handout Questionnaire

observation contrasts with what has been reported by Revell and Wainwright (2009). The authors reported that incomplete handouts are better at helping students to be attentive to the lecture. However, without knowing the exact setup of their experiments, it is difficult to come to conclusions.

In contrast to the first two questions, the last two questions show roughly equal preference for incomplete (5 students (45.5%)) and full handouts (6 students (54.5%)). As for learning how to solve Mathematical equations, students can learn better if they themselves try it out. Students who preferred this way of learning might have opted for incomplete handouts, while students who prefer to look at a solution and identify the steps and logic might have opted for full handouts.

Lessons Learned

Prepare the slides in advance, but create the three versions of the presentation on the night before the lecture. But make sure to double check the final pdf at least one day in advance before printing.

Please indicate your answers to the questions below, with respect to the three options: No handout (NH), incomplete handout (IH), and complete handout (CH)

1. Order (best to worst) NH, IH, and CH according to the ease of taking down notes

CH → IH → NH

2. Order (best to worst) NH, IH, and CH according to the ease of following the lecture

CH ← IH → NH

3. Order (best to worst) NH, IH, and CH according to the ease of learning how to work out the mathematical examples

CH → IH → NH

4. Which option do you want me to follow in the coming courses?

CH.

So we can focus on understanding material, not writing it down.

Figure 4.8: A Sample Student Response to the Questionnaire on Handouts

Decisions Made

Based on my observations and the student feedback, it is evident that students benefit by giving handouts. However, there is roughly equal student response to the type of handout that should be given in the next course: full or incomplete. But I will give incomplete handouts, since it gives students some challenge.

Analysis

Good thing about giving out handouts is I can ask questions based on previous slides. Once I asked a question from students, answer for which was already in a previous slide. Earlier, when I was not giving out handouts also, I used to ask questions referring back the previous slides, but I never really expected an answer from students since I know that it is difficult for the students to remember everything discussed in the slides. Interestingly, when I asked this question related to a previous slide, students were not responding even though they had the handout, as by out of habit. However, when I reminded them that they have the handout, they quickly turned over to find the answer. This, I believe is active learning. After this experience, I started to regularly refer to previous slides and ask questions.

The benefit of giving handouts can be seen from the handout page given in Ap-

pendix D.2. There, to provide the solution to the question in slide 33, the students have to refer to slides 31 and 32. Had there been no handout, I have to allocate time for students to write down all the related equations and the question.

4.9.3 Providing Homework Tasks and Related Material

Pre-CTHE Practice

For teaching, I mainly rely on the PowerPoint hand out. After the lecture, I upload the handout to Moodle. I do not give any additional material for the student to learn, nor do I give them any homework learning activities.

Objectives and outcomes

The objective of this change is to give additional learning material to students as an attempt to remind them of the basic concepts in Mathematics such as Matrix that they could have forgotten, and also to encourage them in gaining more knowledge related to the concepts taught in class.

The outcome of this change is students getting their knowledge refreshed on fundamental concepts in preparation to learn more advanced concepts, and students gaining additional knowledge on the topics discussed in the class.

Related LA: 07 (Appendix J.7)

Rationale

As mentioned in Section 4.8.2, one main objective of giving these homework activities is to save time – when the students on their own re-learn the basic concepts, I do not have to spend time in the class teaching the same concepts. Instead I can focus on new advanced concepts that are based on, or make use of these basic concepts. Brown et al. (1996) have also identified that by asking students to learn by resources, the lecturer can save time during lectures.

There is more than enough empirical evidence to show the benefits of both giving homework and resource based learning as discussed in Section 4.8, so it is worthwhile to experiment with both these. Finally, in this digital age, there are ample resources in the

World Wide Web, and it is time that we make use of these resources (Hill & Hannafin, 2001).

Process

I carried out this change for the Pattern Recognition course for postgraduate students. Initially I planned only to give some material for the students to refer to. However, as pointed out by Brown et al. (1996), simply asking the student to read some material will not work (see Section 4.6.3). Instead, some learning activities should be associated with the material they have to refer to. Therefore, I designed some learning activities for each set of the material that the students have to refer to.

Two variations of this change are planned: give a homework task and ask them to complete by finding material themselves, and give a homework task with associated material. The advantage of the former is that students are not constraint to the given material (see Section 4.8). Advantage of the latter is students are not burdened with spending time to find material, and do not run the risk of relying on out-dated material (see Section 4.6.3).

1. Give a homework task and ask students to complete by finding material themselves

My initial plan was to add a discussion forum in Moodle to get students to discuss what they found out in relation to the given topic. However, I later realized that doing something like that for Mathematics is difficult. So instead, for the first week I created some Matrix related questions (multiplying two matrices, getting the determinant of the matrices, etc), and added them as an assignment to Moodle. Students have to refer to material they find, and try to solve those questions.

My idea was that rather than giving an open goal as commenting on a discussion forum, to give them a definite goal, where they have to find material to solve the questions. In other words, here I believe that I have given them an HOLA, where they have to calculate the answers to given questions. Again, I emphasize that instead of simply giving a reading task to students, I have given them a task to solve based on the material they found- this gives them the purpose to refer to material (see Section 4.8.5). Figure 4.9 shows part of the given homework activity. The questions are related to basic matrix manipulation. The student is expected to possess this basic knowledge, and these basic manipulation operations are used in some advanced Pattern Recognition topics. Since

- Find the addition of the matrices A and B

$$A + B = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix} + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

- Find the determinant of the following 2X2 matrix

$$\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$$

- Multiply the vectors A and B

$$A = \begin{bmatrix} 2 & 3 \\ 1 & 1 \\ 1 & 0 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$$

Figure 4.9: Homework Activity Related to Matrix Calculations

some students might have forgotten the matrix basics they learned at undergraduate level, and since I do not have time to discuss them in lectures, giving homework is the best option.

I also said that although it was added as an assignment to Moodle, no marks are given. I just wanted to see the enthusiasm of students in self-learning, if no marks are allocated. Also, since this LA came after I announced how CA (Continuous Assessment) marks are decided, it is not ethical to give them a graded assignment. However, I indicated that questions related to the homework tasks could appear in the mid-semester examination paper.

On the second week, I gave two homework activities: In the first case, basic introduction to measure the difference between vectors was done in the class, and the students were asked to find material on different distance measurement techniques and prepare a report that contains the use of each technique and its pros and cons. Again, this is a HOLA, where students have to evaluate each technique. Similar to the previous task, this task also saved me time to elaborate more on essential concepts. Figure 4.10 shows the given assignment.

2. Give a homework task with associated material

The other homework task was to find out possible improvements to make the kNN (k

Distance calculation techniques - assignment (submit your answers)

For each of the following distance calculation techniques, briefly describe how the distance calculation is done, pros and cons of the technique, and when the distance measurement technique is commonly used.

Minkowski distance
Chebyshev distance
Hamming Distance
Cosine distance

List the web references you used.

Figure 4.10: Homework on Vector Distance Measurement Techniques

Nearest Neighbour) classifier efficient. Basic operation of kNN was discussed in class. In contrast to the previous two tasks, I gave a research paper as supporting material for this task. Students were supposed to go through this research paper and identify the kNN performance improvements described in that paper. I initially thought of asking student to find material to this as well. However, when I myself tried to filter useful material, I realized that it requires the students to go through many complex research papers, and of course, some research papers are out-dated (as discussed in section 4.6.3, this is an issue that lecturers should be mindful of). Therefore, I spent some time on finding a good research paper that summarizes different kNN improvement techniques, and asked the students to refer to that paper only. Since the paper they had to read was complex, I gave a LOTS (related verb - identify). Figure 4.11 shows this assignment.

The three assignments published in Moodle are shown in Figure 4.12.

Observations

On the first week, 8/14 (57%) students have submitted answers at the end of the week (3 others have submitted much later). I acknowledged the submission in the next lecture, and gave answers and a presentation to learn more about matrices. And because the students got certain that I will not go and evaluate individual submissions, submissions for the second week dropped to three for the first task, and one for the second task. Proving that my hypothesis is wrong, task for which I provided supporting material had the lowest submission rate. However, I assume this is due to this last task being much more difficult. Since the levels of difficulty in the tasks differ, it is not very accurate to compare these tasks on the basis of giving and not giving supporting material.

However, two interesting observations could be made:

1. For homework task 2, one student has submitted not only the description of the tech-

Performance improvement of knn algorithm

In the lecture, you learnt the complexity of the basic knn algorithm. There is was mentioned that it is possible to improve the efficiency of the algorithm by using different techniques.

Use the given research paper as the beginning, and create a list of five techniques (with a brief explanation of each of the technique) proposed in the literature to reduce the complexity of knn. List the references you used.

Figure 4.11: Homework on Improving Efficiency of kNN Algorithm

The screenshot shows a list of assignments for the month of June 2013. The assignments are grouped by week:

- 3 June - 9 June:** resources, Parameter Estimation I
- 10 June - 16 June:** parameter estimation II
- 17 June - 23 June:** matrix - practice questions (please submit your answers) (highlighted), Non-parametric methods I, matrix questions doc, Matrix
- 24 June - 30 June:** non-parametric methods II, Distance calculation techniques - assignment (submit your answers) (highlighted), Performance improvement of knn algorithm, An Optimal Algorithm for Approximate Nearest Neighbor Searching in Fixed Dimensions

Figure 4.12: Assignments Published in Moodle

niques, but also the code implementation of each of the techniques. Interestingly, this was one of the very weak students in the class (he failed my previous module). I think this is somewhat in-line with the observation made by Weems (1998) (see Section 4.8.4), that some students benefit by homework. In other words, it is all about student's attitude and motivation. I believe this particular student was motivated to pass this module, since he failed the previous module. So he was putting extra effort.

2. There was one student who did all three assignments. Interestingly, he was absent in the week I gave the second and third homework tasks (week after the first homework task). Thus, he did not know that I did not give individual feedback for submissions. So I believe that he was under the impression that I evaluate all the assignments. So he spent his time to do the assignments.

Student Feedback on the Change

Since this LA implementation did not work out as I expected, the CTHE course tutors asked me to take student feedback on why they did not do homework. I gave Questionnaire 4.3 to students. Figure 4.13 shows a sample student feedback.

Questionnaire 4.3 Recently, you were given three homework tasks. Some of you completed them, and some of you did not. Therefore, I would like to know your reasons for doing or not doing the assignments.

Please provide your answers for each of the three assignments separately.

1. Did you do the Matrix homework?
2. Why did or didn't you do the Matrix homework?
3. Did you do the vector distance measurement techniques homework?
4. Why did or didn't you do the distance measurement techniques homework?
5. Did you do the KNN efficiency improvement assignment?
6. Why did or didn't you do the KNN efficiency improvement assignment?
7. Do you think that giving homework activities is an effective practice for student learning?
8. Do you have any suggestions to make students do homework?

It was interesting to see that although many students have not submitted their answers to Moodle, they have claimed that they have done the assignment. Some have admitted that they did it just before the mid-semester examination, because they thought that there would be questions for the mid-semester exam from homework tasks.

Out of the 10 students who claimed to have done the Matrix homework, 7 said they did it because they wanted to refresh their knowledge on Matrix. This shows that my effort has been successful in getting students to refresh their knowledge on Matrix before new concepts that make use of Matrix are taught. 3 students have done it because it was an easy task! I think this is a very interesting observation. Had this task been difficult, these students would not have attempted it even though they are required to refresh their

Recently, you were given three homework tasks. Some of you completed them, and some of you did not. Therefore, I would like to know your reasons for doing or not doing the assignments.

Please provide your answers for each of the three assignments separately.

1. Did you do the Matrix homework? Yes/ No
2. Why did or didn't you do the Matrix homework?
To remember the matrix calculation, & theories on matrix
3. Did you do the vector distance measurement techniques homework? Yes/ No
4. Why did or didn't you do the distance measurement techniques homework?
To get to know different distance measurement techniques used in Pattern Recognition.
5. Did you do the kNN efficiency improvement assignment? Yes/ No
6. Why did or didn't you do the kNN efficiency improvement assignment?
Because of timeline and to get the correct details of kNN improvement needed to read research papers.
7. Do you think that giving homework activities is an effective practice for student learning?
Yes. It is effective way to learn & remember the theories and equations studied in the lectures.
8. Do you have any suggestions to make students do homework?
Break the assignment into small tasks and try to do each small assignments in weekly wise.

Figure 4.13: Sample student response for homework questionnaire

knowledge. Out of the two students who did not submit the answers, one has said that she already knows Matrix. Other one did not have time.

6 students (note that there were some late submissions) have claimed that they submitted the answer to the second homework task on distance measurement techniques. Two out of these have done it because they thought there would be questions from this homework for the mid-semester examination. Two students have indicated that they did the assignment because they wanted to know more about the distance measurements, and one has indicated that the homework was interesting. The former response is exactly what I needed – that students do homework because they wanted to know more about a topic. The latter also give a good lesson – that homework should be interesting to the student (see Section 4.8.5). From those who did not submit the answers, one has said he did not give priority to homework since it was not considered towards the grade – this is another example to show that students are motivated by assessment, as mentioned by Gibbs and Habeshaw (1989, p. 23). Others have said that they did not have time.

As mentioned earlier, the last homework was the hardest. Consequently, only one student has submitted the answer, because he “wanted to know more on the state of the art related to kNN”. Out of those who did not do the assignment, one has given the reason as the homework not being considered towards the final grade. All the others have said

that they did not have time. One student's response is worth noting down: "Not enough time to read about the topic. This was a hard problem over first two. You can't just Google and find the answers". This same student has said that he did the Matrix homework since it was easy. It seems that this student is the type that does not like challenges.

Even though some of the students did not do homework, they all agreed that giving homework activities is an effective practice for student learning. As for suggestions to make students do homework, 2 students have suggested to allocate marks for homework (this attests the claim made by Brown et al. (1996)). 3 students have asked to give interesting homework (the same advice is given by Vatterott (2010), that homework should appear interesting to the student (see Section 4.8.5)). One student has asked to give simple and small tasks. I think this is related to the amount of time they have to spend on homework. Vatterott (2010) also suggests that homework must not take an inordinate time. This latter student has said that he did not do the last homework since it involved reading and researching. 2 students have requested to allow them upload scanned copies of their workings done on paper.

Lessons learned

Giving two homework tasks for the same week is not a good idea, as this could overload the students. This is a common mistake done by lecturers, as discussed in Section 4.8.3.

Also, one criterion for effective homework (see Section 4.8.5) was not met by the first homework activity. In other words it lacked purpose because the matrix homework task was given well in advance to the lecture that actually required this basic matrix knowledge.

Students do not want to spend time on typing answers for the homework.

Finally, students are very much motivated by assessment.

Decisions Made

When I teach this module again, I should assess these homework activities, and marks should be included in the CA (Continuous Assessment) component. I should allocate some time from the lecture to discuss answers to the homework tasks, and to provide feedback on individual student submissions.

Moreover, as already discussed above, I should properly plan the homework tasks.

Matrix homework task should be given immediately before the lecture that makes use of matrices. So when announcing the homework, I should explain that this knowledge would be useful for them to understand the next week's lecture better.

I should allow students to do the homework (Mathematical calculations, in particular) on a piece of paper and upload the scanned copy.

Analysis

In Section 4.8.1, three types of homework were presented based on the findings of Cooper et al. (2006). The first homework activity I gave falls into the second category. However, other two activities do not fall clearly into any of the other two categories. Thus I believe a new type of category should be added to Cooper et al. (2006)'s categorization – homework that helps students to gain additional knowledge on top of what was learned in the lecture.

This change used both homework and resource-based learning to improve student learning with respect to two aspects: helping students obtain maximum benefit when the new material is covered in the class, and helping students to gain additional knowledge on top of what was learned in the lecture.

Looking at the literature, it is not very hard to learn why this change did not work out.

1. Homework was not assessed: Brown et al. (1996) say RBL should be assessed. Similarly, in Section 4.6.3, it was highlighted that only assessed homework increased student performance (Paschal et al., 1984). I believe that these two observations in the literature give one possible reason for not getting this change to work out.
2. Homework was not planned properly so that it overloaded students when they got three homework tasks in two weeks (see Section 4.6.3).

4.9.4 Encouraging Students to Ask Questions

Pre-CTHE Practice

Whenever I finished discussing a particular topic, I asked students whether they have any questions. However, students seldom raise their hands and ask questions.

Objectives and outcomes

The objective of this change is to get students to clarify their doubts by asking questions from the lecturer. The outcome of this change is students having successfully achieved LOTS, and their doubts while achieving HOTS are clarified.

Related LA: 01 (Appendix J.1)

Rationale

As discussed in Section 4.7.2, getting students to ask questions have many benefits for both students and the lecturer. Moreover, Van Zee et al. (2001) (see Section 4.7.4) emphasized that the lecturer should take elicitation moves to encourage students to ask questions. In Section 4.7.4, letting students to ask questions anonymously was identified as being more effective.

Students not asking questions is one of my 5 problems in teaching/learning, thus I want to take some action to address this problem.

Just before starting the CTHE course, I visited an academic gathering, where I met a Taiwanese professor who said he is using a “smart classroom” to get students to pose questions they have during a lecture. I found this technique very interesting and useful.

Process

As mentioned in the LA, my initial plan was to implement a simple online platform and enable students to pose questions as done by the Taiwanese professor that I met. My plan was to introduce a bit of blended learning (Garrison & Kanuka, 2004) to the course.

However, when I checked with students, some did not have smart phones. Moreover, some did not have data connections, and the department Wi-Fi point in the lecture room was not strong enough to get 110 students to connect to it at the same time. Therefore I asked the students to write their questions in a piece of paper and pass it. After all, they are familiar with this because of the tuition culture.

Observations

When I first asked the students to pass on their questions, I received two questions. Figure 4.14 shows these two questions.

what is the
Difference between a class
^ and an entity.

What is the difference between
attributes and properties?

Figure 4.14: Student questions that I received on the first week

However, after giving a learning activity, I walked round the class. Then three students stopped me and asked questions. Then I realized that it is more effective, since it gets the student to engage in a conversation, rather than simply asking a question. In fact, this mechanism is used by the CTHE course tutor as well (see Section 2.5.3).

Therefore, while allowing students to pass on their written questions, I started to walk around the class after giving a learning activity.

Moreover, at the beginning of each class, I gave students a chance to pass down the questions/doubts/parts they did not understand related to the previous lecture. This was also successful, as I received two questions that asked questions related to some complex concepts that I discussed in the previous week.

So each week, I received at least one written down question. But one of these questions is worth noting (See Figure 4.15), because I did not know the answer to this question! In fact, this question challenged one point I raised in the class! So I promised to find and present the answer in the next lecture, and did as I promised.

