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Impact Of A Short Teaching And Learning Communication Skills Training Course: Research Postgraduate Students' (RPgs) Transitions In Teaching And Learning

Alex SHUM[1] & Luke K. FRYER[2]

[1] Faculty of Science, University of Hong Kong (HKU)
[2] Center for the Enhancement of Teaching and Learning (CETL), HKU

Correspondence:

Name: Dr. Alex SHUM
Address: Hui Oi Chow Building, Rm 223, University of Hong Kong, Pok Fu Lam, Hong Kong.
Email: alexshum@hku.hk

ABSTRACT

Research postgraduate students (RPgs) are often accepted into degree programmes for their research potential rather than proficiency in teaching and communication skills. In Hong Kong, previous exposure in these areas vary among RPgs, and introductory training courses are often employed to mitigate the experience gap. The aim of this study was to investigate the teaching and learning approaches of participants of an RPg teaching and communication skills training course using person-centred analysis. RPgs at the University of Hong Kong (HKU) who participated in the study (*n*=137) recorded their responses at the beginning and end of the course using the Approaches to Teaching Inventory (ATI, comprising teacher-focused teaching- and student-focused teaching scales) and the Study Process Questionnaire (SPQ, comprising surface learning and deep learning scales). Latent Profile Transition Analysis was used to identify participants with similar scores (subgroups) and analyse their development and movement between subgroups over time. Four subgroups were detected at both times and labelled from the least to most versatile teaching approaches: "Teacher-focused", "Low-mixed", "High-mixed" and "Student-focused". Participants in the Low- and High-mixed subgroups had similar score profiles in teacher-focused and student-focused teaching compared to other subgroups. Deep learning and student-focused teaching scores increased in the High-mixed and student-focused subgroups. All but the teacher-focused subgroup observed an increase in deep learning scores. A small number of participants changed subgroups across the course between the Low- and High-mixed subgroups, indicating that prior conceptions play an important role. A long-term approach to help RPgs develop deep learning and student-focused teaching strategies before and after the course respectively is suggested to facilitate movement towards the student-focused subgroup. Theoretical and practical implications were also discussed.

INTRODUCTION

Research postgraduate students (RPgs) are often required to teach undergraduate students and communicate research findings (Park, 2004). Though they are often hired as graduate teaching assistants (GTAs) as part of their funding schemes that cover tuition and living expenses, RPgs usually lack sufficient experience to teach effectively. They may rely largely on mimicking their undergraduate teachers (Oleson & Hora, 2013). Introductory courses offered by higher education institutions aim to mitigate the experience gap. Though some courses are focused on teaching, they also build proficiency in communication skills. Such training courses have been described as necessary in order for RPgs to build up their teaching capacity (Robinson & Hope, 2013). Literature on RPg training has largely been qualitative and concentrated in North American and European contexts (Shannon, Twale, & Moore, 1998; Park & Ramos, 2002; Park, 2004). However, the literature is scant on investigating the efficacy of RPg training courses quantitatively and in the development of teaching and learning approaches.

The aim of this paper was to perform a person-centred analysis of the development of RPgs in a training course that emphasises teaching and communication skills. The same dataset was used in a previous variable-centred study (Shum, Lee, & Ekaratne, 2017), which measured intended approaches to teaching and learning over the short course at two time points. Overall mean increases in self-reported deep learning and student-focused teaching approaches were observed. Deep learning scores moderately predicted future student-focused teaching scores.

The research questions that guided this investigation were as follows:

1) What latent subgroups exist within RPgs in a Hong Kong university based on the Approaches to Teaching Inventory (ATI) and the Study Process Questionnaire (SPQ), and how would their profiles (mean scores on each scale) be described?

2) To what extent would a short course on teaching and communication support the RPgs' development of teaching approaches within the latent subgroups?

3) How do latent subgroups change membership over time in relation to teaching and learning approaches?

The results of the current study would provide insights on the effectiveness of teaching and communication skills training courses for RPgs and provide theoretical validity for current practices and inform future directions for the development of the course and future participants.