In Section 4.7.3 I discussed types of student questions. Out of these, the two questions shown in Figure 4.14 fall into factual type of information questions – the students just wanted to recall the basic concepts that were discussed earlier, and are closed questions. In contrast, question shown in Figure 4.15 is a very good example for a wonderment

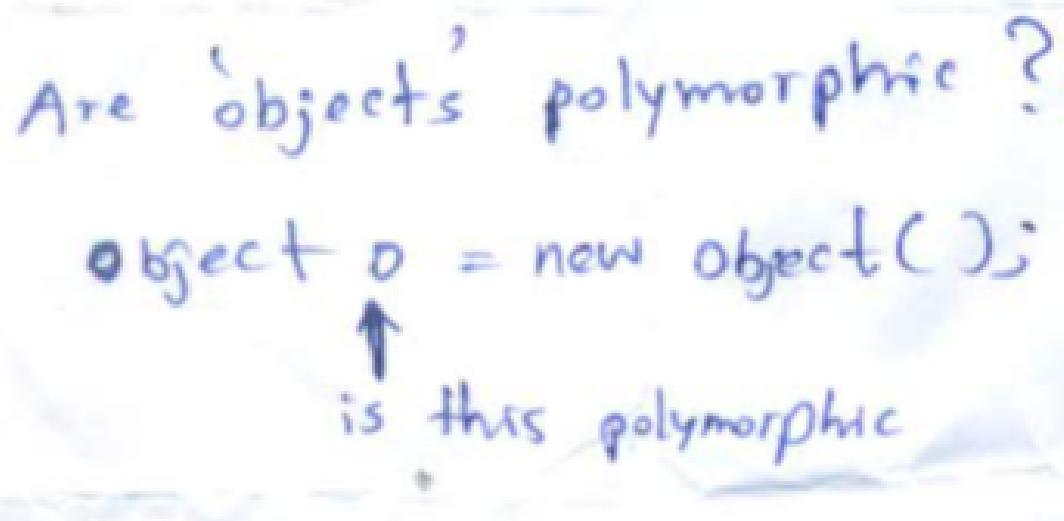


Figure 4.15: A wonderment question

question.

Now in effect, I am using three mechanisms to get students to ask questions:

1. Raise the question while I am teaching in front of the class
2. Let students ask questions while I am walking around the class
3. Let students write down the question in a piece of paper and pass to me

Student Feedback on the Change

In order to identify which method the students preferred the most, I gave Questionnaire 4.4.

Questionnaire 4.4

You have been given different options to ask questions from the lecturer:

- a) Raise your hand and ask when the lecturer is in front of the class
 - (b) Ask questions when the lecturer comes to you
 - (c) Pass a small note with your question
- (1).Out of these, which option do you prefer, and why?
(2).What are the advantages of option(c)?

91 students provided feedback to this questionnaire. Figure 4.16 shows a sample student answer.

You have been given different options to ask questions from the lecturer:

(a) Raise your hand and ask when the lecturer is in front of the class

(b) Ask questions when the lecturer comes to you

(c) Pass a small note with your question

(1) Out of these, which option do you prefer, and why?

c

* easy to explain the problem

(2) What are the advantages of option (c)?

No need to wait until the time comes. to ask the

Figure 4.16: A Sample Student Answer to the Questionnaire on Asking Questions

Benefit	Number of Students
Language is not a problem – Even those who are not good at speaking in English can ask questions. Many students are better at writing than speaking English	31
Anonymity – Those who are shy to ask questions can also ask questions. Moreover, even if the question is a silly one, no one would know who asked the question	18
The whole class benefits, since everyone hears the question and the answer	9
No need to wait till the lecturer gives time to ask question. Student can write down the questions so that he does not have to remember it to be asked later. Can even ask a question related to a previous week as well.	7
Everybody gets a chance to ask questions	2
It does not disturb the class	2
Higher engagement in the class	2

Table 4.4: Benefits of writing down the question on a paper

46 (50.5%) students preferred writing down the question, followed by asking questions when I walk around the class (38 students (41.8%)). Only two students preferred asking question while I am in front. This clearly shows that my pre-CTHE practice to get students to ask questions was not effective at all.

Table 4.4 contains the advantages of writing down the question, according to student feedback. They are ordered most-frequent reason, to least frequent reason.

The most prominent reason for asking questions when the lecturer walks around is that students can engage in a discussion with the lecturer, until their doubts get clarified.

Some have even written down why they do not want to ask questions when the lecturer is in front of the class: it disturbs the whole class, and the attention of the whole class is drawn towards the student who is asking the question.

Lessons Learned

Do not use technology related activities, if all the students do not have equal access to that technology.

Decisions Made

Based on student feedback, it is evident that allowing students to write down their questions is extremely beneficial. So I will continue to do this.

Analysis

With this change, I believe that I successfully overcome one of the main issues in teaching/learning that I identified: that students do not ask questions.

4.10 Changes I Have Done During CTHE

As discussed in this chapter, I have carried out four changes that positively affected how students learn.

1. After discussing a concept, give a problem-solving activity to students so that they have to make use of the concept they learned. Carry this out in the form of a group-based learning activity.
2. Giving partially completed and full handouts
3. Providing homework tasks and related material
4. Getting students to write down the questions they have during the lecture

4.11 Summary of SEDA Outcomes and Values Addressed in the Chapter

4.11.1 SEDA Values:

1. Developing understanding of how people learn:

Section 4.9.1 - I used in-class group-based learning activities in order to support active learning in students – I learned that group-based learning is preferred by students. Moreover, as discussed in Section 4.5.2, group-based learning supports students at different levels of the Maslow's need hierarchy.

Section 4.9.2 - I gave full and partially completed handouts to students. From their feedback, I learned that giving full handouts help them better in taking down notes and being attentive to the lecture. However, to learn how to solve Mathematical questions, both full and partial handouts were equally preferred.

Section 4.9.3 - By giving homework tasks and related material, I tried to get students (1) to refresh their knowledge on basic Mathematical concepts before teaching them more advanced concepts, and (2) gain additional knowledge on top of what was covered in the classroom. Although this change was not successful, I learned that students are not very much motivated to learn new concepts on their own, if what they have to learn is not assessed.

2. Practicing in ways that are scholarly, professional and ethical:

Section 4.9.4 – There are students who are shy, and who find it difficult to speak in English. Thus if I just ask them to ask their question in front of the whole class, it is not fair for them. Thus, I believe I tried to be ethical, by giving everyone a fair chance to ask questions. Moreover, I did not make use of an online platform to get student answers, since there were students without smart phones or Internet access.

Section 4.9.3 – although I identified that student do not do homework since it is not assessed and counted towards the final grade, I did not start giving marks to homework, since it is not ethical to deviate from the assessment criteria defined at the beginning of the semester.

3. Working with and developing learning communities:

Section 4.9.1 – With the use of group-based learning activities, I got students at different levels of knowledge to work together. Thus, weak students got benefitted by others. Moreover, as the students themselves highlighted, they were able to elicit new knowledge through group discussions.

Section 4.9.3 – By giving homework and related material, I tried to make them

responsible and sustainable learners, by trying to develop the habit of finding new knowledge.

Section 4.9.4 – I created a learning environment that encouraged students to ask questions, so that they can develop the habit of asking questions to clarify the doubts they have.

4. Valuing diversity and promoting inclusivity:

Section 4.9.1 – As already mentioned, there are students with different levels of skills and knowledge. By getting them to work in groups, weak students can learn from others.

Section 4.9.2 – there are students who prefer to simply look at the note and learn how to solve Mathematics problems, while others prefer to work out the problems themselves. In order to check on this, I experimented with giving both full and partially completed handouts.

Section 4.9.3 – For students who are motivated to learn (just like the weak student who was in my Pattern Recognition class), giving homework and related material is a bonus.

Section 4.9.4 – there are shy students, and there are students who are not good in speaking in English. This diversity is acknowledged by giving them the opportunity to write down their questions.

4.11.2 SEDA Outcomes:

1. Use a variety of methods for evaluating your teaching

For the four changes I implemented with respect to learning, I collected student feedback. The feedback forms contained multiple choice questions, and questions that required students to write their comments. Responses to the former were analyzed, which give a clear visual representation of the responses. I also analyzed student comments to get more insights.

2. Inform your practice with relevant strategy, policy and quality considerations.

Section 4.9.1 – For students to evaluate the benefits of group-work against individual work, I first gave individual exercises, and in the next week I gave the group

work, so that they can better compare the two.

Section 4.9.2 – For students to decide which type of handouts (full or partial), is better suited, I used a scaffolding approach where the students were first given no handouts, then partial handouts, and finally, completed handouts.

3. Use a range of methods of teaching and supporting learning, assessment and feedback, appropriate to the learners, subject and context, including use of appropriate technologies

Section 4.9.1 – I experimented with group-based learning activities as opposed to individual learning activities to better support student learning.

Section 4.9.2 - I gave the students a chance to select the type of handouts they prefer, by using a scaffolding approach.

Section 4.9.3 – When I wanted students to refresh their basic knowledge and gain additional knowledge, rather than simply giving them material to read, I gave them an associated activity, so the students will see the purpose of referring to material.

Section 4.9.4 – I used a novel method to get students who are shy and/or poor in English to raise their questions.

4. Create a learning environment that includes student support and guidance.

Section 4.9.1 – By introducing group-based learning, I got good students to support weak students, and to elicit new knowledge through discussions.

Section 4.9.2 – I gave handouts to students to improve their note taking skills, skill on being attentive to lecture, and to improve their skill on Mathematical problem solving.

Section 4.9.3 – By giving additional material to read, I tried to make students sustainable learners, who would find more knowledge beyond what was taught in the lecture. I guided them by giving the most relevant material to read.

Section 4.9.4 – I supported students with communication difficulties to ask questions by allowing them to write their questions down. Thus, the learning environment became friendly, and they were willing to get their doubts clarified by the lecturer.

4.12 Chapter Summary

In this chapter I presented a detailed discussion on the changes I carried out to improve student learning in CS2012 undergraduate course, and CS5612 postgraduate course. The selected changes have been hailed by other researchers as being successful in improving student learning, and I provided my evidence from CTHE course as well. Furthermore, I discussed my observations while implementing these with reference to the related literature.

Chapter 5

Assessment

5.1 Introduction and Outcomes of the Chapter

Intended outcome of this chapter is a detailed analytical discussion on the changes I implemented with respect to assessment in my courses. Selection of each of these changes is justified by evidence from related literature. My experiences and observations while implementing the changes are also related to observations in the literature.

At the end of the chapter, the reader should be able to identify

1. Benefits and importance of formative assessment
2. Benefits of giving timely feedback to students
3. Benefits of using analytic marking rubrics

To experiment with changes on learning, I selected two modules: CS5612 - Pattern Recognition (a postgraduate course), and CS2012 - Principles of Object Oriented Programming (an undergraduate course).

5.2 Theoretical and Empirical Foundations

5.2.1 Importance of Assessment

Assessment is the third and final pillar of constructive alignment. In other words, assessment is required to make sure that we know the students have achieved the ILOs that they

are expected to achieve through our teaching and their learning. This fact itself suffices to highlight the importance of assessment.

In addition, assessment has been identified as a factor that improves student learning (Black & Wiliam, 1998). Brown, Race, and Smith (2004) state that assessment helps students to learn from their mistakes or difficulties, and they can check how well they are developing as learners. This can be explained with respect to the 3P model (Section 3.2.3) as well. When the student knows his difficulties and mistakes, she can change to be in a better position in her presage stage for the next module she is going to take. Assessment also causes students to get serious about learning. If properly designed, assessment can be used to improve student motivation to learn. This is why Gibbs and Habeshaw (1989, p. 23) say that students are driven by assessment.

5.2.2 Types of Assessment

While assessment is important, it is equally important to carry out the correct form of assessment. The greatest scientist of all times, Albert Einstein once said “Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid”. However, if the lecturer goes by constructive alignment, selecting the type of assessment is not so difficult – all she has to do is to set up assessments that measure the student achievement with respect to ILOs. For example, in the CS2012 module, for the ILO “analyse a problem and decompose to programmable objects”, there should be an assessment task that gives a problem to students and get them to decompose it into programmable objects.

Depending on the purpose, assessment can be categorized as Norm-Referenced Assessment (NRA) or Criterion Referenced Assessment (CRA).

NRA

In NRA, assessment results are used to compare between students. Closely related to NRA is the concept of “grading on the curve”. Here, the assessment results are expected to fit into the “bell curve”, which means that the results data shows a Normal (Gaussian) distribution. In this distribution, the student population at the two ends (those who got very high marks, and those who got very low marks) is (at least roughly) equal, and is lower than the population that scored average marks. Experienced scholars such as Biggs

and Tang (2007, p 36) criticize this kind of NRA. According to them, the results should not fit into a bell curve. Rather, had the lecturer done her job properly, there should be many students who achieved high marks, and a very small number of students who achieved very low marks. Although criticized by scholars, NRA, at least for me, helped me to take a decision at a turning point in my life while at high school. As described in Section 1.4, since I became the class first during the first term in my A/L class, I continued with the Physical Science stream, instead of changing to Commerce stream.

CRA

In CRA, assessment is “designed to assess changes in performance as a result of learning, for the purpose of seeing what, and how well, something has been learned” (Biggs & Tang, 2007, p 177). Here we can interpret “something has been learned” as the student achieving the ILOs. Thus, in CRA, the objective is not to compare students with each other, but to compare a student’s performance with respect to the ILOs she is expected to achieve.

Depending on when these assessments are conducted, assessments can be broadly divided as “formative assessment” and “summative assessment”.

Summative Assessment

Summative is the more traditional form of assessment. It provides a systematic way to record the overall achievement of a student (Harlen & James, 1997). Therefore, summative assessment is carried out after teaching is completed, at the end of the semester or year. Thus, the result produced by summative assessment is final. This result is used to grade students at the end of the course. According to Harlen and James (1997), summative assessment can be either NRA or CRA.

Formative Assessment

Black, Harrison, Lee, Marshall, and Wiliam (2004) coined the term “assessment for learning”, to refer to any assessment “for which the first priority in its design and practice is to serve the purpose of promoting students’ learning”. In order to promote student learning, the assessment activity should provide feedback for both students and teachers to assess themselves and one another. This feedback helps in modifying the teaching and learning

activities in which they are engaged. This type of assessment is referred to as formative assessment (Black et al., 2004). Thus, in my opinion, it is formative assessment that in fact improves student learning.

In contrast to summative assessment, formative assessment is expected to be CRA. However, unwittingly, many formative assessments have both CRA and NRA. Biggs and Tang (2007, p. 177) criticize this.

However, Harlen and James (1997) state that this is unavoidable, and formative assessment can be both CRA and NRA, since judgment about an individual's progress with respect to others is sometimes useful to identify obvious problems.

According to the TDA model, during the first part of the course, when students are going through the transition phase, more formative assessment has to be given. Later, when students are in development and achievement stages, more summative assessments can be given.

5.2.3 Giving Feedback to Students

As already mentioned in Section 5.2.2, giving feedback is tightly coupled with formative assessment. Biggs and Tang (2007, p. 193) coin the term "formative feedback" to refer to feedback given to students in formative assessment. Shute (2008) defines formative feedback as "information communicated to the learner that is intended to modify his or her thinking or behavior for the purpose of improving learning".

In fact, the real benefits of assessment such as students being able to identify their mistakes as discussed in 5.2.1 can be yielded by providing feedback during formative assessment. Biggs and Tang (2007, p. 97) argue that this is a top-listed factor that leads to good learning. Shute (2008) analysed a large amount of research and concluded that the advantages of formative feedback, both to the students and the lecturer, clearly outweigh the disadvantages of the same.

According to Black and Wiliam (1998), when giving feedback, it is the nature, rather than the amount, of commentary that is important. According to the authors, feedback is useful only if students use them to guide future work. Thus, the nature of feedback should be motivational, and in order for the student to use it, feedback should be instructional.

According to Shute (2008), the lecturer can select different ways to give feedback to students. These vary from a simple verification of response accuracy to worked exam-

ple, with other feedback types such as correct answer explanation and hints in-between. Moreover, feedback can be given immediately following student submission (which is very easy if computer-aided assessment is used), or after some time. The former has been hailed by students in greatly helping them in making most out of feedback (Shute, 2008). I believe that this may be because the students are still fresh with the memory of what answers they gave for the assessment, and the reasons behind giving those answers. This assertion is based on the observation made by one of my CTHE colleagues. As one of her learning agreements, she has given feedback for the mid-term examination. However, she has taken about a month to do this, and the students have complained that they do not remember what made them write the answers they wrote for the mid-term examination!!

5.2.4 Designing Assignment Assessment Rubrics

As already mentioned in this chapter, one of the main objectives of assessment is to measure how well students have achieved ILOs. This achievement can be expressed in the form of a hierarchy of levels, with the use of a rubric (Biggs & Tang, 2007, p. 178). Airasian and Russell (2001) define an assessment rubric as “a set of clear expectations or criteria used to help teachers and students focus on what is valued in a subject, topic, or activity”. According to the authors, a rubric “includes both the aspects or characteristics of a performance that will be assessed and a description of the criteria used to assess each aspect”.

In particular, use of rubrics in assessment can greatly improve both intra-judge reliability (same person making the same judgment about the same performance on two different occasions) and inter-judge reliability (different judges make the same judgment about the same performance on the same occasion) of assessment (Biggs & Tang, 2007, p. 188).

A rubric could be either holistic or analytic. In a holistic rubric, the lecturer scores the overall product or the process, without judging the component parts. In contrast, in analytic rubrics, separate individual parts of the product are scored first, and these scores are summed up to obtain the total score (Mertler, 2001). The benefit of using holistic rubrics is the less time it takes to develop it and assess student submissions using it. Since holistic rubrics give an overall assessment of a product, they are more suitable for summative assessment (Mertler, 2001). In contrast, analytic rubrics take more time to develop, and to

assess student submissions using them. However, assessment using analytic rubrics can provide a significant level of feedback, both to the lecturer and students, where students can receive feedback for individual scoring criteria (Mertler, 2001).

5.3 Open Book Examinations

As the name implies, in open book examinations, students are allowed to refer to their notes and other material. Although at a glance, open book examinations appear to be a better alternative to closed book examinations, previous research has made mixed observations.

Theophilides and Koutselini (2000), whose study results favored open book examinations note two positive study behavior of students with respect to open book examinations – while preparing for, and while taking the examination.

- **Preparation stage** - when studying for open-book examinations, “students work with the purpose of collecting and organizing the material for use during the exam”, whereas in closed book examinations, [student’s] “effort is directed mainly towards collecting and memorizing information so that it is readily available for use during the actual taking of the exam”. Thus, referring to the SOLO taxonomy, they argue that when preparing for open book examinations, students strive for deeper knowledge by trying to draw relationships between the topics they have learned.
- **During examination stage** – In open-book examinations, the student is able to creatively use the knowledge she has already collected.

Furthermore, Theophilides and Koutselini (2000) reported that open book examinations reduce examination tension and stress. Similar finding was reported by Broyles, Cyr, and Korsen (2005).

However, benefits of open book examinations can be reaped only if the students prepare for the examination as expected by Theophilides and Koutselini (2000). If the students simply bring their notes to the examination without bothering to “deep learning” them, I do not think the students can get any benefit by open book examinations. Boniface (1985)’s study confirms my argument, where he found out that who devoted more examination time to using notes and texts obtained less good scores.

It should be noted that these observations on open book examinations heavily depend on the type of questions given for the examination, i.e. the type of cognitive skills required to answer each question. As shown by Brightwell, Daniel, and Stewart (2004), if the questions in the examination only cover upto Bloom's level III cognitive skills, there is no significant difference in student marks. This observation is not surprising at all. For most of the questions that only cover upto Bloom's level III, each student can simply look up the answer from the notes, and it does not require much creative thinking or analytical skills.

Therefore, as noted by Kalish (1958) as well, it is important that the lecturers realize that close-book and open book examinations should be used to measure different levels of cognitive skills, and use the correct type of examination that best suits to the type of skills that they want to measure. However, I believe that if a lecturer sets up an examination with constructive alignment in her mind, this is not at all difficult. Normally, course ILOs refer to higher levels in Bloom's taxonomy. If we plan to test if the students achieved these ILOs, I believe that there is no issue in using open book examinations.

5.4 Effective Assessment in my Courses

Below sections describe the changes I carried out with respect to student assessment in my courses.

5.4.1 Giving an Open Book Examination

Pre-CTHE Practice

For mid-semester and end-of-semester, I hold closed book examinations.

Objectives and Outcomes

The objective of this change is to measure whether open book examinations help students to better perform in the examinations. The expected outcome of this change is students preparing for the examinations by steering for deeper knowledge by trying to draw relationships between concepts/topics they learned, and using that knowledge to creatively answer exam questions.

This change was implemented in CS5612 Pattern Recognition.

Related LA: 08 (Appendix J.8)

Rationale

As already discussed in Section 5.3, there is an opportunity to make use of open book examinations to get students to seek for deeper levels knowledge by identifying relations between the concepts they know, rather than memorizing the facts in lecture notes.

This is especially the case with Pattern Recognition, where many Mathematical calculations are needed to solve different Pattern Recognition problems. Some of the Mathematical equations are quite complex to remember, and I believe that there should be no need for a student to memorize the equation. Rather, when given a problem to solve, she should be able to figure out the correct Mathematical equation to apply, and then use that equation to solve the given problem. Thus, I believe that letting the students have access to the set of Mathematical equations and theories would not make any impact on testing this ability of students.

Process

I informed the students that the mid-term examination would be open book. I reminded them, that when they get an open book examination, the questions they get are of more analytical type.

Appendix F.1 contains the mid-semester examination paper given to students. All these questions fall into Level III in Bloom's taxonomy (verbs – calculate and derive). Although Brightwell et al. (2004) say that questions upto Level III gain no significant advantage with open book examinations (see Section 5.3), I believe that in the types of questions I gave, there is more work to be done than simply mapping the values given in the question to the equation, since figuring out to which part of the equation a given value gets mapped to is not straightforward. The marks scored by students give evidence for this observation as discussed below.

Observations

When analysed the marks distribution of students, it could be seen that only 26% of the class obtained full marks, 13% have below average marks, and 60% have marks below

20. Were the students being able to answer the questions simply by looking at their notes, everyone would have scored full marks, or at least more than 20. This observation asserts the claim I made above, that the questions in the examination paper could take the benefit of open book examinations.

Student Feedback on the Change

To get student opinion on open book examinations, I gave them questionnaire 5.1.

Questionnaire 5.1

1. Based on your experience today, do you prefer open book exams over closed book exams?
2. Based on your experience today, what are the advantages of open book exams?
3. Based on your experience today, is there any disadvantages of open book exams?

A total of 15 students provided their feedback. 13 (86.6%) students preferred open book, while 1 (67%) student preferred closed book, and one student had no preference.

Analysis of the student responses to the second question in the questionnaire justifies my rationale - According to 14 (93%) students, the benefit of open book examinations is that they do not have to memorize complex equations. One student said the advantage is that she can “focus on studying about application of the theory rather than the theory”.

6 (40%) students saw no disadvantage in open book examinations. 5 (33.3%) students highlighted that referring to notes takes too much time, which sheds light on claims made by Boniface (1985) in Section 5.3 that students who come to the examination to read material do not do well. A related observation was made by another student, who said that “students do not try to remember materials in lectures” [when they know that they can refer to their notes during the examination]. One student claimed that the examination scope could get larger. I guess she means that the questions are more application oriented, rather than testing the theories discussed in the class.

Decisions Made

As discussed in Section 5.3, if the examination paper is properly set to test high level cognitive abilities of students, students can take benefit of open book examinations. Student marks distribution of the open book examination I held also confirms that, with the correct set of questions, open book examinations can measure the problem solving skills of students. Therefore I will be using open book examinations for mid-semester of all the postgraduate courses I teach.

Analysis

This change further highlights the importance of constructive alignment in our courses. If the assessment in the examination is done with constructive alignment in mind, the students will be tested on higher levels of the Bloom's taxonomy. The students can focus on higher levels of thinking rather than worrying about LOTS. Thus giving open book examinations can really benefit students, if done properly.

Moreover, students should be better educated about open book examinations – the type of cognitive skills that will be tested. Then they will spend time on activities related to HOTS while preparing for the examination, which is exactly what is expected from them.

5.4.2 Giving Timely Feedback on Summative Assessment

Pre-CTHE Practice

Normally I mark the mid-semester examination papers just before the end of the teaching semester. And I do not discuss the examination paper in the class. Nor I give feedback to the answers written by students for the mid-semester examination.

Objectives and Outcomes

The objective of this change is to mark the mid-semester examination of CS5612 soon after the examination, and discuss the question paper in the class. I intend to give the answer scripts back to the students, so that they can compare their answers with the model answer I discuss. The final objectives are to give meaningful feedback for the student answers, and also to make sure that I have done no mistake in marking.

The intended outcome of this change is students being able to identify the mistakes that they have done, and fix those mistakes before the end-of-semester examination.

This change was implemented in CS5612 Pattern Recognition.

Related LA: 06 (Appendix J.6)

Rationale

As discussed in Section 5.2.3, giving individual feedback helps students to identify their mistakes. Furthermore, students prefer feedback soon after their examination. I believe it is because how they answer the examination, and the decisions they make are still fresh in mind.

Moreover, according to the 3P model (section 3.2.3), this can be considered as modifying the student's P2 stage, in order to positively affect P3 stage.

Process

Just after the examination, I marked the student answer scripts.

I was planning to discuss the paper in the next class. Just before this next class, at the CTHE workshop we learned about the importance of giving feedback to students. We were asked to refer to a statement made by Henry Newman in 1854 and map the importance of giving feedback to the graduate qualities specified by Newman. During that exercise, I was thinking that we cannot give meaningful feedback to the type of question papers we give in Applied Science disciplines, and Newman's statement is only valid for Social Sciences. However, out of nowhere, I realized that I indeed can provide some sort of feedback to the students on their answer scripts. So I re-assessed the answer scripts and added feedback. Then at the next lecture, I distributed the answer scripts back to the students, and worked out all the questions on the board.

Observations

Figure 5.1 shows an answer script with feedback. Given feedback can be categorized into two forms: feedback that highlights how the student should have attempted the answer (instructional feedback), and feedback that shows for which part of the answer they received partial marks, if the answer was only partially correct.

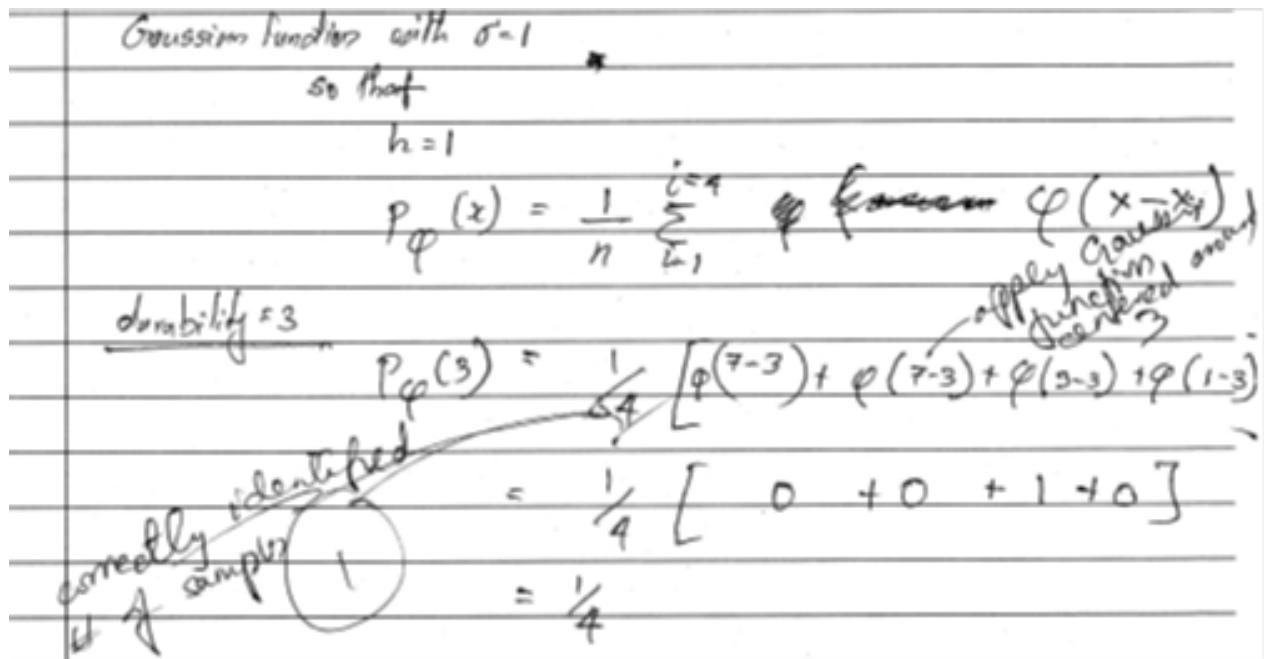


Figure 5.1: Feedback given to a Student Answer

The feedback “Apply Gaussian function centered around 3” is an instructional feedback. The feedback “correctly identified # of samples” near the given marks (1) indicates that the student received 1 mark for correctly identifying the number of samples.

Figure 5.2 shows a student with her answer script. Figure 5.3 shows how the answer to one question is worked out on the white board.

Student Feedback on the Change

In order to analyse the benefits students get by immediately getting back their answer scripts with feedback, I gave Questionnaire 5.2.

Questionnaire 5.2 Please provide your answers to the following questions.

1. What are the benefits of immediately assessing and giving marks for an assignment?
2. What are the benefits of giving out corrected answer scripts to the students?
3. What are the benefits of adding feedback in the marked answer scripts?
4. Do you see any negative aspects of any of the above?

13 students provided feedback. Many students have misunderstood the first question -

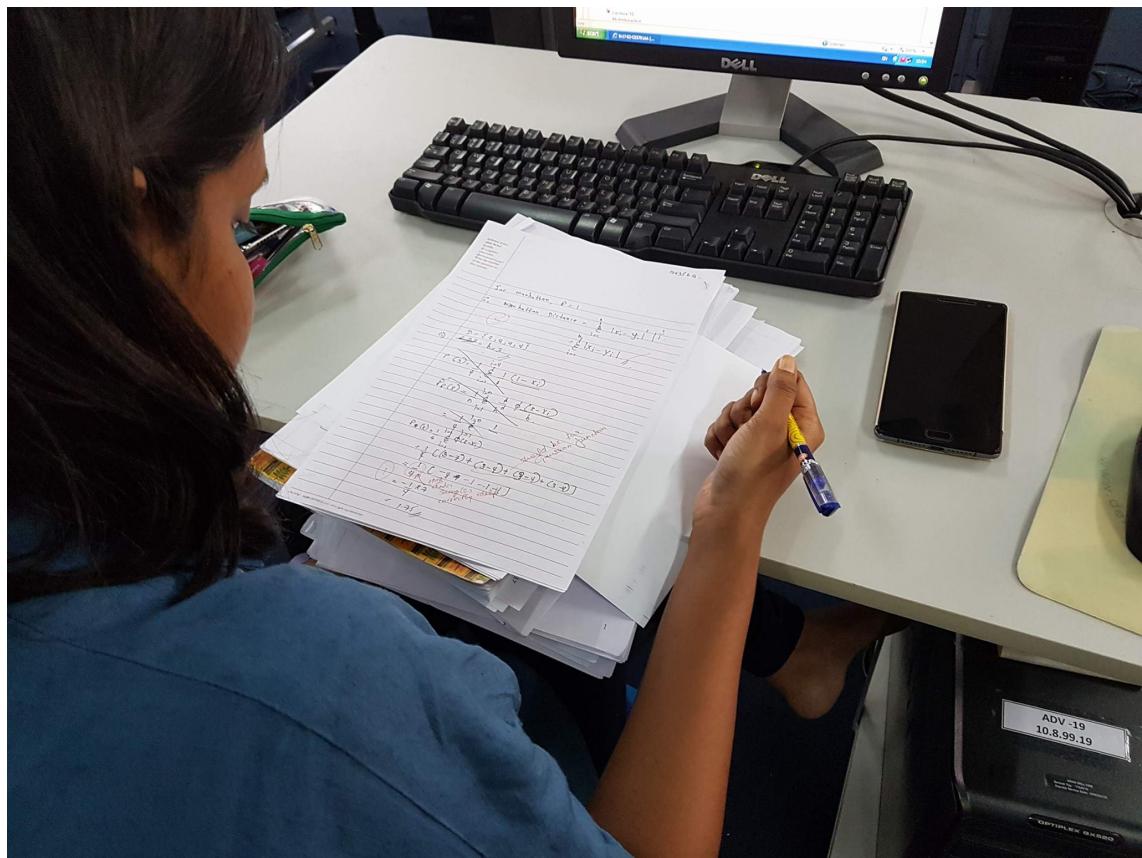


Figure 5.2: A Student with her Answer Script

$$(3, 7) \quad (7, 7)$$

$$\sqrt{(7-3)^2 + (7-7)^2} = 4$$

Euclidean

$$\sqrt{(7-3)^2 + (4-7)^2} = 5$$

$$\sqrt{(3-3)^2 + (4-7)^2} = 3$$

$$\sqrt{(1-3)^2 + (4-7)^2} = 3.6$$

Figure 5.3: Answer to one Question Worked out on the Board

they have taken it as benefits of discussing the question paper in the class. However, some students have correctly understood the question, and their common answer was that since they still remembered the question and how they answered it, they can easily figure out the misunderstandings they had. For example, one student wrote “we would remember what we have done at assignment therefore easily understand the mistakes”.

As for the second question, two students saw the benefit of getting their answer script back as being able to identify any marking mistakes done by the lecturer, which is an objective I too had. Others have said that they can identify the exact mistakes they have done in answering the paper.

Student feedback on adding feedback to the answer scripts resembles the two types of feedback I gave: instructional feedback helped them to identify what is expected in the answer (or the correct approach). Explaining how partial marks are given helps students to understand how marks are allocated. None of the students indicated any negative points of immediately assessing answer scripts, giving answer scripts to the students and discussing the answer in the class, and adding feedback to the answer script.

Lessons Learned

No matter what type of assessment we do, there is always a possibility to give helpful feedback to students.

Decisions Made

Given that students have identified many benefits of getting answer scripts with feedback immediately after the examination, and they have not seen any disadvantage of the same, I will continue to do so in the coming mid-semester examinations for other courses as well.

Analysis

This change actually involved three different sub-changes:

1. Giving answer scripts back to students
2. Immediately giving marks for the mid-semester examination
3. Giving feedback to student answers

I have a confusion over whether mid-semester examination should be considered as summative or formative assessment, although I referred to it as summative. On one hand, it cannot be summative since the examination was not held at the end of the course. However, on the other hand, it does have summative features since it is carried out to grade students, and its marks will add up to the final marks. Despite this confusion, I believe we can give feedback to student answers even for a mid-semester examination that contains Mathematical calculations. From student feedback, it was evident that they found this feedback useful. Although the type of feedback we can give for this type of questions cannot be mapped to many of the graduate qualities discussed by Newman, at least we can say that it helps the student to master in her subject. This is because they can easily understand their mistakes well in advance, and work on to fix them.

5.4.3 Formative Assessment of In-class Exercises

Pre-CTHE Practice

I do not assess student answers to in-class exercises, mainly due to the time constraints I have.

Objectives and Outcomes

The objective of this change is to immediately assess the student answers to in-class exercises in order to identify common misconceptions the students might have on the related topics.

Outcome of this change is students not having any misconceptions (at least to a certain extent) on the immediately covered topics.

Related LA: None

Rationale

I design my in-class activities in such a way that in order for the student to carry out that activity, she should have the knowledge of the recently discussed concepts. In other words, for the students to develop the required HOTS, they should have already developed the associated LOTS. Therefore, if I assess student submissions for a given in-class, I can easily figure out what parts of the theory discussion that the students did not understand.

This gives me the opportunity to clarify those doubts during the next lecture.

Process

This section is related to Section 3.5.2. After students did the in-class activity shown in Appendix E.2, I collected the answers and asked my junior lecturer to assess them and identify common mistakes made by students, or the common misconceptions they have. I requested this analysis before next week's lecture.

Appendix G.1 shows the email the junior lecturer sent me highlighting the common misconceptions.

I used this and changed my lesson plan for the next lecture accordingly, and spent about 0.5hours in clarifying the identified common issues (see Section 3.5.2). This was more like a re-cap of the previous week's lecture at the beginning of the lecture. (Appendix G.2 shows another email from the junior lecturer on the common misconceptions that were noted for another in-class exercise. However, this is not discussed in the portfolio).

Observations

Figure 5.4 shows a sample student answer to this exercise.

The junior lecturer had done a thorough analysis on the student submissions. Not only she identified the common mistakes, as shown in Appendix G.1, for each mistake, she provided examples from student answers.

Although she did not report back on the percentage of the number of students who misunderstood a concept, it was evident that at least some of the students have not been able to identify objects, and their attributes and methods.

When discussing the common mistakes, I used the examples sent by my junior lecturer, since those examples would look familiar to the students, and they can easily relate to those examples. As discussed in Section 6.3.4, one student commended this saying that they sometimes do those same mistakes as what was discussed by me, so showing sample mistakes from a random student submission is very much useful. As discussed in Section 6.3.4, discussing answers to the previous week's in-class was found useful by the students.

I must admit that I was shocked to see that many students have not been able to identify

Object - Dr. Surangika

Class - Lecturer

Attributes - has, spectacles, employee ID, has a weight

Methodes - can walk, talk, teach, shout

Figure 5.4: Sample student answer for the in-class activity

objects, because I spent almost the whole lecture explaining them! Referring to my group mate Rumiza's seminar presentation (Section 2.6), may be this is due to the fact that I directly tried to move students to 'do' stage from 'tell' stage, thus bypassing the 'show' stage.

Student Feedback on the Change

I used Questionnaire 5.3 to get student feedback on doing in-class activities and discussing answers to them in the class.

Questionnaire 5.3

During the lectures, we did many practical exercises. Once you did the exercise, the lecturer also discussed the answer to the same.

1. Describe the benefits you got from doing these in-class exercises
2. Describe the benefits of the lecturer discussing the answer to in-class exercises
3. Describe the disadvantages of doing in-class activities
4. How do you think we can improve your learning process more, using in-class activities?
5. Do you recommend the lecturer to do in-class activities for your junior batch?

79 students gave feedback for the questionnaire. Figure 5.5 shows a sample student response to the questionnaire.

As can be seen, many students thought that by doing in-class exercises, theory parts

During the lectures, we did many practical exercises. Once you did the exercise, the lecturer also discussed the answer to the same.

1. Describe the benefits you got from doing these in-class exercises *we can get on time feedback for our activities*
2. Describe the benefits of the lecturer discussing the answer to in-class exercises *we can understand where we goes wrong*
3. Describe the disadvantages of doing in-class activities – *using laptops instead of writing by hand (code)*
4. How do you think we can improve your learning process more, using in-class activities? *using laptops instead of writing by hand (code)*
5. Do you recommend the lecturer to do in-class activities for your junior batch? *yes*

Figure 5.5: Sample student response to the questionnaire on discussing answers to in-class activities

Theories become more clear and learn to apply theories	25
Can identify weak points and mistakes	10
Understand how to solve practical problems	10
Can improve coding skills	9
Can get doubts cleared	6
can get help from lecturer	5
Can get help from colleagues	3
Getting timely feedback	1
Make lectures more engaged	1

Table 5.1: Advantages of doing in-class exercises

are more elaborated, and they learn how to apply theories. This can be interpreted as they get a better idea on how to compose a program using OOP principles that were discussed in the class. Learning how to solve practical problems is similar to this.