BACKGROUND

Development of RPgs in teaching and learning

RPgs constitute a large portion of the teaching force at many higher education institutions worldwide, as GTAs. Their teaching duties include facilitating laboratory experiments, seminars, discussion groups, as well as presenting lectures, and assessing student work (Park & Ramos, 2002). Given the initial lack of experience and expectation to teach effectively, the need to develop teaching and learning capacity in RPgs has been widely reported (e.g. Lueddeke, 1997; Robinson & Hope, 2013). Training courses facilitated by the university are led by departments (Young & Bippus, 2008; Marbach-Ad *et al.*, 2012) or institutional teaching centres (Shum *et al.*, 2017), lasting between half a day to several months (Park, 2004; Stes, Min-Leliveld, Gijbel, & van Petegem, 2010). Content can include institutional policies, constructive learning strategies (Park, 2004), generic teaching skills, formative and summative evaluation, and classroom management (Luddeke, 1997). It has been observed that enrolment can be low for courses where participation is voluntary (Park, 2004; Muzaka, 2009).

Studies on the effectiveness of GTA training have been predominantly qualitative, or qualitative turned quantitative through coding analysis, with little statistical treatment. Exceptions include studies on self-efficacy in teaching (Prieto & Altmaier, 1994; Young & Bippus, 2008) and multicultural diversity (Elicker *et al.*, 2009). Further quantitative study of the effectiveness of GTA training programmes on a larger geographical scale and in broader domains is warranted. These may further support wider adoption and development of GTA training courses among institutions.

In Hong Kong, participants in GTA training courses report experiencing mostly teacher-centred lecture-style learning activities as undergraduate students, and having little active learning (Shum *et al.*, 2017; Mark, Thadani, Calonge, Pun, & Chiu, 2011). At the City University of Hong Kong, a training course was adapted to include e-technology and lecture capture (Mark *et al.*, 2011) and computer science programming methodology was used to improve microteaching session experiences (Calong, Mark, Chiu, Thadani, & Pun, 2013). Most universities in Hong Kong facilitate a GTA training programme offered by the institution's teaching centre. In order to gain a comprehensive understanding of such programmes, it is worthwhile to investigate how different subgroups experience teacher and learning training in Hong Kong universities.

Approaches to teaching and learning

Marton and Säljö (1976) described two different approaches students adopt to process information. When students adopt a surface learning approach, they feel forced to complete assigned tasks and are motivated by external factors such as grades. Students using a surface approach typically rely on rote memorisation as the dominant strategy. When students adopt a deep learning approach, they have a genuine interest in learning the content and a desire to understand concepts. They may seek additional resources outside those given during class and connect learned concepts to previous knowledge. Such students may adopt different approaches to different contexts (Biggs, 1993). The SPQ was developed to measure a student's intended learning approach in higher education contexts. The original SPQ (Biggs, 1987a, 1987b) assessed preferences in three scales: surface, deep, and achieving. Biggs, Kember, and Leung (2001) updated the SPQ to contain only the surface and deep scales, asserting that the achieving latent variable could be described by the other two scales. As RPgs are also students within the higher education context, their intended approach to learning may influence their teaching and presenting development (Muzaka, 2009; Shum *et al*., 2017).

The ATI was developed (Trigwell & Prosser, 1996) to measure one's intention to adopt an information transmission teacher-focused (henceforth "teacher-focused") approach and conceptual change student-focused (henceforth "student-focused") teaching approach. Teacher-focused teaching is characterised by performance and effort of the teacher (e.g. presentation skills, good notes, good time management, and punctuality) along with a focus on formal assessments. Student-focused teaching is characterised by a focus on students making conceptual changes in their understanding and demonstrating intended learning outcomes. Student-focused strategies include active learning, student-teacher interaction, and supporting self-directed learning. The ATI was updated (Trigwell *et al*., 2005) by replacing some complex items to provide better reliability. As with the SPQ, scores of the ATI are indicative of intended teaching approaches in a specific context.