Table 5.2 shows the advantages of discussing the answer in the class, as seen by students.

Table 5.1 shows the salient advantages students noted for doing in-class exercises.

It is interesting to see that more than half of the respondents thought that the best advantage of discussing answers to in-class exercises is the opportunity they get to identify their mistakes by comparing their answer with the sample answer.

Only 11 students reported a disadvantage of doing in-class activities – that is takes too much time. Others did not report any disadvantage.

Table 5.3 shows the improvements suggested by students. As can be seen in Table 5.3, many students had the same request – to get the sample answers in Moodle. This they

Advantage	No. of students
Identify mistakes	43
Ask questions from the lecturer	2
Proper understanding of the question	3
Learn new concepts, taught concepts get clearer	5
Process of solving the question is learned	1
Wanted to attend the lecture	1

Table 5.2: Advantages of discussing answers to in-class exercises

raised in their mid-semester feedback as well (see Section 6.3.4). As mentioned in Section 6.3.4, I have already addressed this concern.

It is interesting to see that students are requesting even more in-class activities.

Except for one student, all the others have recommended to have in-class exercises for the next batch as well. I cannot determine why this one student said no. He has said that in-class exercises were useful, and he saw disadvantages of the same, which is contradicting.

Lessons Learned

As already discussed in Section 3.4.4, this change was also an eye opener – no matter how much effort we put in teaching, and even after engaging in related learning activities, there could be students who have not developed the required thinking skills (May be the ‘Roberts’ described by (Biggs & Tang, 2007, p. 8)).

It might not be wise to directly jump from ‘tell’ to ‘do’, bypassing ‘show’.

Decisions Made

I will definitely continue to give in-class exercises in the future, and assess them in order to identify common misconceptions.

Analysis

The in-class exercise described above is related to Section 3.5.2. There, in order to achieve the ILOs (decompose and program), the immediately preceding thinking skill (verb) is

Suggested improvement	No. of students
Give full sample answer in Moodle	14
Do more activities	10
Discuss the code fully	2
Reduce speed	2
Have shorter activities	1
Explain the answer in slides	1
Get TAs to the class so that they also can help students during in-class	1
Indicate the time that should be spent on an activity	1
Use laptops rather than writing by hand	1
get students to show their code	1
encourage students to learn Java	1
Give individual feedback	1
Give less time for student activity, let lecturer discussion take more time	1

Table 5.3: Improvements for in-class exercises as proposed by students

identify. Thus, if a student failed to identify objects and their attributes and properties, she would find it difficult to engage in the next level of thinking skills (decompose and program). This demonstrates the importance of formative assessment in achieving constructive alignment in our courses.

Moreover, this in-class exercise was given in the very first lecture, which means that it was given during the transition phase (according to the TDA model (See section 3.2.5)). This is because students are very much new to the course, and they are hearing most of the concepts for the first time. In this particular course, they are learning about the concepts of Object Oriented Programming, which is a completely new programming paradigm compared to the programming that they have done before. Thus, according to the TDA model frequent (in my case, weekly) formative assessments and feedback is extremely useful to students.

Ideally, I should have assessed and given feedback to individual student answers. However, as this is time consuming, I identified the general mistakes and discussed them. In addition, by discussing sample answers, I give students a chance to do self-assessment

of their answers, which is one possible way to do formative assessment. As shown in results, students did find this useful, as many said that they were able to identify their mistakes.

5.4.4 Assessment of Weekly Practical Submissions

Pre-CTHE Practice

In CS2012, there is a semester project, which will be evaluated twice: mid-semester evaluation, and end-of-semester evaluation. Although students work on their project through the semester on a weekly basis during practicals, students are not required to submit their computer program at the end of each practical.

Objectives and Outcomes

The objective of this change is to assess the weekly practical submissions of students. Each student will be given feedback for his submission. Student progress is monitored over several practicals, in order to make sure that the student has made use of the given feedback to correct her mistakes. The intended outcome is the identification of students who have not achieved the ILOs for the corresponding week, and those who have not acted upon the given feedback.

Related LA: 03 (Appendix J.3)

Rationale

As mentioned in Section 3.4.1, students from the previous batch complained that practicals were not effective, since there was no submission of practical work.

Moreover, if weekly submissions are assessed and feedback is given, I can easily identify students who have not improved despite given feedback. Moreover, if there are many students doing the same mistake(s), it is an indication that majority of the class has not achieved the Thinking Skills they were expected to achieve during the lecture. Then, before moving the students to the next level of Thinking Skills, I can get them engaged in some more learning activities to improve the current set of Thinking Skills. Thus, in essence, this would further strengthen constructive alignment in my module.

Finally, giving weekly formative feedback to students during their transition phase would be very much beneficial to them.

Process

The main issue with weekly assessment is the amount of additional work load that falls upon me. When discussed with the CTHE tutor, he suggested that I could take just a random sample of submissions and assess.

However, later I got a much better idea. Instead of me assessing, I could get the TAs to assess weekly submissions.

This benefits all the parties:

Students – every student gets weekly feedback

Me – I do not get an additional overhead

TAs – they get exposed to assessment as well, which gets counted up for their work experience. Plus they get paid for the time they spend on assessment as well.

One drawback of this is that assessment not being uniform across students, since it is not practical to get the TAs to assess the submissions in the same way. In order to increase the inter grader reliability (See Section 5.2.4), during weekly TA meetings (See Section 3.4.3), I clearly explained what to be assessed every week. I also told them what I learned through CTHE – that feedback should be motivational and actionable, and gave examples of such feedback (See the email communication in Appendix G.3).

I divided the class among the TAs. On average, each TA got about 26 students. I instructed the class that students assigned to a particular TA should be sitting together during the practical. Also I instructed the TAs to assist only the students that were assigned to them during the practical. My objective was to identify students who are weak, and provide personalized assistance.

In the first week, I simply asked the TAs to assess the submissions and report on the common mistakes. However, instead of reporting common mistakes, one TA has recorded feedback for each student. When I saw this, I thought that it was an excellent idea. I took this a step further and got my junior lecturer to create a Google sheet (See Appendix B.3), where the TAs can go and add feedback to student submissions. This feedback was later copied to Moodle, so that student also can see. See Appendix G.3 for the email I sent to the TAs informing about the use of the Google sheet.

Observations

Although I asked the TAs to give actionable and motivational feedback, I noticed that TAs do not adhere to this all the time. Moreover, there was a difference in the amount of feedback given – some TAs wrote detailed feedback, and others gave very brief feedback. Moreover, I had to remind them to give feedback from time to time, since they tended to give less priority to this work, and focused more on their research (see the email communication in Appendix G.4). Nevertheless, TAs reported that this was useful for them to keep track of the students that are assigned to them, and they were individually addressing weak students.

Student Feedback on the Change

In order to determine whether students actually benefited from this change, I gave them Questionnaire 5.4.

Questionnaire 5.4

Your weekly submissions for the semester project were assessed on a weekly basis:

1. Do you see any benefits of doing weekly assessments?
2. Are there any disadvantages of doing weekly assessments?
3. Did you find the feedback you received as useful?
4. How do you think we can improve the weekly assessment process?
5. Do you recommend us to carry out weekly assessment of the semester project for your junior batch?

92 students gave feedback for this questionnaire. Figure 5.6 shows a sample student response.

Table 5.4 shows the student responses to the first question. As can be seen, there is not much meaningful feedback. This is because the question was misinterpreted by students, and many have simply answered yes. This is my fault, the correct question I should have asked is “what are the benefits of doing weekly assessments?”.

Not many students saw any disadvantage of weekly assessment. However, two students have said it is time-wasting. Again, seems like the students have misunderstood

Your weekly submissions for the semester project were assessed in a weekly basis.

1. Do you see any benefits of doing weekly assessments? Yes
2. Are there any disadvantages of doing weekly assessments? No
3. Did you find the feedback you received as useful? *We - I didn't get any*
4. How do you think we can improve the weekly assessment process? *Make it more interactive.*
5. Do you recommend us to carry out weekly assessment of the semester project for your junior batch?
Yes but make it more interactive so students can actually test the code in small fragments.

Figure 5.6: Sample student response to the questionnaire on assessing weekly submissions

Advantage	No. of students
identify errors in code	7
Gradual learning	4
Practice what was learned in the lecture	2
Motivates to learn	1

Table 5.4: Benefits of weekly assessments of the practical as seen by students.

the question. I think they are referring to having practicals, rather than assessing their submission.

72 (79.1%) students found the feedback useful, while 9 (9.9%) did not find it useful. Some students (4.4% of the respondents to the questionnaire) were not given feedback since they were absent for the lab. This was informed to students in advance, in order to motivate them to come to practical classes. 6 (6.6%) did not give any feedback.

Table 5.5 shows the student suggestions given to improve weekly assessment. However, not much useful feedback was there. One notable request is to give more detailed feedback.

Except for five students, all the others recommended to have weekly assessment of the

Response	No. of Students
Give more feedback	13
give marks	2
let students explain their code rather than reading code to assess	1

Table 5.5: student suggestions on improving weekly assessment of practical

practical.

Though not related to the questions asked in the questionnaire, few students have requested not to release the semester project at the beginning and not to use the initial practical slots for developing the project. Their suggestion is to do small coding activities in the first few practicals, and then release the project. I think this makes sense – since students are in the transition phase (according to the TDA model), they find it daunting to work on the semester project that has a long description of the problem. This is something I need to consider when I design the assessments for the next batch.

Lessons Learned

It is not practical to expect the TAs to show the same commitment and effort for assessment as the lecturer. We have to be satisfied with what we get, since it is better than nothing.

Decisions Made

I will continue this practice for the new batch as well, given that I have enough TA support.

Analysis

This is one of the few implemented changes where I expected support from others. In particular, to implement this change, I had to take support from four TAs and the junior lecturer. Since each person is different, we cannot assume the same feedback from TAs. Moreover, I felt that this work is a burden for them, especially when they are pressed for time (e.g. when they have a deadline to submit a paper to a conference). Despite this, I believe that this is a very important step in making sure that each and every student achieves the ILOs.

5.4.5 Detailed Marks Breakdown of the Assignment

Pre-CTHE Practice

For CS5612, there is a programming project, which accounts for 25% of the total marks of the module. For this, students have to carry out a set of tasks specified in the project description. Then they have to provide a report on the tasks they carried out. I indicate

the set of tasks that they should carry out, and the corresponding sections in the report. However, I do not indicate how much marks are allocated for each task.

Objectives and Outcomes

The objective of this change is to provide a detailed marks breakdown for the programming project, so that the amount of marks assigned for each task is indicated.

The intended outcome of this change is to make student effort on a task being proportional to the amount of marks allocated for that task.

This change was implemented in CS5612 – Pattern Recognition.

Related LA: 10 (Appendix J.10)

Rationale

When assessing submissions to the programming project in the previous batch, I saw that some students have not given an attempt to carry out certain tasks, which were allocated much higher portion of marks. One of these tasks is to refer to related literature and compare the data analysis result they got with the results reported in the literature for the same data set. Since students do not like reading research papers, they tend to avoid this task, and lose marks.

As stated by Rust, Price, and O'Donovan (2003), making the students aware of the assessment criteria makes the assessment process more transparent, and their learning also improves. The latter is an interesting point – if we assign high marks to tasks that involve HOTS, students would put more emphasis on those tasks, and consequently would achieve the ILOs.

Process

The change I had to implement was very simple – I added the amount of marks allocated for each task in the assignment (See Appendix B.1).

Observations

I compared the marks for the project for this batch and the previous batch. It is evident that students have put more effort on questions that were allocated more marks. Table 5.6 shows the average, minimum, and maximum student marks for the two batches for the

Question	Q6/40		Q11/15		Q12/15		
	batch	current	previous	current	previous	current	previous
Average		40	38	10.9	6.6	11.9	7
Minimum		40	35	10	0	10	0
Maximum		40	40	15	10	15	10

Table 5.6: Student marks comparison

questions that were allocated the highest marks - Q6 (40 marks), Q11(15 marks), Q12 (15 marks).

Positive results of the change are evident from the data given in Table 5.6. Interestingly, for the question with the highest marks, every student in the current batch scored full marks. In fact, this is not a very difficult question. The student just has to take time and explain the code she has written.

However, some students are just lazy to provide explanations of their codes. However, knowing that it does get them marks, all the students provided descriptions of their codes as the answer to this question.

Moreover, in the previous batch, 3 students and 2 students scored zero for 11th and 12th questions respectively. However, not a single student from the current batch scored zero for these two questions. Average performance of current batch students for these two questions is noticeably higher than that of the previous batch students.

Lessons Learned

Students are indeed driven by assessment. They would put an effort on assignments, only if they are rewarded with marks.

Decisions Made

I will definitely give the allocated marks for each sub-questions for future projects of all the courses I teach.

Analysis

This is a very simple change – I just had to add the allocated marks for each sub-question in the project report they had to submit. Though simple, this change shows the potential to facilitate students achieve ILOs – we can allocate higher marks for questions that test the higher level thinking skills of the students. When the students know that the amount of marks allocated for each question, they would put more effort on questions that have higher marks, and thus even without knowing, they are putting an effort to develop HOTS.

5.4.6 Developing an Assessment Rubric

Pre-CTHE Practice

When assessing the semester project of CS2012, I make use of 4 TAs and the junior lecturer in addition to me. So the students are divided into 6 panels. I give a marks breakdown for the assessment, however this breakdown is not comprehensive.

Objectives and Outcomes

The objective of this change is to develop an analytic rubric (See Section 5.2.4) for the mid-semester evaluation of the semester project.

The outcome of this change is mid-semester evaluation marks that show less deviation (i.e. improved inter-grader reliability), meaning that the assessment process is standardized.

This change was implemented in CS2012 – Principles of Object Oriented Programming.

Related LA: None

Rationale

For the previous batch also, I made use of TAs for semester project assessment. However, I noticed that there was a considerable variation between marks given by TAs, which made me to normalize the marks.

As discussed in Section 5.2.4, having an assessment rubric is the best way to avoid these inter-grader disagreements.

Grader	Average	Standard Deviation
Me	79.725	8.775676612
Junior lecturer	83.34210526	7.808564798
TA1	84.11111111	13.10540476
TA2	85.44736842	6.977930959
TA3	82.13333333	12.92901867
TA4	80.08333333	9.896894938

Table 5.7: Average and Standard Deviation of marks given by grader

Process

The analytical rubric I designed is shown in Appendix B.2. Instead of simply giving the marks allocated for each task, I gave a detailed marks breakdown for each task as well. In addition, prior to evaluation, I had a TA meeting and discussed this rubric. I did few changes based on TA input. The assessment was conducted in the form of a viva – the student has to show the code she has written and explain it, while answering questions posed by the grader.

Observations

Table 5.7 shows the average and standard deviation of marks given by each grader.

Here, what is more important is the comparison of averages. The maximum difference between averages is less than 6 marks, thus I believe that there is inter-grader agreement. Interestingly, I am the one who has given the lowest marks.

Lessons Learned

I do not think it is possible to not to have any deviation in marks across graders. However, with the help of a rubric, this deviation can be minimized.

Decisions Made

I will use this rubric (modified appropriately if needed) for project evaluation of next batch as well.

Analysis

I believe that this change is very important to be fair by each student. The best case is one grader assessing all students. However, since this may not be practical in certain cases, the best is to use a panel of graders and use a rubric to guide their grading.

5.5 Changes I Have Done During CTHE

As discussed in this chapter, I have carried out seven changes on how I assess students.

1. Giving an open book mid-semester examination
2. Giving timely feedback on summative assessment
3. Giving the mid-semester answer scripts to students and discuss the answer in the class
4. Formative assessment of in-class exercises
5. Formative assessment of weekly submissions to the semester project
6. Giving details mark breakdown of the assignment
7. Developing an analytic assessment rubric to evaluate assignments

5.6 Summary of SEDA Outcomes and Values Addressed in the Chapter

5.6.1 SEDA Values:

1. Practicing in ways that are scholarly, professional and ethical

Section 5.4.2: I gave the answer scripts of the mid-semester examination back to students and discussed the answers . This preserves the student's right to know what mistakes she has done. This is a common practice in western countries, but not so common in our country.

Section 5.4.6: I developed an analytic marking rubric to increase inter-grader reliability of the summative assessment, which employed six graders.

Section 5.4.4: I described how I assessed weekly submissions to the semester project. However, I did not assess submissions of those who did not attend the practical. This was informed to students in advance.

Section 5.4.5: I discussed how I gave a detailed mark breakdown of the sections in the project report. This satisfies the right the students have in knowing the amount of effort they should put into in carrying out the project.

2. Working with and developing learning communities:

Sections 5.4.3 and 5.4.4: Through formative assessment, I was giving feedback to students, which helped them to achieve the ILOs in a systematic manner.

3. Valuing diversity and promoting inclusivity:

Section 5.4.6: Development of an analytic marking rubric guaranteed that all students are treated nearly equally by the graders, without any subjective judgments.

4. Continually reflecting on practice to develop ourselves, others and processes:

Sections 5.4.2, 5.4.3 and 5.4.4: Giving feedback in a timely manner made students to identify their own mistakes and correct them. Thus, it gave them a chance to develop themselves.

Section 5.4.4: By involving the TAs in the assessment process gave them experience in the assessment aspect.

5.6.2 SEDA Outcomes:

1. Use a variety of methods for evaluating your teaching Sections 5.4.1, 5.4.2, 5.4.3, 5.4.4
 - I got student feedback in order to evaluate whether the implemented changes positively impacted student learning.
2. Inform your practice with relevant strategy, policy and quality considerations.

Section 5.4.6 – The TAs were provided a detailed analytic rubric for assessment.

Section 5.4.5 – At the time of the release of the assignment, I indicated the marks breakdown for different sections.

Section 5.4.4: I informed well in advance that submissions of those who are absent for a practical would not be assessed.

3. Use a range of methods of teaching and supporting learning, assessment and feedback, appropriate to the learners, subject and context, including use of appropriate technologies.

Sections 5.4.4 and 5.4.3 :I introduced two formative assessment components, in addition to the already existing summative assessments.

4. Create a learning environment that includes student support and guidance.

Section 5.4.3: By discussing sample answers to in-class exercises, and highlighting common errors done by students, I created a learning environment where students can continuously improve.

Sections 5.4.2 and 5.4.3: Giving feedback in a timely manner supports students to identify their mistakes, and guidance on how to improve them.

5.7 Chapter Summary

In this chapter I presented a detailed discussion on the changes that I did on assessment in CS2012 undergraduate course, and CS5612 postgraduate course. In particular, I introduced more formative assessments, and gave feedback whenever it was appropriate. While aspects such as giving feedback have been hailed by other researchers, aspects such as open book examinations received mixed responses. Thus, I took student feedback to measure the impact of these different assessment techniques. In line with the related literature, giving feedback and doing formative assessment were found useful by the students. Even open book examinations were preferred by many students.

Chapter 6

Reflections on My Teaching

6.1 Introduction and Outcomes of the Chapter

The outcome of this chapter is a detailed discussion on how I developed the reflective practice, and how students were benefited through it. Thus, in a sense, this chapter can be thought of as a look-back at the portfolio content related to the implemented changes in my teaching/learning/assessment. In addition, I provided an evaluation of my teaching in multiple perspectives.

At the end of this chapter, the reader should be able to

- Identify the importance of reflective practice, and different notions of reflective practice
- Identify the benefits of getting our teaching evaluated

6.2 Developing the Reflective Practice

6.2.1 Importance of Reflective Practice

According to Loughran (2002), reflective practice carries diverse meanings that vary from ‘simply thinking about meaning’, to ‘a well-defined and crafted practice that carries very specific meaning and associated action’. Reflection as a well-defined and crafted practice involves the teacher being able to identify the need to reflect, the context, nature of the problem to be solved through reflection, and the expected value of such reflection (Loughran, 2002).

Despite this diverseness, all agree that the correct application of reflective practice is guaranteed to improve teaching. According to Gibbs and Habeshaw (1989, p 202), getting better at teaching is a life-long task, and reflection on one's teaching is the key for this continuous development.

I believe that a teacher reflecting on her own teaching is important in achieving constructive alignment. It helps the teacher to evaluate what she did to make her students achieve the ILOs of the course. If any gap is identified between the expected outcome and the actual outcome, the teacher can take corrective actions for her teaching in the future. In fact, Zeichner (1994) says that through reflective practice, teachers no longer become passive participants in the teaching process who do what they have been asked to do. Rather, they are being able to make use of the teacher-generated knowledge and experience in providing a better learning experience to their students.

6.2.2 How I developed Reflective Practice through CTHE

In my opinion, reflective practice is something inherent to humans. Although they do not specifically refer to the term 'reflection' per say, humans always reflect on their past experience, and use the learned lessons in taking decisions in new situations. Teachers are no difference. However, this type of reflection is not a well-defined practice.

As many other teachers, I was at this level of reflective practice with respect to my teaching. To be honest, prior to CTHE, I did not even know there was such a thing as 'reflective practice'. During CTHE, through the theories I learned, and through the teaching/learning experiments I carried out, I gradually moved to the better extreme of the reflection spectrum ('a well-defined and crafted practice that carries very specific meaning and associated action') described by Loughran (2002). In fact, reflective practice is one of the most important, as well as interesting concepts I learned from CTHE.

The best example of the development of this well-defined reflective practice is how I implemented the changes to my teaching/learning. During the CTHE course, we were taught to make use of Kolb's learning cycle (or the IPUR) (see Section 4.2.2) to implement the changes. I followed this exact process when implementing my changes.

When reporting our experience, we were asked to use the 4R: reporting and responding, relating, reasoning, and reconstructing (Ryan, 2013). In reporting and responding, we simply notice the set of events related to the implemented change. In relating, we refer

to our past experience, experience reported by others, and the theories we know, to identify any similarities between those and what we observed. In reasoning, we analytically look at our current experience and derive the factors that created this present experience. Finally, reconstructing refers to how we plan to change our current practice in order to solve the perceived issues – we could modify, stop, or continue the present practice, or start a new alternative practice.

Incorporating the 4R process, I introduced my own structure for reporting. First I give my pre-CTHE practice, which led me to identify the need for a change. Then I list out the objectives and the expected outcomes of the planned change, followed by the rationale for the change. Next I discuss the change implementation, followed by the observations I made during this implementation. I then discuss the lessons learned by the implementation, followed by the decisions made. Finally, I took a step back and analysed the change, relating my experience to what has been reported in the literature.

A good example for this is the change related to proving homework tasks and related material (see Section 4.9.3). First I identified that homework and resource based learning could benefit student learning. Then I planned some homework activities (however, this planning should have done better. For example, I should not have given two homework activities for the same week). Then I undertook the change, by adding the assignments to Moodle, and asking students to do homework. I was monitoring student submissions to the Moodle assignments, and noted that the number of submissions gradually dropped. I discussed this with the course tutors, and they advised me to take student feedback on why they did not do homework. When I took feedback, the reason for the failure of this change was obvious.

Zeichner (1994) reported different notions of reflection. To my surprise, I realized that I have developed my reflective practice to a level such that all these different notions have been addressed by the changes I introduced.

These different notions of reflections are discussed below, along with a discussion on how my reflective practice could be related to them.

Reflecting before, during, and after action: Whenever I (and all the other CTHE participants too, I guess) am about to implement a new change in my classroom, I reflect on the identified issue (refer to IPUR cycle) that led to me to implement that change. With that, I develop an expectation (or hypothesis) on how the outcome would be. One example

is the analysis of feedback from the previous batch of students when planning the course delivery for the current batch (Section 3.4.1).

Later, after implementing the action, I reflect back on how I implemented the change, and I analyse student response on the change in order to measure how successful my change was – whether I achieved the desired outcome. In many cases I have, but in some cases I did not.

A very good example for reflection during action is providing homework tasks and related material (see Section 4.9.3). There, the students were not interested in doing the homework activities. I could notice this because I was monitoring the Moodle page for student submission. Thus I discussed this with the course tutors and took student feedback once I finished giving homework.

Reflecting about teaching vs reflecting about social conditions that influence teaching: Most of the time, I am concerned over my teaching and student learning. However, if we identify situations where social conditions influence teaching, we should act upon it. During CTHE, I came across a situation where I had to take action against such a situation. As described in Section 3.4.3, during one of the TA meetings for CS2012, a TA informed me that few students complained that they did not want to do Computer Science and Engineering course, however they have been forced to do so by their parents. This is not something directly related to my teaching, but of course something that influences how these students would learn. As discussed under the 3P model (see Section 3.2.3), presage stage of a student directly affects the process, and in turn the product stage. I raised this issue with our HoD, as well as initiated an email discussion on the same with my other colleagues in the department (see Appendix G.5).

Reflection as a private activity vs reflection as a social practice: Much of the reflective practice that was evident in this portfolio has been done as a private activity, by me alone. One exception is the change related to LA 12 (Section 3.4.3), where I had weekly meetings with my TAs to discuss their experience in the previous practical class.

Another example of reflection as a social practice is the discussion I had with my colleague who did the peer evaluation for me (see Section 6.3.3).

Reflective teaching as detached rational and logical process vs reflection as a process imbued with an ethic of care and passion: As I mentioned above, it was at CTHE that I learned about the reflective practice, and how to carry it out in a methodical way.

Had I wanted, I could have simply done just 7 learning agreements (LAs) and finished the course. However, I got very much enthusiastic about how much I could positively change my teaching to make my students learn better (as going by our group motto: better academics, better graduates). Thus I wrote 18 LAs, and implemented them all. Moreover, as described above (also see Section 4.9.3), I was unhappy when a planned change did not yield expected results. Instead of simply forgetting about it, I spent time on understanding why that change did not work. Moreover, I looked into the related literature as well, to relate (refer to 4R process) my experience to what has been reported in literature. For example, the literature reported that giving homework would not have the intended results if it is not planned properly. This indeed was one of the major issues in the way I gave homework.

So I believe I demonstrated that I did not carry out the changes just because I had to complete the CTHE course, but because I took reflection process with care and passion.

Level of reflection: technical, practical, and critical reflection. In technical reflection, we simply look at whether the teaching practice is successful or not. This I did with respect to all the implemented changes. Practical reflection analytically looks at the reasons for success or failure of a teaching practice (thus similar to the reasoning step in 4R). This also I did with respect to all the implemented changes, and even related my experiences to what has been reported in literature. Critical reflection is when we add ethical and moral considerations into practical reflection. I can give an example for this too. When students were not doing homework activities (see Section 4.9.3), by referring to the literature, the problem was identified as partly due to the homework not being assessed. However, I did not want to start giving marks to homework, since I did not inform students about it earlier, nor it was mentioned in the syllabus.

6.3 Getting Myself Evaluated

6.3.1 Importance of Evaluation

Evaluation is an indication that the teacher understands that she always has the opportunity to improve. Thus it is the teacher who must take the initiative to get her teaching evaluated (Fink, 1995). I believe that evaluation is an integral part of reflective practice. Assessment can be categorized as reflection that we do after completing an action. Eval-

uation helps in reflecting on the implemented change through different perspectives of different individuals, not only of the teacher. If the feedback is good, it brings a great deal of satisfaction to the teacher. If there are any highlighted issues, the teacher can take corrective actions in the next courses she teaches. Thus, as noted by Fink (1995), evaluation is an inherent part of good teaching.

Fink (1995) lists few different evaluations that can be carried out: self-assessment, audiotape and videotape recording of lectures, student assessment through questionnaires and interviews, students' test results, and peer assessment. Out of these, I have carried out self-assessment, student assessment through questionnaires, and peer assessment.

6.3.2 Self-Assessment

Before CTHE, I have not heard of teacher self-assessment. When we were told that we must do a self-assessment for our portfolio, I thought that it is an excellent idea! If someone was to judge our teaching, it should be us before anyone else! However, as noted by Fink (1995), self-assessment provides information "created by us for us", thus this information may be biased and could be misinterpreted. Moreover, for some teacher, one who thinks that she is already doing her best in teaching, asking for self-assessment could be an attack on his pride. However, for those of us who are willing to accept our limitations and willing to change, self-assessment is an excellent aid.

To be frank, each one of us privately assesses our teaching. There were many-a-times that I have felt I could have done better, after completing a lecture. However, as shown by Ross and Bruce (2007), in order to make self-assessment effective, it is better to use a self-assessment tool or guidelines. At CTHE, we were provided a sample self-assessment form because of this reason. However, I deliberately avoided looking at it in detail. I was worried that I would change how I deliver my next lecture simply to satisfy the tick-list in the form. Instead, I conducted a lecture (for CS5612 Pattern Recognition – lecture on Bayesian Networks). After coming home, I completed the self-assessment form for this lecture (see Appendix H.1). As can be seen, there were many drawbacks:

1. I do not introduce the session
2. I do not make the aims clear to the students
3. I do not summarise the session

4. I do not sufficiently link the session to previous sessions

These drawbacks are mainly related to the beginning and the end of the lecture. The problem is, I just start the lecture without even giving an outline for the lecture, and do not bother to summarize the important points at the end. As for the last drawback, I referred to the fundamental theory behind Bayesian networks, which was covered in the second lecture. However, facts such as whether it is a supervised/unsupervised algorithm, its performance with respect to the other algorithms that were discussed previously, were not discussed. As I can see now, the problem is related to the insufficient focus placed on constructive alignment.

However, it should be noted that my lecture had many positive aspects with respect to the self-assessment form. For example, the concept of Bayesian networks is based on the theory of cause-and effect. I related this to the cause and effect (*patichcha samuppada*) concept taught in the Buddhist philosophy, in order to convey my interest on the subject. In order to build up student confidence, I gave small Mathematical calculations as activities. This also addressed the problem of student inattention (due to student attention being limited – see Section 3.5.1). While students were working on these, I walked around the class, helping those who are struggling.

After seeing that my lectures had weaknesses, I took corrective actions to make my lectures better. As can be seen in Appendix D.1, the lecture 1 of CS2012 that was held later on did not have any of these limitations.

6.3.3 Peer Assessment

Related LA: 11 (Appendix J.11)

According to Martin and Double (1998), getting a colleague to observe our teaching, and joint reflection with colleague helps to improve teaching skills in supportive collaboration. Chism (1999) also makes similar observations. Thus, I believe that peer assessment can be considered under reflection as a social practice, as described above.

Peer assessment is useful both to the one being assessed, and to the one doing the assessment. Martin and Double (1998) describe several such benefits received by both parties:

1. To extend and enhance an understanding of personal approaches to curriculum delivery.

2. To develop and refine curriculum planning skills in collaboration with a colleague.
3. To enhance and extend teaching techniques and styles of presentation through collaborative practice.
4. To engage in and refine interpersonal skills through the exchange of insights relating to the review of a specific teaching performance.
5. To identify areas of subject understanding and teaching activity which have particular merit or are in need of further development.
6. To develop personal skills of evaluation and self-appraisal

In many universities, peer assessment is mandatory. In my university, the requirement for this has been identified. The lecturers are encouraged to do peer assessment, but it is not mandatory. A peer assessment form is also available, and the university Quality Assurance (QA) cell continuously reminds the lecturers to carry out peer assessment. However, according to the statistics recently shared by the QA cell, many lecturers do not carry out peer assessment. And I also belonged to that lot!

To be honest, I was kind of shy to get a colleague to sit through my lectures. ‘What if I was not teaching well?, what would she think of me?, would she compare me with herself’ were some of the questions that jumped into my mind whenever I thought of peer assessment. However, through CTHE, I did many changes in my classes. Above all I was feeling confident and satisfied that I am doing my best at teaching. So I was no longer hesitant to invite a colleague to my lectures.

Going by the advice of Biggs and Tang (2007, p. 46) on selecting a colleague that I am comfortable with, I selected Dr Rapti de Silva to do my peer observation. She is one of the lectures I admire in the department, who is very straightforward and who minds her own business without subjectively criticizing others. Moreover, she has obtained her PhD in Mathematics Education, and is one of the few lecturers in the department who put effort on implementing active learning in her classes. She carried out group work and interesting activities such as poster presentations to make Mathematics (an always boring subject) interesting to students. Plus, she is the lecturer in-charge of many of the soft-skills modules. Above all, she herself has done the CTHE course few years back.

Upon her request, I provided her the lesson plan of the lecture. I asked her to use the peer assessment form given by the university QA cell. She arrived on time, and sat

at the back of the lecture. Giving me more than I asked for, she wrote down a running commentary of the lecture (Appendix H.2) , which I found very useful.

After the lecture, I had a brief discussion with her. The major drawback she pointed out was that although I ask many questions from the class, I do not give enough time for the students to answer, and I end up in answering the question myself! Reflecting on that, I did realize that I am not giving enough time for the students to answer my questions! She further explained to me that research has shown that on average a lecturer waits only about 5 seconds after asking a question, which should indeed be 30 seconds. She also said that it is better to ask questions pointed at some students. In her course, what she does is, she carries the list of student names (which are paired), and randomly picks a name and asks questions.

After this feedback, I changed the way I asked questions. Although I did not take a student name list to the class, rather than standing on the stage and waiting for students to answer, I started walking around the class, randomly pointing at students. Sometimes, the same question I asked from few students. I found this very useful – sometimes, about half of the students I pointed at could not give the correct answer. This was a good indication that some of the students still did not understand the related concepts. In such cases, I spent some more time on re-explaining the concepts.

Other prominent problem related to small font size in slides was easily fixed. Sometimes, when I had to show code, I increased the font size and asked the students in the back rows whether they could read it.

Further discussions with the colleague provided a possible solution to a problem I was having. As discussed in Section 3.5.2, I did not want to get the students to explain their answers to the class, because it takes time for them to write the answer on the board. Then Rapti suggested using an overhead projector so that they can simply show the answers without having to write them on the board.

Appendix H.3 shows the completed peer assessment form.

6.3.4 Assessment by Students

Out of the different types of assessments on our teaching, I believe that student assessment is the most important – if I want to find out how good I was in teaching students, the best people to ask is the students themselves, because it is them who are at the receiving end

of my teaching! Marsh (1984) has reported that student feedback is generally reliable and unbiased.

In many universities, it is the standard practice to take student feedback at the end of the semester. However, many researchers doubt on whether collecting student feedback really serves its purpose (Harvey, 2003; Kember, Leung, & Kwan, 2002; Richardson, 2005). One of the reasons for this is that the teachers or institutions do not take student feedback seriously (Richardson, 2005). I also feel the same with respect to our university. I always wondered, “if students reported a particular lecturer as pretty bad, and if this happens over the years, would the university take any action on this?”. Well, I guess not, since I have never heard of any lecturer being fired for not teaching properly (or it could be the case that ALL the lecturers do teach properly). What I feel is that collecting student feedback is happening routinely, but no proper action is taken to follow up with the feedback. When the university sends us the summary of student feedback, we do not receive the written feedback by students. This is a major limitation. Information on the analysis over the likert chart simply gives a rating for our teaching, which can be used for appraisal as done in some universities (Kember et al., 2002). Why students have given us a particular rate in the likert chart can only be interpreted properly only if we could get access to written comments.

In addition to the individual lecturers, the university should put an effort to go through the student feedback and note down salient issues raised by students. However, this is a time-taking process. As mentioned in Section 1.11, some of my students are in the process of designing a system to automatically summarize student feedback. If this was successful, this could be used by the university QA cell.

The main issue of ignoring student feedback is students losing faith in providing feedback, as they see no action being taken upon. In fact, Kember et al. (2002) did find out that students feel that their feedback has not contributed to the improvement in teaching. To overcome this, Harvey (2003) proposed a satisfaction cycle that covers the additional steps to be taken to process the student feedback in order to make it useful. I believe that every university should set up such a full cycle process rather than simply collecting feedback.

I collected student feedback on three different occasions. These are described in detail below. In particular, in par with the reflective practice, I demonstrate how I took note of

student feedback and changed my teaching accordingly. Although I did not employ any full cycle process to deal with feedback, I think I did what was needed – that I changed different aspects of my teaching based on student feedback.

Student Feedback on Implemented Changes

As already discussed throughout the portfolio, for most of the implemented changes that directly affected the student, I collected their feedback. Below given is the list of changes for which I collected student feedback.

1. After discussing an important topic, give 5 mins for students to pose questions
2. After teaching a concept, give a practical question to be solved using the learned concept
3. Assess the weekly submissions of the semester-long programming project
4. Give full/partially completed handouts before the lecture
5. Give mid-semester answer scripts to students
6. Give additional material for students to refer to
7. Give an open-book mid-semester exam
8. Discuss ILOs on the first day of the course
9. Signpost the presentation
10. Have a Java bridging course
11. Group-based learning activities

As mentioned earlier, the main issue is not lecturers not collecting feedback from students, but the lecturers not making use of the feedback to improve their teaching. However, I did quite the opposite. I collected student response to questionnaires in hand-written format, and got them typed in Microsoft Excel.

Then I calculated simple statistics out from student responses that had multiple choices. This way it was quite evident how the student responses were divided among the options. For written textual feedback, I manually grouped the student responses. Interestingly, all

the student responses were around few points, and it was fairly straightforward to identify the points students raised. I did not stop there. Based on my analysis, I took some decisions to be implemented in the future. For example, based on student feedback for giving homework and related material, I decided to allocate marks for homework tasks for the courses I will be teaching in the future.

One problem I faced during this process is designing a questionnaire that is effective in getting the correct response from students. Coming from an Engineering background, I lack the knowledge that humanities academics have in carrying out qualitative research. Thus, as discussed in Section 3.4.2, when analyzing data, I realized that I have not designed the questionnaire properly. Therefore, as mentioned in Section 2.9 as well, it is preferable if CTHE could educate the participants on designing questionnaires to get student feedback.

Student Mid-Semester Feedback

Related LA: 04 (Appendix J.4)

Earlier, I used to take student feedback through Moodle at the end of the semester. In addition, the university insists we collect student feedback on hand-written form, and send feedback forms to the final lecture. This is fine, but by the time I read this feedback, there is no time to make any changes on the current batch.

Therefore, I set up a Moodle feedback forum to collect feedback on the course after teaching the first 7 lectures for CS5612, Pattern Recognition course.

I retrieved questions from the end-of-semester feedback form and prepared this questionnaire. Altogether there were 20 questions. Except for the last question, all the others had likert scale. Appendix H.4 shows the set of questions in the questionnaire.

When analyzing student responses only I realized that I have made a mistake in making the questionnaire! – I have not specifically asked them to give feedback on the first 7 lectures, so that it could be used to improve the latter part of the lecture series. Therefore, most of the comments I received were very general comments.