In undergraduate education, student-focused teaching has been suggested to support deep learning in students (Trigwell, Prosser, & Waterhouse, 1999; Prosser, Ramsden, Trigwell, & Martin, 2003), in which higher-quality learning outcomes are projected by students (Prosser & Trigwell, 1999). As such, deep student learning and student-focused teaching are considered adaptive strategies.

METHOD

Course context and RPgs

RPgs at HKU are required to enrol for the certificate course offered by the University's Centre for the Enhancement of Teaching and Learning (CETL). The course consists of 24 hours of instruction in eight face-to-face classes over four weeks of instruction. A gap between the fourth and fifth class lasts 4 to 6 weeks, where students observe a teacher conducting a class and complete a report. Over 25 iterations of the course take place annually, training about 550 to 600 RPgs. The class size is usually between 8 to 22 RPgs. Science and engineering RPgs enrol into faculty-specific classes, while RPgs from other faculties enrol into mixed classes. Although English is the medium of instruction, the level of English language proficiency would vary among participants and for many RPgs it was often not their first language. Nonetheless, RPgs are required to attain a minimum score on a standardised test such as the TOEFL or IELTS[1] for admission. Most RPgs did not teach concurrent with the course though reported that they likely had to teach later in their degree.

The trainers are two lecturers with several years of experience in training RPgs in teaching. In this study, one lecturer's background was in STEM (mathematics and engineering), while the other's was in the humanities. Both had taught participants from all faculties and consulted each other on facilitation strategies.

Each of the first six classes focused on a different topic: 1) teaching and learning at university, 2) preparing lesson plans, effective lecturing and materials, 3) active learning strategies, 4) effective questioning strategies, 5) reflective practice, and 6) assessment and feedback. The last two classes were reserved for teacher demonstrations. As many participants had little exposure to student-focused teaching in their previous learning experiences, a mix of teacher-focused and student-focused teaching techniques were used. In Classes 3 and 4, students were taught to develop questions for different active learning activities including think-pair-share, the one-minute paper and debates, which supported the development and proficiency towards employing student-focused teaching. Participants were further coached in facilitating these activities.

Prior experience with delivering presentations and teaching amongst the participants was mixed, with some reporting that they had little exposure and experience in their secondary and undergraduate education. Participants often cited improving English skills and attaining overall proficiency in presentation skills as their goals (Lee, Shum, & Ekaratne, 2015). Trigwell *et al.* (2005) described the necessity for some mastery of teacher-focused teaching skills

prior to developing and employing student-focused teaching skills. Therefore, trainers also stressed teacher-focused skills in the second class, by observing and identifying effective traits in videos of effective public speakers. The assessments of the course continued to help participants develop in both teacher-focused and student-focused teaching strategies. While all training in the course dealt with development of the teachers themselves, teacher-focused strategies focus on what the teacher is doing, while student-focused strategies focus on what the student is doing. In the course, teacher-focused strategies included developing presentation skills and lesson planning, while student-focused teaching included facilitating activities that help students truly understand the material, and demonstrate achievement of the learning outcomes (e.g. think-pair-share and short quizzes).

Course assessments

Participants must fulfil three requirements to receive the certificate: 1) attend at least seven of the eight classes and achieve a minimum standard for each, 2) submit a written reflection of a lecture or classroom observation of an experienced teacher, and 3) do a 10-minute teaching demonstration that would occur in the seventh or eighth class. In light of the short duration of the course, the reflection required participants to answer questions about the classroom observation in detail (about 200-400 words) while the teaching demonstration required participants to have some mastery in teacher-focused teaching and minimal demonstration of student-focused teaching.

In the third and fourth classes, each participant had to facilitate a practice teaching demonstration for five minutes. Peers and the trainer would identify each participant's strengths and areas for improvement. The trainer's written feedback would include comments on both teacher-focused and student-focused teaching with specific suggestions for improvement. Participants also had to facilitate some audience participation during their ten-minute demonstration. Written feedback is given for the 10-minute teaching demonstration. These practices are in line with other RPg training courses (Park, 2004).