However, I must mention about one particular feedback. There, one student requested to provide the printed handouts in landscape mode (refer to Section 4.9.2 that described the change related to giving handouts). So, the next week, I printed the handouts in landscape mode. At the end of the lecture, I asked for a show of hands on their preference

Aspect	No of students
In-class activities were useful	19
Homework activities were useful	11
Lectures are well-organized	5
Revising previous week's lecture at the beginning of a lecture is good	4
Use of examples to teach is useful	2
Asking questions from the class	1
Let students ask questions during the lecture	1
Discussing randomly selected erroneous code parts from student submissions	1

Table 6.1: Positive Aspects of the lectures

for handout – portrait mode or landscape mode. Many preferred the former. Then one student spoke up and requested to increase the size of the slides in the handouts, because sometimes it is bit difficult to read the equations. Then only I realized the real motive behind that particular feedback comment! The student had requested the handouts in landscape mode in the hope that it would increase the size of the slides. May be the student who spoke in the class could have been the one who gave that particular feedback on the questionnaire. Although this is a very simple feedback, I believe that it shows the power of taking feedback, and taking action upon it (the reflective practice).

Moreover, I found that the student answers to the questions with likert scale were not very useful for me to take an informed decision.

Therefore, later when I was taking mid-semester feedback for CS2012, I gave a simple questionnaire with just one question: “please give your constructive feedback on the first 7 lectures”.

Altogether 64/110 students added their comments to Moodle forum. Despite being asked to give constructive feedback, many students have simply given very general feedback. However, there was some very useful feedback.

Table 6.1 shows the positive aspects of the lectures as noted by students:

It is interesting to see that the aspect the students valued most is the in-class activities, which is one of the changes I introduced during CTHE. The next aspect, giving homework activities to be done before doing the semester project was the aspect that came next. This is an unplanned change unlike the former, but is a change introduced during CTHE. This

can be considered as a during-action reflection – since I realized that there were students who are struggling to achieve the ILOs, I decided to introduce homework. Similarly, revising previous week’s lecture at the beginning of the lecture is a during-action reflection related to discussing ILOs in the class (see Section 3.4.4). Asking questions from the class I have been always doing, but this was properly formulated based on peer feedback (see Section 6.3.3). Letting students ask questions is a planned change (see Section 4.9.4), and discussing randomly selected erroneous code parts from student submissions is an unplanned change that was introduced as part of the planned change (see Section 5.4.3).

The aspect ‘lectures are well-organized’, is worth a special discussion. I believe this is due to the special attention given to achieving constructive alignment in my courses, based on what I learned from CTHE. Not only that, most of the other aspects hailed by students are indeed results of improving constructive alignment. For example, earlier I had no idea that I should make students achieve a specific set of ILOs. After I was introduced to constructive alignment, I was determined to make sure that I am going to get my students achieve the ILOs specified in the curriculum. Thus in-class and homework activities were introduced to make sure the students have achieved the specific ILOs.

Table 6.2 shows the improvements/requests suggested by the students.

The request to hold tutorials is something worth discussing. As mentioned in Section 3.4.1, I asked the students whether they wanted the optional tutorial. For this, I set up a simple Moodle forum to collect student responses. This is because it would not be ethical to force a tutorial on students without their consent, since they are already overloaded with work. However, by the given deadline, only 60% of the class had bothered to provide their feedback, and altogether, only 50% of the class requested a tutorial. I really found this response disappointing – here I was willing to spend one additional hour each week to help them to achieve their ILOs, and the students are not even bothered to tell me whether I should be doing it for them or not.

So I just did one tutorial, since I have already promised some students that I would do the tutorial. However, I informed the class that there will be no more tutorials. However, after seeing the student feedback, I changed my mind. Some students, especially the weak ones (see Feedback 6.1 requested tutorial classes. So I decided to have tutorials for those who are willing to come – if I could help at least one student during that one hour, I think I have spent that time in a fruitful way. So I informed the class that I would have optional

Request	No. of students
Give answers to homework activities	6
Teaching is fast, speak bit slowly	6
Do the tutorial	5
Discuss more examples	4
Difficult to learn OOP concepts without knowing Java	2
Giving conceptual scenarios is not good	2
White board not clear, use dark marker pen	2
Use more images in slides	1
Give more information on the semester project	1
Presentation slides were not descriptive	1
Add slides to Moodle before the lecture	1
Do more group activities	1
Summative assessment for project on a weekly basis	1

Table 6.2: improvements/requests suggested by the students

tutorial classes.

Feedback 6.1

Thank you for having good lectures. We find it useful. If really student concentrate on what is being taught he should have at least 70% subject matters covered. In class exercises are useful and the way that labs are assigned help us to practice what we have studied.....Thanks for the lone tutorials. Please make sure in future though tutorials are need not to be mandatory, but some will find them useful. Really some students learn from doing questions.....

Another request was to upload sample answers for the in-class and homework exercises. This request was another eye opener. Although I discussed the sample answer in the class, there could be students who cannot understand it fully. Moreover, since it involved coding, it is not possible to quickly write down the answers. So I added the sample answers in Moodle to the complex exercises (See Figure 6.1). I decided to follow this practice when I am offering this module to the next batch as well.

As for the comment that lecture speed is too fast, I must admit that I was bit surprised.

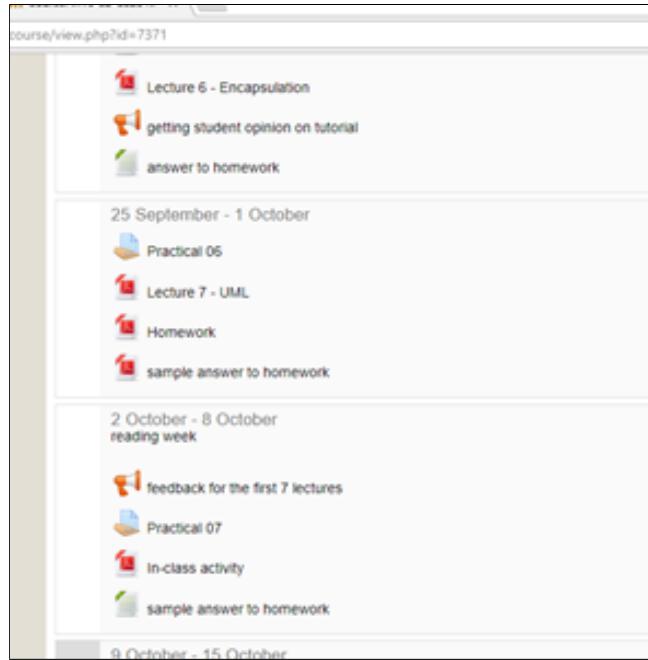


Figure 6.1: Samples answers have been added to Moodle

Earlier I used to talk very fast, but over time, I have learned to talk much slower. Even the peer did not complain about this. So I guess this comment is from students who do not have a good command in English. I should try to talk even slower, I guess. Moreover, I should use a dark writing pen. I can also add slides to Moodle before the lecture. However, I do not intend to make slides more descriptive. This is a concern raised by the previous batch as well (see Section 3.4.1). I do this deliberately so that students will have to come to the lecture to learn. According to Revell and Wainwright (2009), this is a concern that many lecturers have (see Section 4.6.6).

The problem with not knowing Java is a recurring problem (see Section 3.4.1). To solve this problem, I organized a Java workshop (see Section 3.4.2), however, it seems like still there are some students who are struggling.

Finally, some requests such as giving more information about the semester project cannot be addressed for the current batch.

After going through the feedback, I got to think: “what if I did not take this feedback?”. The answer was simple: I would never hear requests such as those on conducting tutorials and uploading sample answers! In other words, until I gave the students a chance to give feedback, no one made these requests, even through email. Since the feedback was anonymous, they were not afraid to make requests. Moreover, by positively responding

to student requests, I made them see that I am listening to their voices, which would make them feel that giving feedback is indeed useful.

Student End-Semester Feedback

As usual I took end-semester feedback for CS5612. In addition to the university provided hard-copy form. I asked the students to fill the same form I entered in Moodle. This is because it takes some time for me to receive the feedback collected through the hard copies, and I do not get to see the written feedback.

I must admit that some of the feedback did surprise me. For example, for the question “Lecturer was sufficiently audible”, 1/10 student had responded as ‘Disagree’. I found this really surprising, since I think I have an embarrassingly high-pitched voice that is far too high when teaching a small class like this. For the question “Lecturer promotes self-studies by the student”, only 7/10 students responded “Strongly Agree”. This is bit surprising even after I gave homework activities. Come to think of that, may be I just gave homework, but did not promote self-studies through homework. Therefore, as explained in Section 4.9.3, in future I am going to assess homework and give marks.

Responses to the two related questions “Number of worked examples and tutorials were adequate” and “Practical applications relevant to the subject were discussed” have got mixed responses. Although I discussed mathematical examples in the class, they were just dummy examples. Therefore, for the next batch, I am planning to provide widely available data sets and ask students to implement toy pattern recognition solutions for those data sets using the techniques taught in the class.

For CS2012, I decided to use a different feedback form to collect student feedback. The standard feedback form has very general questions with a likert chart. Student response to these questions I will anyway get from the university QA cell (although it comes late, it comes before I start teaching this module to the next batch. So I have time to see what aspect that I have to improve). Moreover, as mentioned earlier, this information is not very much useful.

Thus I designed Questionnaire 6.1 that contained questions that specifically checks the student’s perspective on how much they achieved the ILOs.

Questionnaire 6.1

1. Before coming to CSE, I could write a simple Java Program
2. Now I can write a simple Java program
3. Before coming to CSE, I could write Java programs using OOP concepts
4. Now I can write Java programs using OOp concepts
5. Now I can write multi-threaded Java programs using shared resources and tread synchronization
6. Now I can write Java programs containing asynchronously communicating objects
7. What are the POSITIVE aspects of how CS2012 was taught?
8. What are the NEGATIVE aspects of how CS2012 was taught?
9. What suggestions would you give to the lecturer to improve how CS2012 is taught for next batch?

SA - Strongly agree **A** - Agree **N** - Neutral **D** - Disagree **SD** - Strongly Disagree

This was the last day of the course, and only 34 student turned up for the class. Out of these students, only 14 (41%) students had prior knowledge in Java. At the end of the course, 33 (97%) agreed that they can now write a simple Java program. The one student who remained neutral for this question has strongly disagreed to the first question, meaning that she has got some knowledge on Java at the end of the course.

Only 2 (5.8%) students claimed that they had prior knowledge on OOP concepts. This is very interesting - even the students who knew Java, did not know about the OOP concepts, which means that their prior Java education is incomplete. At the end of the course, 33 (97%) agreed that they can now write a Java program using OOP concepts. The one student (the same student who stayed neutral to the above question) who remained neutral for this question has strongly disagreed to the first question, meaning that she has got some knowledge on OOP at the end of the course.

21 (61.7%) and 14 (41%) students have either agreed or strongly agreed that they

Positive Aspect	No. of Students
Discussing practical questions in the class	7
Having tutorial classes	4
Well-planned lectures	3
Semester project	3
Acting upon the mid-semester feedback	2
Having weekly practicals	2
Good communication with students	1

Table 6.3: Positive Aspects of the Course

can now implement multi-threaded programs, and programs containing asynchronously communicating objects, respectively. Again, this result worths a discussion. The latter topic is much easier than the former, still a lower number of students have proficiency in it. This topic was taught by the junior lecturer. This makes me think whether it was not a good idea to get a junior lecturer to teach.

Table 6.3 records the positive aspects of the course as noted by students. As in the mid-semester feedback also, students have commended the practical question discussion and tutorial classes. One notable aspect mentioned by students is me taking action upon the mid-semester feedback given by students. As discussed in Section 6.3.4, researchers have reported that many lecturers do not take action upon student feedback, which makes the students lose their faith on giving feedback. Thus, as discussed in Section 6.3.4, I made sure I took action upon student mid-semester feedback wherever possible. It is good to see that students have noticed that. This helps to develop their trust on me.

Table 6.4 shows the negative aspects as seen by the students. This feedback suggests some restructuring to the course, such as allocating more time for multi-threaded application development topic.

Table 6.5 shows the suggestions to improve the course. As can be seen, this feedback is more or less in-line with the mid-semester feedback. In particular, changes introduced during CTHE course have been the best attractions.

Negative Aspect	No. of Students
Multi-threaded application development is difficult and allocated time is not enough	4
Some lectures were too fast	3
Lab feedback is not sufficient	1
Not teaching Java	1
Junior Lecturer teaching one topic	1
Not discussing enough practical examples	1

Table 6.4: Negative Aspects of the Course

Suggestion	No. of Students
Have more tutorial classes	5
Discuss more examples	3
Allocate more time for multi-threaded programming	3
Provide the full code of the examples at the initial lectures	2
Teach Java	1
Do not let the junior lecturer teach	1
Use a clear marker and a white board	1
Do summative assessment of the practical on a weekly basis	1
Give feedback to practical submission till the end of the semester	1
Give small tasks for practical, instead of the semester project	1

Table 6.5: Suggestions to Improve the Course

6.4 Willingness and Ability to Change

The reflective practice that was exhibited throughout this portfolio is the best evidence for my willingness and ability to change. Nevertheless, I decided to highlight it furthermore, since in our university system, I have witnessed some resistance for change.

As already described, I implemented 18 LAs, where I could have simply finished the CTHE course with just 7 LAs. This is the best example for my willingness to change.

The changes described throughout this portfolio can be broadly categorized into two: planned changes, and unplanned changes. LA implementations fall into planned changes. Going along the IPUR cycle, I identified issues with my teaching, and I planned the change to overcome these issues, and I implemented those changes. In contrast, unplanned changes were mainly due to the during-implementation reflections. One good example is the reflection on mid-semester feedback from students. Although I have earlier decided that I will not hold any tutorials or will not share the sample answers to the homework questions, after seeing the requests made by students in their feedback, I decided to have the tutorials.

An example on during-implementation change is how I implemented the lesson plans. Although I had a pre-designed lesson plan, during the lecture when I realized that students were struggling and I had to explain a concept more, I modified the lesson plan while it was being executed.

Finally, I believe that this willingness and ability to change is an indication of one's humbleness – to know that no one is perfect and being willing to improve.

6.5 Implemented Changes – What Worked and what did not

Altogether, I proposed to implement 18 Learning Agreements. Table 6.6 shows a summary of these LAs. Out of these, all were implemented. However, I do not report the implementation of LA 17 in the portfolio, as I felt that it not directly related to teaching/learning/assessment. The status column in the table indicates the success level of these implementations: S- successful, F – Failed, P - Partially successful, NA- Not Applicable (i.e. not implemented).

LA No.	Description	Section in PF	Success Level
1	After discussing an important topic, give 5 mins for students to pose questions on an online platform	Section 4.9.4	S
2	After teaching a concept, give a practical Question to be solved using the learned concept	Section 4.9.1	S
3	Assess the weekly submissions of the semester-long programming project	Section 5.4.4	P
4	Set up a Moodle forum to take student feedback after 7 weeks	Section 6.3.4	S
5	Give full/partially completed handouts before the lecture	Section 4.9.2	S
6	Give mid-semester answer scripts to students	Section 5.4.2	S
7	Give additional material for students to refer to	Section 4.9.3	F
8	Give an open-book mid-semester exam	Section 5.4.1	S
9	Use a to-do list	Section 7.2.2	S
10	Give the detailed mark breakdown of the assignment	Section 5.4.5	S
11	Conduct a peer review on my lecture	Section 6.3.3	S
12	Have weekly meetings with TAs to discuss about practicals	Section 3.4.3	S
13	Discuss ILOs on the first day of the course	Section 3.4.4	P
14	Plan the lecture with lecture breaks	Section 3.5.2	S
15	Signpost the presentation	Section 3.5.5	S
16	Plan the course delivery plan with other lecturer	Section 3.4.1	S
17	Record student attendance in Google sheet	NA	NA
18	Have a Java bridging course	Section 3.4.2	P

Table 6.6: Summary of implemented LAs

The portfolio sections corresponding to each of these LA implementations described the reasons for a particular LA being considered under this given success level.

Moreover, as described in the related sections, some LA implementations differed from the initial plan proposed in the LAs. One example is the first LA. Although I planned to use an online platform for students to pose their questions, I asked students to write down their question and pass to me instead, because there were students who did not have Internet access during the lecture.

6.6 Revisiting the Five Main Problems of my Teaching and Learning

At the second CTHE workshop, we were asked to fill a table related to the five main problems in our teaching, or those that we experienced as a university student. As described in Section 2.8, I was passing the Transition phase in my learning curve (according to the TDA model), thus I was simply following the instructions of the course tutor without thinking much about them. For this activity also, I thought it was just a standalone activity. However, I wrote down 5 problems that I thought were the most important. In a

much later workshop, again we were asked to re-visit this table to see how many of those problems were now solved with the implemented LAs.

Below I discuss the solutions I gave to these issues during CTHE.

Interestingly, through my LAs, I have given solutions to all these problems, directly or indirectly.

1. Students falling sleep in the class – The reason for this is student attention being limited (see Section 3.5.1). As a solution, I introduced lesson breaks and group-based learning (Section 3.5.2). I conducted many in-class exercises during the lecture. As discussed in Section 6.3.4, many students found in-class activities very useful.
2. Students not asking questions in the class – I implemented LA 01 where I gave students the opportunity to write down their questions and send. One student commended this in her mid-semester feedback.
3. Cannot see or hear lecture properly – this is what I faced as a student. As a lecturer, I do not think I have a problem with talking loudly. According to the feedback from students for CS5612, all except one student said that lecturer is sufficiently audible. As noted by my peer, my PowerPoint presentation could be seen clearly from the back most of the time. When I was giving in-class exercises, I gave the printed copy as well, so even if students could not read it on the screen, it was not a problem. As requested by the students, I will use a darker marker pen in the future.
4. Students being so apathetic – Although there was no any direct solution for this, I carried out many activities to make students (in particular, the ‘Roberts’ as mentioned by Biggs and Tang (2007, p. 8)) motivated. For example, many students develop a dislike for CS2012 when they struggle with Java. As a solution, I introduced a Java workshop. Moreover, weekly submissions to practicals were assessed in a formative manner, and each student was assessed by the same TA every week, which helped us to identify apathetic students and talk to them. One student did comment on how I tried to motivate them, in her feedback comment (see Feedback 6.2).

Feedback 6.2

Oop concepts are taught by her very well. I understood them and the home-works and other activities done by her motivate us for the subject.

Although not reported in the portfolio, with the consent of the department, I started a mentoring project for the students. Each student is allocated to a lecturer, where he meets her mentees on a bi-weekly basis. When a student is noted for his apathetic attitude or misconduct, her mentor is informed, and the mentor talks to the student to change her attitudes/habits. Just by letting students know that a lecturer is there to help each student is helpful in getting students to work.

In particular, there was a set of Tamil speaking students who were really apathetic. They sat in the back of the class, and appeared lost when asked to do in-class activities. I got these students to sit in the front of the class every week, and showed that I am keeping an eye on them. I also asked a Tamil senior lecturer to talk to them and motivate them. And this really worked! After about three weeks, I saw a complete transformation of these Tamil students. They were asking questions, responding to my questions, doing very well in in-class activities, attending all the practical classes, and were trying to learn more than needed for the course. This was a very pleasant surprise, and I feel humbly happy about changing lives of these students.