After each of the two teaching demonstrations, participants had to complete a short written reflection (between 100-150 words) to identify their strengths, and choose one area of improvement to provide specific actions for change. Teaching reflections have been shown to support teaching development for the GTA context in related fields (Langdon & Wittenberg, 2019).

Structured reflective practice is introduced during the fifth class using Kolb's reflective cycle (Kolb, 2014). Trainers would group the participants according to self-chosen areas of improvement (in the reflection of the first teaching demonstration) to collaboratively develop action plans. For example, if a

participant wanted to improve their eye contact, they could 1) practice with notes written in point form to reduce reading, and 2) leave visual cues in the slides to look at the audience. If a participant wanted to receive responses from the audience, they could 1) reduce the difficulty of the question, or 2) use active learning strategies such as wait-time, think-pair-share, or the one-minute paper. The trainer assesses for improvement in the chosen area in the 10-minute presentation.

For the classroom observation, participants might seek an upper-year RPg, a lecturer or professor in their faculty to observe their teaching. If one was not available, they would watch a prescribed video on a topic related to their field. Participants answer questions such as, "[R]egarding your areas [*sic*] of improvement in your 5-min teaching demonstration, did the teacher perform better or worse? What aspects might you try to incorporate or avoid?", and "[A]re there any techniques observed that you want to start implementing? Try this in your 10-minute presentation." Participants had to submit their guided written reflections before the start of the fifth class. Participants may have observed the effectiveness of teaching techniques used by senior colleagues in their respective classes and often wanted to mimic them.

Study participants, instruments and data collection

A subset of participants (*n*=137) enrolled in the course between February to June 2015 completed the SPQ and ATI at the beginning (Time-1) and end (Time-2) of the course. Remaining consistent with previous work (Trigwell *et al*., 1999; Prosser *et al*., 2003), the SPQ (Biggs 1987a, 1987b) was used. All seven items in each of the surface strategy and deep strategy scales were selected to facilitate in-class teaching of approaches to learning. The revised ATI with eleven items on each scale (Trigwell *et al*., 2005) was used to avoid confusion for non-native English speakers. Participants responded to all questionnaire and inventory items using a five-point Likert scale ranging from "1–This item was never or rarely true of me" to "5–Almost always or always true of me". The highest loading items in an exploratory factor analysis (Shum *et al*., 2017) are presented in Table 1 for both the SPQ and ATI.

Table 1

Highest loading items of the SPQ* and the ATI* from exploratory factor analysis (Shum et al., 2017).

Questionnaire Scale	Highest Loading Item
SPQ*: Surface Strategy	"I am very aware that teachers/lecturers know a lot more than I do so I concentrate in what they say is important rather than reply on my own judgement."
SPQ: Deep Strategy	"I try to relate what I have learned in one subject to that in another."
ATI*: Information Transmission Teacher-Focused	"I structure my teaching in this subject to help students to pass the formal assessment items."
ATI: Conceptual Change Student-Focused	"I make available opportunities for students in this subject to discuss their changing understanding of the subject."

*ATI: Approaches to Teaching Inventory, SPQ: Study Process Questionnaire

Participants were informed of the nature of the study and assigned anonymous codes at Time-1, then self-reported them and indicated consent for the study at Time-2. The collection of data was approved by the university's ethics committee.

Reflections (*n*=20) on both teaching demonstrations and the observed teacher described previously from an older cohort of participants (2014-2015) were used to qualitatively describe members of each subgroup found by the person-centred analysis. Previous participants had also consented online to having their reflections used for this study.

Analyses

All person-centred analyses were undertaken with Mplus 7.2 (Muthén & Muthén, 1998-2015). R v3.2.1 was used for all other analyses (R Development Core Team, 2008). Missing data (<1%) were imputed with Predictive Mean Matching using the mice package[2] (Buuren & Groothuis-Oudshoorn, 2011).

Factor analysis had already been performed on the structure of the four scales at Time-1 and Time-2 (Shum *et al.*, 2017). One of the teacher-focused items did not load as expected and was removed. Descriptive statistics were performed, followed by Latent Profile Transition Analysis (LPTA) of the dataset.

LPTA is a person-centred analysis technique that helps to answer the three research questions cited in the section "Introduction". It does so by probabilistically inferring the existence and memberships of latent subgroups

(Research Question 1) at each time, and how their description (Research Question 2) and memberships (Research Question 3) change over time. LPTA employs a stayer-mover model. In this study, stayers are participants who remain in the same subgroup throughout the course, while movers change from one subgroup to another from the beginning to the end of the course. LPTA was chosen over traditional methods (such as K-means clustering) as it belongs to the family of finite mixture models which test for subgroups using a statistical model of the population inferred from the data. Advantages include the choice of optimising the metrics based on this model and the use of fit indices to interpret validity of results (Magidson & Vermunt, 2002). This method has been used to describe transitions in undergraduate students' learning strategies (Fryer & Vermunt, 2018; Fryer, 2017).

Two through five subgroups were tested for fit to the data. For each LPTA, three information criteria were examined for each set of subgroups tested: Akaikes's Information Criterion (AIC) (Akaike, 1987), the Bayesian Information Criterion (BIC) (Schwartz, 1978), and the sample size-adjusted BIC model, wherein lower values indicate the preferred model in all information criteria. When there is no minimum, then the sharpest decrease (i.e. elbow) is used to determine the number of subgroups. While all three information criteria are important, BIC is generally seen as being the most useful guide for LPTA (Nylund-Gibson, Grimm, Quirk, & Furlong, 2014).

To use qualitative data to describe the subgroups, the twenty written reflections were analysed for content to determine which subgroup the participants were most likely to belong to, and whether there was a movement between the subgroups based on comparing the two reflections after each teaching demonstration.

RESULTS

Descriptive findings

Upon analysis of the data collected, the descriptive statistics are presented in Table 2. Internal reliability, measured using Cronbach's Alpha (α) for ATI scales (Devellis, 2012), were acceptable (>.70; Teacher-focused T-1:α=.78, T-2:α=.76, Student-focused T-1:α=.85, T-2:α=.84). Reliability measures of the SPQ were lower (Surface Strategy T-1:α=.57, T-2:α=.64, Deep Strategy T-1:α=.60, T-2:α=.70). Lower reliability is acceptable (>.60) for scales with fewer than ten items (Loewenthal, 1996). The marginal surface strategy reliability is comparable to values reported in Asian contexts (Kember & Gow, 1990; Biggs *et al*., 2001; Fryer, Ginns, Walker, & Nakao, 2012), which are likely attributed to the complexities of capturing negative aspects of

learning and the use of these instruments outside of their original development contexts (Richardson, 1994). In all measurements, student-focused teaching and teacher-focused approaches to teaching correlated positively with deep and surface approaches to learning respectively. All of these correlations (Cohen, 1992) were either moderate (r=.30/.50) or large $(r>.50)$, except for the small correlation between Surface Strategy T-2 with Teacher-focused T-1 (r=.10/.30). Small negative correlations were observed between Teacher-focused T-1 and Student-focused T-2, and surface and deep scales (T-1).

Table 2

Descriptive statistics

	Teacher-Focused T-1	Student-Focused T-1	Surface Strategy T-1	Deep Strategy T-1	Teacher-Focused T-2	Student-Focused T-2	Surface Strategy T-2	Deep Strategy T-2
Teacher-Focused T-1	-							
Student-Focused T-1	-.03	-						
Surface Strategy T-1	.30***	-.11	-					
Deep Strategy T-1	.07	.51***	-.19*	-				
Teacher-Focused T-2	.61***	-.15	.31***	-.08	-			
Student-Focused T-2	-.20*	.66***	-.13	.43***	-.15	-		
Surface Strategy T-2	.26**	-.12	.57***	-.14	.55***	-.16	-	
Deep Strategy T-2	-.02	.37***	-.11	.60***	.01	.57***	-.10	-
M	3.27	3.78	2.91	3.75	3.33	3.95	2.88	3.95
SD	.60	.63	.55	.51	.58	.54	.58	.49
Cronbach's Alpha (α)	.78	.85	.57	.60	.76	.84	.64	.70