5. Students copying from each other – This is the problem with summative assessment – students simply try to score marks, rather than worrying about learning. Thus, in addition to summative assessment, I introduced homework, which was formative. Moreover, since each student was assessed and monitored by a single TA throughout, it was easy to identify if someone was cheating. We indeed caught one student cheating – he simply showed his friend's software program as his own. Since the TA was closely monitoring him and noted that the student was not doing the homework activities, she doubted as to how the student produced such a nicely written program. When interrogated, he admitted that he cheated, and showed the email sent by his colleague, which contained the answer. Moreover, my junior lecturer set up software to test for plagiarism in software programs submitted by the students.

6.7 Summary of SEDA Outcomes and Values Addressed in the Chapter

6.7.1 SEDA Values:

1. Continually reflecting on practice to develop ourselves, others and processes:

Section 6.2.2: I analysed and appraised the reflective practice that I have developed through CTHE. Reflective practice is hailed by educationers as a great tool to improve teaching and learning.

Section 6.3: I presented self, peer, and student assessment on my teaching to identify further improvements I can do.

6.7.2 SEDA Outcomes:

1. Use a variety of methods for evaluating your teaching:

Section 6.3: I presented self, peer, and student assessment on my teaching to identify further improvements I can do.

6.7.3 SEDA Specialist Outcomes:

- i undertake appropriate development activities:

Section 6.2.2 - I started to follow the reflective practice.

Section 6.3 - I started doing self and peer evaluation on my teaching, and took more student feedback as well.

- ii reviewed your development and your practice, and the relations between them:

Section 6.3 - I reviewed my teaching using self, peer and student feedback.

6.8 Chapter Summary

In this chapter, I revisited my recently developed reflective practice in an analytical manner. In addition, I provided self, peer and student feedback on my teaching. Student

feedback was taken on three occasions - after implementing a new change, during the middle of the semester, and at the end of the semester.

Chapter 7

Being an Effective Academic

7.1 Introduction and Outcomes of the Chapter

The outcomes of this chapter are an analytical discussion on my effectiveness and efficiency, my teaching philosophy, and my plan to achieve my long-term professional goals.

At the end of this chapter, the reader will be able to

- Identify good human values
- Identify good values of a teacher
- Identify some noteworthy professional goals

7.2 Being Effective and Efficient

Being an Effective and Efficient Academic- the General Notion

In the English dictionary, the term effective is defined as “successful in producing a desired or intended result”. Similarly, this term, with respect to a person is defined as “working in a well-organized and competent way”.

In Human Resource Management, these characteristics of personnel are very much encouraged, while more emphasis is given to effectiveness. With respect to academics, effectiveness should be measured along three dimensions: research, teaching, and administration.

Effectiveness of researchers is quantified mainly based on the research publication output. Highly effective researchers continuously publish in high-impact indexed journals

followed by publications in high-impact indexed conferences. Two (1994) presents the characteristics of effective teaching. Interestingly (and not surprisingly) I see a close alignment between these characteristics and SEDA values/outcomes.

- Being an expert in the subject
- Being continuously aware of developments in the teaching in their subjects
- Having an understanding of how students learn
- Ability to systematically use a wide variety of teaching methods
- Being able to reflect upon her teaching practice
- Willingness to develop herself
- Effectively plan teaching lessons, material, and courses
- Carrying out course review and evaluation of student learning
- Expertise in a variety of assessment methods
- Maintaining awareness of the student population
- Understanding and following equitable practice
- Providing examples of learning for students

Being effective in administration can be described with respect to the general notion of administration. Watt (2009) discusses 10 traits of an effective academic leader.

- Follow procedures and adhere to policies
- Submit to the authority of others
- Take risks
- Commitment to the organization
- Being proactive
- Anticipate conflict
- Tell the truth, but with compassion

Not urgent important	Urgent and important
Not urgent not important	Urgent not important

Table 7.1: Task prioritization based on importance and urgency

- Ability to listen
- Respect values of co-workers and treat them with dignity
- Make sure personal, as well as organizational goals are achieved

The key to be efficient is the ability to prioritize tasks. Table 7.1 shows a categorization of tasks based on their urgency and importance. The task execution priority should be: urgent and important tasks, urgent but not important, important but not urgent, and finally neither important nor urgent.

Based on the identified prioritization level of a task, we can either do, delegate, delay, or dump it. Tasks with no urgency or importance are candidates to be considered to delegate, delay, or even dump. In contrast, we ourselves will have to do important tasks, as they lead to better benefits in the future.

7.2.1 Am I Efficient and Effective?

Am I efficient and effective? The question will always get a subjective answer. I will not say I am 100% efficient and effective, because on one hand, I do not think it is possible to quantify the maximum level of efficiency and effectiveness. On the other hand, if I start believing that I am fully effective and efficient, I will allow no room for myself to improve.

So again revisiting the question, am I efficient and effective? I would say yes, to a certain extent. My effectiveness can be analysed with respect to the characteristics of different roles of an academic as discussed above.

Being effective in research: I would say I am somewhat effective. This year and last year I produced 14 research papers per year. So in that sense, I am active in research. However, these are in indexed conferences, but not in indexed journals. Therefore, I have a lot more room to improve. I should focus on doing more high quality research and publish in high-impact journals. However, with respect to the standards in our university,

I am not doing that bad. Based on the recently released research award winner list for 2016, I am one of the 83 academics who won a research excellence award. Although I got category 2 award instead of category 1 award since I did not have journal publications, I have the highest total marks for research publications in the whole Engineering Faculty, and the second highest total in the whole university. Appendix I shows the certificate I received for this.

Being effective in teaching: when looking at the list of characteristics of effective teaching, I can see that after about a 7 month journey with CTHE, my teaching effectiveness has been substantially improved. In the chapters 3-5, I clearly demonstrated, and again in Chapter 7 I again discussed how I developed an understanding of how students learn, how I applied different teaching methods, how I developed the reflective practice, my willingness and ability to change, how I efficiently plan for teaching, how I reviewed the course, use of different assessment methods, being aware of students and individual issues, and how I followed equitable practice.

In addition, for the subjects I teach at undergraduate level, I already have experience from the industry as well. As for postgraduate teaching, the subjects I teach are closely related to my research areas. Since I am very much active in research, I always update my lecture content with the knowledge I gain from the research publications I read. For example, recently I have seen an increase in the use of deep learning and word embedding based techniques for text classifications. So I added new material on this to my lectures.

Being effective in administration: As discussed in Section 1.12 as well, I do not have much administrative duties and I do not fancy administrative work that much. However, looking at the list of characteristics of effective academic leaders, I do believe I have many traits discussed there.

I am very much a policy-oriented person. I always go by the laws, and I think it makes our lives easier because it makes us more consistent when taking decisions at various points.

I also submit to the authority of my HoD. If I am going to try out something new, I always inform him. For example, the mentoring program I started for the Level 2 undergraduate students (see Section 6.6), I got the consent from the HoD. Even more, when I informed the other staff about that, in the first sentence of the email read “as per the instructions of the HoD”. Then no one can point fingers at me.

I believe I am very much committed to the department, and the university. I always release exam results on deadline, and sometimes even before that. I conduct continuous assessments as indicated in the syllabus. Sometimes I even go and teach with my little son. The same applies to meetings. I seldom allow my personal difficulties to stop me from participating in important meetings. So many a time I attend meetings with my son. He has now even been to the faculty board room! Once when I was going to the lecture, my car met with a major accident. So I quickly called another lecturer and swapped my lecture with him, and after the police matters were sorted, went and did the lecture although I was very much shaken after the incident.

I am proactive, most of the time. The best example is, when we were filling an activity sheet at CTHE, we were asked to indicate the most influential person in the group. My other members decided that it has to be me, and the distinguishing character they saw in me was proactiveness.

After seeing many incidents during department meetings, I always anticipate conflict. That is why I always go with HoD approval, as mentioned earlier.

I think I am a good listener, a good crying shoulder. When there are female students under stress, the HoD has asked me to talk to them.

I am someone who treats everyone, those below me in particular, with dignity. Even the domestic workers I used to have, I always treat them with dignity, and consider them as humans who have the same needs as us. I think how we treat those below us shows our real character. Even when a non-academic staff or a research student does not deliver as expected, I do not shout at them – I calmly explain the issue.

As I discuss below as well, I am continuously working towards achieving my personal goals – to become a renowned researcher. This in turn helps the university to achieve its goals- to become a high-ranked university.

As per efficiency, I do believe I am efficient to a great extent, and have potential to be even more efficient. The CTHE time is the best example for this. Even before I started the CTHE course, I was claiming that was working at my full capacity. When I had to do CTHE work on top of my university duties (with no reduction in that), I was delivering equally for both CTHE and university. And mid-way during CTHE, my domestic helper lady disappeared. So on top of CTHE and university duties, I had to do all the household work as well.

This got me to thinking, how on earth did I find time? Then I realized that I have reduced the time I earlier spent on unnecessary things such as checking FaceBook, arguing over religion and politics in FaceBook posts, and reading gossip news. And I never watch TV – we do not even have a TV. As per Table 7.1, these are not important or urgent, and are thus time wasters. However, stopping these things does not make me sad. In fact, these are things that spoil one’s mind and I always wanted to stop them. Once I read an article on how to be productive, and there the author said we should spend time on producing tasks but not consuming tasks. In other words, watching TV, etc are consuming tasks, and (say) writing a research paper is a producing task. So I am happy that I finally managed to reduce time on consuming tasks. I also improved my multi-tasking ability. In the university where I was doing my PhD, there was a renowned professor. Many a time I have seen him reading research papers while walking! Although I did not go to that extreme, I started doing household chores while taking care of my son, simply by getting him involved in the work. He also enjoyed it, because I think he felt that he is doing some important grown-up work. In Section 2.8, I explained how I used CTHE workshop days to the maximum.

Once CTHE is completed what would I do with the time I save? Well I might get few more hours of sleep and re-start my daily exercise dose, I guess.

However, I must admit that I do have some weaknesses, the first one being trying to be a perfectionist. This is especially the case with the research publications I work on with my students. I always tell them “if a paper carries my name, it should be upto my standard”. Once I remember correcting a student’s paper 15 times! I think this is a habit I got from my PhD supervisor, who himself is a perfectionist. This of course makes me effective in research – I make quality publications. However, this makes me less efficient as the paper writing process does take too long and it stresses me out.

And I tend to plan, re-plan, and over-plan everything, from the steps I would carry out to finish cooking in the morning within 1 hour, to how I would organize my son’s birthday party, to how I would organize a research paper. This of course is unnecessary, as the famous Buddhist monk Venerable Ajahn Brahmawamso once said, “the more you plan, the more things would go out of hand”. However, getting out of such a habit is easier said than done.

I am not much of a risk-taking person. With the amount of politics I see around me, I

think the stress of that would be too much.

Finally, I have a very bad memory. I am very famous at the department for forgetting my room keys. The support staff has to bring ladders and climb over the room partitions to get my bag out! And I find it very difficult to remember all the rules, regulations, and by-laws in the university, which are constantly changing.

7.2.2 Improving Efficiency and Effectiveness

As I said earlier, I always believe that I have room to be more effective and efficient. During CTHE time, I took two more steps towards this – by starting to use a Google calendar, and an electronic to-do list (Bellotti et al., 2004). This really helped me to overcome one of my major weaknesses – having a bad memory.

Maintaining a Google Calendar

When organizing meetings in our department, it is a common practice to send the participants a Google calendar invitation. Google calendar is included in our Gmail profile associated with the department email address. When we accept a Google calendar invitation, it is automatically added to our Google calendar. Best thing is that it sends event reminders to our smart phone, so even if we do not open the Google calendar, we will not miss the event notification. Although events sent by others appeared in Google calendar, I did not have the practice to add my own meetings (such as meetings with research students) to Google calendar. Due to this I have run into embarrassing situations sometimes, where I have scheduled two meetings at the same time.

Thus during CTHE, I decided to add my meeting schedule to the Google calendar. For crucial tasks such as exam invigilation that I cannot afford to miss, I add a reminder one day before, just to be in the safe side. Figure 7.1 shows a snapshot of my Google calendar (Fridays were kept completely free for me to attend CTHE).

Related LA: None

Maintaining a To-do List

Related LA: 9.

I normally do not miss completing tasks on time. However, some tasks such as reviewing student draft thesis, I tend to postpone quite a bit, because they are not that important

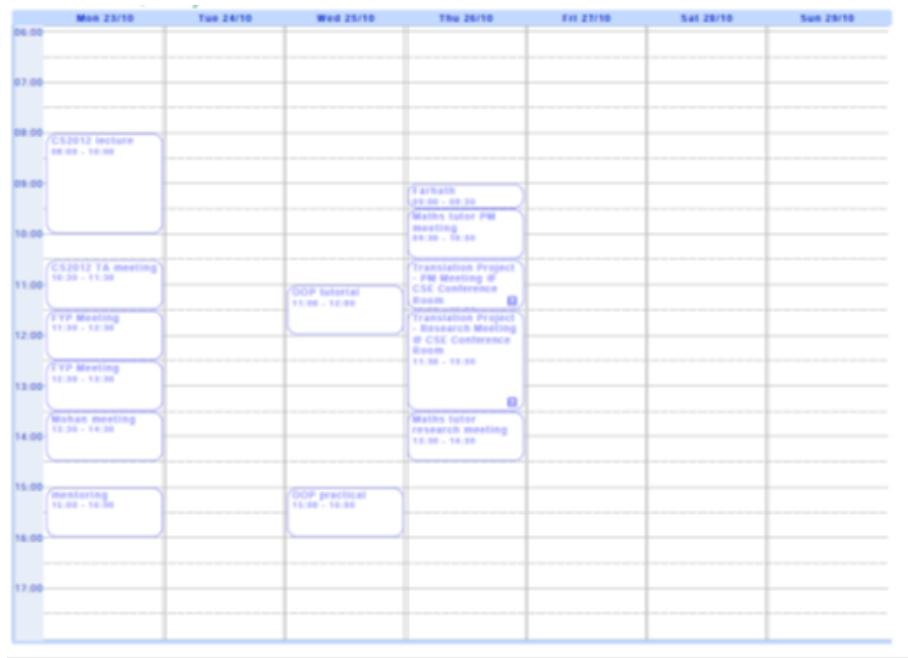


Figure 7.1: Snapshot of my Google Calendar

on my side. However, this is not a good practice, since even if those tasks are not that important to me, they are much important to my students. Thus I decided to use an electronic to-do list. When I see the to-do list appearing on my computer screen every day, I see tasks that keep on delaying, and would take actions to complete them. Out of curiosity, I decided to check how much time I take in completing a task after being assigned to me. So, whenever I added a task to the to-do list, I added it to an excel sheet along with the date. Once I completed the task also, I added the completed date to the excel sheet. Table 7.2 contains this excel sheet that I maintained for about a month.

As shown in Table 7.2, I have always managed to meet the deadlines. Of course, all these deadlines (such as preparing examination paper, submitting a paper to a conference) are non-extendable - if you miss it, you miss it. Of course, some tasks such as setting up an exam paper cannot be missed at any cost.

Most of the tasks that have taken longer are those that are not really urgent or important (at least) to me. For example, the task “Java for Yohan” is something I do as a favor to that person. Some tasks such as sort out travel money are important, but not urgent, because that money I can get eventually.

Book uni van	2017-06-12	2017-06-14	2017-06-13	yes	1	1
Apply for academic award	2017-06-13	2017-07-11	2017-07-05	yes	22	6
Telco proposal	2017-06-14	2017-06-21	2017-06-21	yes	7	0
PhD recommendation letter	2017-06-15	2017-06-30	2017-06-21	yes	6	9
Prepare my 2pg cv	2017-06-15	2017-06-19	2017-06-17	yes	2	2
Sort out travel money	2017-06-21		2017-07-06		15	NA
Issue appointment letters to RAs	2017-06-21		2017-07-10		19	NA
IR paper check	2017-06-23	2017-06-25	2017-06-24	yes	1	1
Java for Yohan	2017-06-25		2017-07-04		9	NA
Hasanga presentation	2017-06-27		2017-07-04		7	NA
Join UMTA	2017-06-28		2017-07-05		7	NA
Umayangani report	2017-06-29		2017-07-06		7	NA
Lab for chathura's experiment	2017-06-29		2017-07-10		11	NA
Nimasha abstract read	2017-07-05	2017-07-10	2017-07-06		1	4
RFP for live room	2017-07-10		2017-07-25		15	NA
Rajpirathap paper read	2017-07-12		2017-07-24		12	NA

Table 7.2: Analysis of my Task Completion Rate

7.3 My Beliefs and Values

7.3.1 Personal Beliefs and Values

I believe in

Karma – if you do or say something with bad intentions, you will face the bad repercussions of it. Similarly, if you say or do something with good intentions, you will face good repercussions of it. This gives me greater control of what I do – I have some control over what happens to me. I have seen many incidents that prove that your karma comes after you in this very life (Dittadhammadaneeya karma). I think this belief is much better than believing in an unseen god, or other superstitious things.

Golden rule – Lord Buddha said “Hurt not others in ways that you yourself would find hurtful”. Similarly other religions have this same rule in slightly different ways. In modern world, this is termed as the ‘golden rule’, which means that what you do not like happen to you, do not do it to others (Golden Rule - wikipedia). I believe that all my

actions are guided by this rule. In fact, I believe that if we could teach our children how to practice the golden rule, there is no need for religion in this world. The simplest example of me following the golden rule is how I treat the kids in the neighborhood who come to play with my son. These kids belong to different economic and social levels. However, I treat them all just the way I treat my son. I have been discriminated many a time as a kid, and I do not want to do it to any other kid.

Hard work (not luck) – If we want to achieve our highest dreams, the only way is to work hard. Recently I read a nice post by the famous Bollywood actress Sonam Kapoor. There she explained how hard it is for an actress to maintain her appearance. Although many girls wish to be like an actress, it is not the luck or beauty that makes a good actress. Rather, it is the hard work that pays off to excel in that profession.

I value

Happiness – Happiness is what I value most. Whatever we do (whether we try to be an effective teacher, or whether we just want to sleep for 10 hours per day), the ultimate goal is to be happy. However, I always think the best long-lasting happiness can be achieved if we learn to be happy by letting go, rather than by holding on to materialistic things.

Honesty – Honesty comes from two beliefs I described above - karma and golden rule – just like I do not like to be cheated, I do not want anyone to be cheated by me. Thus I very seldom lie. In some situations, I refrain from answering/commenting, rather than lying.

Empathy – Once I came across a nice quote: “Be kind, for everyone you meet is fighting a hard battle”. So before being harsh to anyone, I try to understand the situation they are in. Recently, I noticed that one of the bright students in my MSc class is not focusing much on the lecture. Later on, she emailed me saying that she got separated from her husband. I was so glad that I did not ask her about her lack of attention to the lecture.

Equality – Every human being should have equal rights, at least for basic necessities. No one should be put down because of his cast, or profession. I still remember as a kid how I used to fight with my grandmother when she did not allow low cast people to sit on the chairs saying that it is against Buddhist teaching.

Respect – I expect to be respected for the human being I am, and I always try to

be respectful to others, especially to those who are below me. Again, this follows from golden rule.

Minding my own business – I think this is a value I develop as I got mature with life experiences. I can think of many times that I got into trouble because I was unnecessarily reacting to things. But now I think I am much better – I respond only if it is necessary. Recently, during one of our staff meetings, there was a heated debate on some matter, among senior lecturers. Since taking one's side would be catastrophic and my opinion would be unheard of among the loud voices, I decided to do some work on my computer.

Selflessness – All of us are selfish, up to some extent. However, when a decision that involves others have to be taken, it is always important that we make sure the other party is not at a disadvantage unnecessarily. Again, this value is tied up with the golden rule – if we do not like something, others may not like that too.