Note: ***p<.001,**p<.01,*p<.05
M: Mean, *SD*: Standard Deviation, T-1: Time-1, T-2: Time-2

Person-centred findings

From the BIC, the most reliable indicator of subgroups which fit to the data (Nylund-Gibson *et al.*, 2014), yielded a minimum of four subgroups. Meanwhile, the other criteria, AIC and SABIC, did not yield minimums; however, they contained elbows at four subgroups (Nylund-Gibson *et al.*, 2014). Supported by Trigwell *et al.* (1999) and Prosser *et al.* (2003) regarding preferences for different teaching approaches, the size of the subgroups (>10% of the sample) and the clear differences observed in the profiles supported the Information Criterion results (Table 3).

Table 3

Fit for Latent Profile Transition Analysis: Two to five subgroups.

	c2	c3	c4	c5
Akaike Information Criterion	1739.599	1685.854	1639.565	1614.714
Bayesian Information Criterion	1818.438	1802.653	1800.164	1824.953
Sample Size Adjusted Bayesian Information Criterion	1733.022	1676.111	1626.168	1597.176

The four subgroups were labelled from least to most adaptive in their teaching and learning strategies, "Teacher-focused", "Low-mixed", "High-mixed" and "Student-focused". The teacher-focused and student-focused subgroups were identified by higher relative teacher-focused and student-focused scores respectively, and lower relative scores on the other. The Low- and High-mixed subgroups had relatively low and high values in both teaching approach scores respectively, while the teacher-focused and student-focused subgroups presented a relative preference for one teaching approach over the other. In all subgroups, higher scores in student-focused and teacher-focused teaching corresponded to higher deep and surface learning scores respectively. Fourteen participants (10%) moved from High- to Low-mixed while three participants (2%) moved from Low- to High-mixed. Figure 1 presents the stayer-mover transitions between time points, and Table 4 presents the mean scores of all transitions with Bonferroni adjustment applied (4 tests). Stayers in all but the teacher-focused subgroup increased significantly in deep learning score. High-mixed and student-focused stayers increased significantly in student-focused teaching scores. Decreases in both teacher-focused and student-focused teaching for High- to Low-mixed movers, and increase in teacher-focused teaching for Low- to High-mixed, were significant.
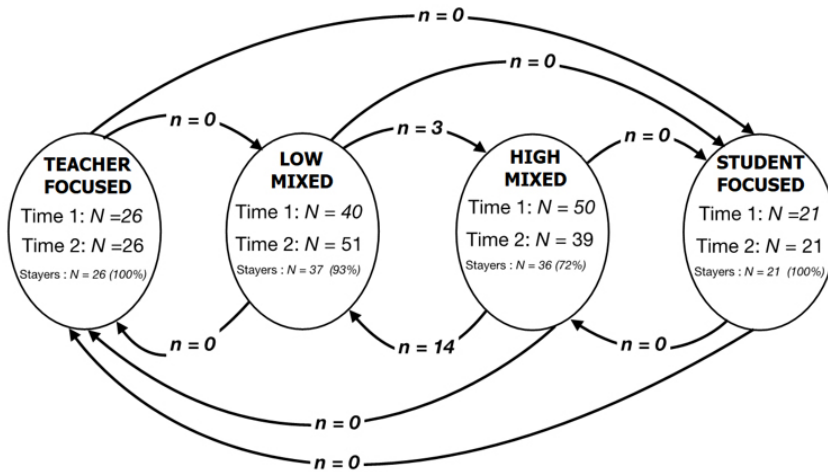
Figure 1. Transitions across subgroups in training course.

Table 4

Mean scores for transitions (Significances Bonferroni adjusted, 4 tests)

	Teacher-focused Stayers (*N*=26)			Low-mixed Stayers (*N*=37)			High-mixed Stayers (*N*=36)		
	Time-1	Time-2	Change	Time-1	Time-2	Change	Time-1	Time-2	Change
Teacher-focused	3.69	3.76	+.07	2.79	2.98	+.19	3.63	3.77	+.14
Student-focused	3.22	3.34	+.12	3.51	3.74	+.23	4.06	4.28	+.22*
Surface	3.33	3.26	-.07	2.70	2.70	.00	3.15	3.23	+.08
Deep	3.35	3.64	+.29	3.46	3.71	+.25**	4.00	4.21	+.21**
	Student-focused Stayers (*N*=21)			Low-mixed to High-mixed Movers (*N*=3)			High-mixed to Low-mixed Movers (*N*=14)		
	Time-1	Time-2	Change	Time-1	Time-2	Change	Time-1	Time-2	Change
Teacher-focused	2.71	2.70	-.01	3.10	3.73	+.63*	3.75	3.14	-.61***
Student-focused	4.42	4.58	+.16*	3.39	4.48	+1.09	3.94	3.76	-.18
Surface	2.49	2.29	-.20	2.86	3.10	+.24	2.70	2.63	-.07
Deep	4.23	4.50	+.27**	3.24	4.05	+.81	3.95	3.65	-.30*

DISCUSSION

In the descriptive statistics concerning the overall group of RPgs, the large and moderate correlations observed between surface and teacher-focused teaching, and deep with student-focused teaching are consistent with the literature (Trigwell *et al.*, 1999; Prosser *et al.*, 2003). However, only two of the remaining pairings of surface and teaching-focused teaching with deep and student-focused teaching had a small negative correlation, suggesting that these scales may not oppose one another. Participants can employ mixed strategies in teaching and learning. Descriptive findings are further discussed in Shum *et al.* (2017).

In the person-centred findings, as RPgs duties include presenting research and teaching (Park, 2004), these were hypothesised to be perceived as similar tasks for the Low-mixed and teacher-focused subgroups. Reflections of their teaching demonstrations and observed teaching from a different cohort of participants enrolled in the same course provided some insight on how the stayers (Research Question 2) in subgroups and movers (Research Question 3) between the Low- and High-mixed subgroups approach teaching and learning. Participants who primarily demonstrated teacher-focused teaching in their lessons often displayed a poor understanding of student-focused teaching. Some participants considered asking questions that did not invite responses (e.g. "Ask 'OK?', 'Right?' after teaching every knowledge point. It's an effective way that encourage student [*sic*] to think." and "Ask some questions just like 'Anyone see this?'"). They often suggested using practice research presentations to refine their teaching abilities (e.g. "I will utilize each week [research] meeting to practice my presentation."). When observing more experienced teachers, the halo effect, where a positive impression in one area influences another, was common. Participants often mimicked the observed teacher-focused teaching, without development in student-focused teaching. Although some participants valued student-focused teaching, they often lacked a specific plan to improve their teaching abilities (e.g. "Next time, I will prepare for my course more and pay more attention.") When these participants encountered difficulties with student-focused teaching (e.g. "When I was asking the answers [*sic*], nobody answered it and they seemed to have no ideas of my question. Then I solved all the math by myself."), they reverted to teacher-focused teaching.

Other participants demonstrated an eagerness to develop in both teacher-focused and student-focused teaching as in the proposed High-mixed subgroup (e.g. "I need to involve more interesting examples in my presentation and try to have the audience do a discussion during the demonstration of the examples"). Participants that tried to facilitate active learning sometimes lacked proficiencies in teacher-focused areas, identifying areas such as time

management and producing effective slides for improvement. This further supports Trigwell's and colleagues' (2005) assertions that some proficiency in teacher-focused skills is required to effectively facilitate student-focused teaching. The reflections of participants who demonstrated substantial student-focused teaching often discussed a willingness to try non-traditional teaching methods. Such participants would provide a specific plan for implementing them, for example, they would incorporate online polling quizzes before and after discussion to assess understanding.