Discipline – Abiding the rules, written or unwritten is very important. And it is very important that we discipline our children – in obeying road rules, not littering public places, waiting for the turn in the queue, and many more. If only the citizens in this country value selflessness and discipline, we would not be hearing about bond scams or would not see any traffic rule violations.

7.3.2 Teaching Beliefs Values

As a teacher, I believe that

All students should be treated fairly – As mentioned above, we should treat everyone equitably. No student should be discriminated because of her gender, ethnicity, and most importantly, their academic performance. Sometimes I catch students for misconduct, such as signing for absentees. I take necessary discipline actions, but I dismiss that incident after that, and do not let it affect the student's grade. Once I was asked by another lecturer to push a student one grade up, since he was in the boarder and he is extremely doing well in extracurricular activities. I rejected this suggestion. My stand is, if a student does extracurricular activities, that is his choice and he will be recognized for that in a different forum. However grades are completely based on academic performance, and in that scale, each student should be measured and treated in the same way.

I should help students excel – Students follow a course because they want to learn something new. In other words, no student will follow a course, if she is already a master

in it. Thus, it is my responsibility to make the students achieve the ILOs and make them excel. I believe that the previous chapters demonstrated my willingness for this.

Student has the right to have different opinions and views from mine – on the same theory or concept, different people might have different opinions, because everything is decided based on subjective judgments. Thus we should allow the students to develop their own views of the concepts that they are taught, and even more, they should be given a chance to discuss these opinions. That is why it is important to allow students to ask questions, as I always do in my classes.

Teaching is a two-way interactive process – Passive learning based on lectures is now proven not effective at all. Thus, the teacher should get the students involved in the teaching process, thus converting the lesson into an interactive process that enhances active learning by students.

Students deserve respect – As mentioned earlier, we should treat everyone with respect. Our students are of no difference. It is not a very good idea to shout at students unnecessarily, or humiliate them in front of others. Above all, as mentioned earlier, we should respect their opinions and values.

Each student is different – So is each human – like the five fingers in our hands. According to the Maslow's needs hierarchy, each student might have different needs. They might have different future plans. Although it is difficult to individually cater for each student's need in every class, the teacher should be able to roughly identify different student groups, and cater to them accordingly. If there are extreme cases, they should be handled. As discussed in Section 6.6, where I identified some Tamil students who are not much motivated, I referred them to a Tamil colleague of mine.

There are no bad students, just bad teaching methods – this is a belief I developed during CTHE. In particular, at the university level, there cannot be bad students, as they entered the university after going through competitive selection exams. As discussed in, Section 4.2.2, Kolb (1985) identified different learning styles. So students belonging to these different categories prefer different ways of teaching/learning. Thus the same content can be, and has to be delivered to students using many different teaching/learning methods. Thus it is important to identify the best way to teach a particular class. This requires the teacher to carry out many teaching/learning experiments, and get student feedback on the same to identify which methods suit best, as I explained throughout my

portfolio.

Students deserve my best effort – Just like in every profession, a teacher should be committed to give her best. In the case of a teacher, the best effort is to develop students in her course. Otherwise, they would finish my course just the way they started – without any ILO achieved. This means that a teacher should not take doing the lecture as her only duty. Proper planning of the course in order to get the students achieve ILOs, proper design of assessments to correctly measure if ILOs are achieved, reflecting on my own teaching, and analyzing student feedback to assess if teaching has been successful, are all part of my duties, which require significant effort from me.

Students should be appraised – As also explained in the behaviorist approach to learning (see Section 4.2.1), students should be reinforced. Appraisal is one such reinforcement, let it be a pat on the back, or motivational feedback on the student's assignment submission. I always keep this in mind, and appraise students who ask questions and answer my questions in the class. Plus, during CTHE, I started giving formative feedback to student assessments.

Students are the best judges of my teaching – Students are at the receiving end of my teaching. Thus they are the best to judge my teaching. This is why I take student feedback on my courses in many different occasions.

I can never stop learning and experimenting on how I should teach – Teaching is a never ending journey, which requires continuous improvements. I learned this through CTHE. Inspired by what I learned, I keep on carrying out improvements to my teaching. As highlighted in the previous chapter, some of these changes were done before teaching, while teaching, and after teaching is completed, with respect to a particular course.

As a Teacher, I value

Fair assessment – assessment is what determines the future of a student, whether we like it or not. Going by my belief that all students should be treated equally, I make sure I carry out objective, but not subjective assessment.

Timely and quality feedback – I believe that I have a responsibility to make my student excel. Thus I should help them identify their weaknesses. Giving actionable and motivational feedback (that appraises a student) on a timely manner is one of the best

ways to get the students to learn from their mistakes.

Content and pedagogical competence – I cannot make my students excel in a certain course or a program if I myself am not familiar or up-to-date with the subject matter. I remember when I first joined university of Moratuwa, I was asked to teach a subject that I knew nothing about, and had no desire to learn. So I had to kindly reject that. In order to achieve pedagogical competence, it is important that we are equipped with the fundamental theories and concepts related to teaching. Using them as a base, we can experiment with many teaching/learning activities. As for me, the concepts such as active learning, constructive alignment, formative assessment, and the TDA model paved the way for me to improve my pedagogical competency.

Confidentiality – not only exam papers we prepare, but the assessments we do should be treated confidentially until they are officially released. In Sri Lanka, we hear many stories where confidentiality of exams being violated. Although I have heard stories of some lecturers giving answers to selected students (not in my university), I have never even thought of doing such a thing, as I believe in fair treatment for students.

Respect for students, colleagues, and institution – based on my personal values on respecting others, I respect my students, colleagues, and institution. I do not humiliate or shout at students in front of others. I also am in very good terms with all of my colleagues. Although I have many differences with respect to opinions, and although in some cases I have been mistreated by some of my colleagues, I have no intention of having any grudges with anyone. In particular, as I mentioned earlier, I try to mind my own business, and as much as possible, I try to refrain from discussing any colleague behind his back.

Commitment to teach – Making students excel with respect to the ILOs of my course is threefold – having subject competency, having pedagogical competency, and having the commitment to teach. Even a world renowned professor in his discipline is useless if she does not have any commitment to deliver that knowledge to her students. In this portfolio, I clearly demonstrated my commitment to teach, how I walked that extra mile to help students in learning such as by organizing optional tutorial classes.

Positive interaction with student – As teachers, we should not be thought of as non-approachable. Thus, during my classes, I ask questions, and answer questions from students. I even encourage students to email me with their questions. After some time, students develop a trust on me, and by the time they come to the final year, many have

asked for my advice on their career planning and to provide recommendation letters. I'm being invited to their weddings as well.

Teaching improvements based on student feedback – as I mentioned earlier as well, students are at the receiving end of my teaching. Thus, if they do not like the way I teach, I should know that, so that I can change my ways. The only way to find this out is by taking anonymous student feedback, which I do in many different occasions.

7.3.3 My Teaching Philosophy

According to Schönwetter, Sokal, Friesen, and Taylor (2002), a teaching philosophy statement is increasingly becoming a mandatory requirement for getting, as well as promoting, in faculty positions. This statement is expected to be comprehensive, which includes personal beliefs about teaching and learning, disciplinary cultures, and many more.

My teaching philosophy is given below:

I believe that teaching is a very much challenging, as well as a rewarding discipline. Teaching is challenging because the teacher has to identify the best teaching method(s) in such a way that each student with her different needs, beliefs, and skill sets can achieve the Intended Learning Outcomes (ILOs) of a course or a program. Teaching is rewarding because it helps transform naïve students fresh from high-school into budding young professionals to take up the future of a country.

I see two orthogonal competencies associated with my teaching – the subject competency (in Computer Science and Engineering discipline), and pedagogical competency (ability to deliver subject matter in the most appropriate way that ignites and sustains student learning). Thus, a teacher should be a life-long researcher. She should consciously update her knowledge on the latest developments in her discipline. This is particularly true for my discipline – Computer Science and Engineering, which is fast changing. Thus I engage in much research related to the subjects I learn. I not only share this knowledge with my students, but I encourage them to get upto date with the latest developments in our field of study. As for pedagogical competency, it is important that we experiment with different teaching/learning approaches, rather than restricting ourselves to traditional lectures. I received my basic knowledge on pedagogical theories and methods from the teaching in higher education course that I followed. Inspired by what I learned, I now

apply many different teaching/learning methods in my courses, and get student feedback to evaluate the techniques that work for my students. I continuously discuss my teaching experiences and difficulties I faced with my colleagues individually, as well as in departmental forums.

In addition to the aforementioned competency dimensions, I am constantly aware of the psychological needs of my students. Coming from different cultural and economic backgrounds, and belonging to different genders and ethnicities, different students have different needs, opinions, and skill sets. Thus I always listen to my students, be it in the class, or be it outside the class, or be it over email. As much as possible, I try to cater to individual needs of students, as each student deserves my best effort in developing themselves. I go into the extent of holding optional tutorial classes for students who struggle with subject content, and clarify doubts of individual students via email communications.

I am a firm believer in active learning. Inspired by how my little son learns in his kindergarten, I try to get my students achieve the course ILOs by getting them engaged in activities rather than by listening to a lecture. In particular, in a very practical discipline like Engineering, such activities are needed to develop the higher order thinking skills of students, which are linked to the course ILOs. I take great care in designing these learning activities, so that they would gradually develop the students' thinking skills into the course ILOs.

I also make sure I align the assessment with the ILOs such that my assessments are able to measure whether students have achieved the course ILOs. During the first part of a course, students are going through a transition phase, where they juggle with the new information thrown at them. Thus during this period, I purposefully carry out many formative assessments related to the lower-level thinking skills they should gradually develop, and give them instructional and motivations feedback. I try to give individual feedback as much as possible, and if not I at least analyse common student misconceptions visible in student submissions and discuss these in class. During the latter part of the course, where the students are in the developing or achieving stages, I do more challenging assessments that push the limits of the students.

I also value the benefit of reflective teaching practice, in particular the value of feedback. I always try to learn from my experience in past teaching, and try to improve the same for the current courses. As a result, I continuously change my teaching/learning

techniques. As mentioned earlier, in order to evaluate the effectiveness of changes, I always sort student opinion. I always collect anonymous student feedback so that I get the honest opinion of students.

In summary, I am proud that I, as a teacher, am trying my best to make my students excel – to achieve ILOs of my courses, which in turn would help them to achieve ILOs of their degree program and go out to the world as competent professionals. However, I am humble enough to admit that I have a lot to learn in making all my students learn. Thus my teaching journey is a never ending learning process for me. I not only learn subject content, but learn on the best teaching/learning methods. With the help of student feedback, I keep on improving my teaching continuously.

7.4 Professional Goals

To be an effective academic, we have to make things happen and for this an action plan is needed (L. Johnson, 1996). As an academic, my ultimate professional goal is straightforward – to retire from university service as an emeritus professor. At CTHE, we discussed the point scheme to get promoted as a professor. I have enough points from my teaching responsibilities. I also have enough marks from my research supervision. However I lack marks from publications in indexed journals. Plus I lack marks for administrative duties. I am already working on some journal papers, which I hope to get published in indexed journals. Upto now, I did not bother too much about doing administrative duties. However, after seeing that it is mandatory for promotions, I have decided to talk to my HoD to get me appointed to some university-level committee.

As a passionate researcher, I also have many other goals. I want to publish in high-impact journals, and renowned conferences such as ACL (Association for Computational Linguistics) in my field of research, Natural Language Processing (NLP). As for measurable performance, by the time I retire, I expect to have an h-index of at least 25. Moreover, I want to become a well-known figure in the field of NLP. I want to be an editor in one of the good journals in my field, and deliver a key-note speech in a well-known conference in my field. I also want to develop all the basic language processing tools for Sinhala, so that Sinhala will not be left out in the cyberspace. I want to be remembered for my efforts in developing the foundation for Sinhala language computing.

Having goals to excel as a researcher, directly serves the university in achieving its vision and mission. In particular, the university mission “Carrying out nationally relevant and high-impact research to expand the boundaries of knowledge and to enhance the national technological capabilities” is directly supported by my goal. As discussed in Section 1.11, I work on developing natural language processing for our national languages. This, undoubtedly has a major national relevance. By getting my research work into high-impact journal and conferences makes my research globally valid. The next mission statement “Providing expert services to the State, Industry and the Society as an Internationally positioned Sri Lankan University” is also supported by my research. As mentioned in Section 1.11, I am providing my service to the Official Languages Department of Sri Lanka. By actively working with the National Languages Processing Center of University of Moratuwa, I support the mission statement “Contributing to sustainable, scientific, technological, social and economic development of Sri Lanka”, because we are trying to present a sustainable and long-visioned plan for local language computing in Sri Lanka. Finally, all these together (in particular, by getting myself known by the international research community) supports the university vision “To be the most globally recognized Knowledge Enterprise in South Asia”.

7.5 Changes I Have Done During CTHE

During CTHE, I have started to add my events to Google calendar, and started to maintain an electronic to-do list.

7.6 Summary of SEDA Outcomes and Values Addressed in the Chapter

7.6.1 SEDA Specialist Outcomes:

- i Identify your own professional development goals, directions or priorities:

Section 7.4 - in this chapter, I have clearly identified my professional goals, and the direction I want to take is research, which I like the most.

- ii Plan for your initial and/or continuing professional development:

Section 7.4 - I have already made plans to gain what I currently lack. For example, I have planned to talk to my HoD in getting me into a university committee.

iii Undertake appropriate development activities:

Section 7.4 - To be an effective researcher, I need to publish in high-impact journals. I am already working on few papers, which I plan to get published in good journals.

Section 7.2.2 - I started using a to-do list and a Google calendar.

Section 7.3.3 - Developed my teaching philosophy.

iv reviewed your development and your practice, and the relations between them:

Section 7.4 - I reviewed my research performance.

Section 7.2.1 - I analysed my effectiveness and efficiency.

7.7 Chapter Summary

In this chapter, I discussed the level of efficiency and effectiveness I think I have, and also identified some weak areas that I should improve. I also discussed what I believe in and what my values are, as a human. I humbly believe that I am a human with good qualities, with much more room to improve. I also discussed my beliefs and values as a teacher. My teaching philosophy is an outcome of these beliefs and values. Finally, I discussed my professional goals, and my plan to achieve them.

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Appendices

Appendix A

Syllabi

For titles of the documents of this Appendix, please see Table of Contents.

A.1 CS2012 Syllabus - Old

A.2 CS2012 Syllabus - OBE Format

A.3 CS2012 Syllabus - OBE Format with new Modifications

Appendix B

Assessment Descriptions

For titles of the documents of this Appendix, please see Table of Contents.

B.1 CS5612- Project Description

B.2 CS2012 - Project Assessment Rubric

B.3 CS2012 - Project Feedback

Appendix C

Delivery Plans

C.1 CS2012 - Weekly Delivery Plan

1. Analyse a scenario and identify objects - theory
2. hands-on exercises on analysing a scenario and identify objects, and convert them to objects in a program
3. OOP principles - inheritance
4. OOP principles - abstraction
5. OOP principles - polymorphism
6. OOP principles - encapsulation + how to design a program using OOP principles
7. design systems using UML class diagrams
8. concurrency - basics
9. concurrency - synchronization (first part)
10. concurrency - synchronization (second part) + hands-on exercises for concurrency
11. hands-on exercises for concurrency
12. event-based systems - theory
13. event-based systems hands-on exercises
14. event-based systems hands-on exercises + revision

Appendix D

Lecture Slides

For titles of the documents of this Appendix, please see Table of Contents.

D.1 CS2012 - Lecture Slides

D.2 CS5612 - Part of the partially Completed Lecture Slides

Appendix E

CS2012 - In-class Activities

E.1 In-class Activity I

We will be developing a simple game.

In the center of land of Mordor, is the Mount Doom. The quest is to climb to the top of Mount Doom. Whoever reaches there becomes the winner. A set of warriors go to climb this mountain. Each warrior is equipped with a walking stick that helps him to walk. There are monsters in the land of Mordor. Some monsters are innocent. They will just steal the warrior's walking stick. But other monsters will kill the warrior and take the walking stick. If a warrior loses his stick, he is stranded. In the land of Mordor, there are magic trees. If a warrior eats fruit of these trees, he becomes immortal. The warriors are also of two types. Each super warrior has binoculars. They can look for any magic trees in the vicinity. Normal warriors cannot see a tree unless he bumps into one.

1. Identify entities in this scenario.
2. Identify the characteristics that define each entity.
3. Identify what these entities can do.

E.2 In-class Activity II

Look around the classroom. Identify an object you can see.

1. What is the class that this object belongs to?
2. What are its methods adn attributes?

E.3 In-class Activity III

You are required to develop a software program that will simulate a swimming competition. The simulation contains a swimming pool that has 5 swim lanes. It also has a pavilion. There are swimmers, spectators, judges and supporting staff. Swimmers should be distinguished as male and female – males wear blue and females wear red. Every person in the simulation has a unique name. When the judge blows the whistle, the competition is started and the players start swimming. Once they reach the other end of the pool, they have finished the game. They need to touch a touch pad at this finishing end. Each touch pad then notifies the finishing time to a score board. The score board compares these finishing times, and identifies the order of finishing. This information is then displayed in the score board.

Identify objects, their states, and behavior in this scenario.

Advanced task – identify relationships among these objects.

E.4 In-class Activity IV

Write a Java program for the below scenario, which is a simplified version of the game scenario that we discussed last week.

In the gaming application, each warrior is walking using a walking stick. Monsters can steal these walking sticks. A warrior becomes immobile if he loses the stick.

A warrior has a name and age. A monster also has a name and age. Add the required methods to these classes. In addition to the classes you identified above, you should have a separate class ‘MyGame’ that contains the main method. Inside the main method, create two warrior objects, and a monster object. Now set the first warrior’s age to the monster’s age. Now write the code for the monster to steal the walking stick of the second warrior.

Appendix F

Examination Papers

For titles of the documents of this Appendix, please see Table of Contents.

F.1 CS5612 - Mid-Semester Exam Paper

Appendix G

E-mail Communications

For titles of the documents of this Appendix, please see Table of Contents. Note that email addresses of other parties were removed to preserve confidentiality.

G.1 E-mail Regarding the Common Student Mistakes I

G.2 E-mail Regarding the Common Student Mistakes II

G.3 E-mail Regarding the CS2012 Project Weekly Submissions

G.4 E-mail Regarding CS2012 Project Weekly Assessment

G.5 E-mail Regarding Students Forced to come to CSE

Appendix H

Evaluations

For titles of the documents of this Appendix, please see Table of Contents.

H.1 Self-Assessment Form for CS5612 Lecture

H.2 Peer-Assessment Running Commentary

H.3 Peer Assessment Form

H.4 Mid-Semester Feedback Form

Appendix I

Research Excellence Award

Appendix J

Learning Agreements

For titles of the documents of this Appendix, please see Table of Contents.

J.1 Learning Agreement 01

J.2 Learning Agreement 02

J.3 Learning Agreement 03

J.4 Learning Agreement 04

J.5 Learning Agreement 05

J.6 Learning Agreement 06

J.7 Learning Agreement 07

J.8 Learning Agreement 08

J.9 Learning Agreement 09

J.10 Learning Agreement 10

J.11 Learning Agreement 11

J.12 Learning Agreement 12

J.13 Learning Agreement 13

J.14 Learning Agreement 14

J.15 Learning Agreement 15

J.16 Learning Agreement 16

J.17 Learning Agreement 17

J.18 Learning Agreement 18