Movement from Low- to High-mixed can be explained by participants finding relevance in both teacher-focused and student-focused approaches. Participants who experienced significant development in their actual student-focused teaching often noted these classroom practices in their observed teacher (e.g. "Clicker questions were useful for making everyone in the class to participate [*sic*]…I should try to make online Question and Answer session like the teacher") or teaching as a teaching assistant concurrently with taking the course (e.g. "I am also able to get my students participated [*sic*] in my tutorial."). Movement from High- to Low-mixed could be explained by diminished interest due to research responsibilities taking precedence over their teaching tasks. Teaching may be regarded as a secondary objective or merely a source of funding (Park, 2004). Other reflections suggested a desire to improve teaching through other means such as residence activities. Increases in deep learning approaches can also be explained by its emphasis in the course along with its use in RPg research projects.

Implications for theory

Results of the study indicate that while small developments in deep learning and student-focused teaching approaches to teaching and learning may occur in short training courses (Shum *et al.*, 2017), movement between subgroups described by substantially different teaching approaches is not realistic. Previous teaching and learning styles experienced as a student would likely influence one's teaching (Oleson & Hora, 2013). As one's learning experience may impact their initial teaching experience (Shum *et al.*, 2017), interventions promoting deeper learning and student-focused teaching are required both before and after the course to facilitate movement to subgroups representative of adaptive teaching strategies. For example, a focus on student-focused teaching methods at the undergraduate level by faculty and GTAs would not only improve the quality of learning outcomes for all students, but also help students in Hong Kong universities facilitate these methods as teaching assistants. Follow-up courses or actual in-class observation with consultation (Gallardo-Williams, & Petrovich, 2017) would serve to encourage continuing student-focused teaching development.

To address the first research question, the majority of participants did not demonstrate a clear preference for teacher-focused over student-focused teaching or vice versa. Over 65% of the participants belonged to the Low-mixed and High-mixed subgroups. Comparing to studies of teachers in undergraduate education, lecturers in science contexts with more experience were more likely to differentiate on teaching approaches (Trigwell *et al*., 1999). In Prosser *et al*. (2003), teachers in less experienced subgroups and teachers who provided lower quality learning experiences did not show preference for either teaching approach. Experienced teachers showed a strong preference towards one teaching method over the other. Given that no movement occurred between the differentiated subgroups (i.e. teacher-focused and student-focused subgroups) helps to answer the third research question, that only those who are undifferentiated between teaching methods (i.e. Low-mixed and High-mixed subgroups) exhibit movement between subgroups.

Addressing the second research question, only the increases in student-focused teaching approach observed in High-mixed and student-focused subgroups were significant. Though Low-mixed members may lack interest in teaching development, members of this subgroup did develop significantly in deep learning approach, along with the High-mixed and student-focused subgroups, emphasising its necessity in the RPg context. For the teacher-focused subgroup, the findings support Shum's and colleagues' (2017) observation that development in student-focused teaching is difficult in the presence of strong teacher-focused teaching beliefs.

Implications for practice

Differentiation towards preference for teacher-focused or student-focused approaches is likely to occur during the earlier stages of one's academic career. As such, initial teaching experiences and continued support after the training course may influence teacher development. The development in student-focused teaching scores observed in the High-mixed and student-focused subgroups are likely attributed to providing opportunities for students to learn and engage in facilitating active learning.

To support the development of teacher-focused and Low-mixed subgroups, a balanced approach between training teacher-focused and student-focused teaching is suggested. When active learning is unfamiliar, first facilitating, then analysing the activity step-by-step will promote greater understanding and likelihood of adoption of such strategies into their own teaching. Participants may report an intended teacher-focused approach, but lack mastery. Training supports teacher-focused teaching development and provides exposure to student-focused teaching, allowing for growth in both approaches. Biggs (1999) has proposed an analogous theory, in which adapting the focus

from the teacher to the student is a developmental process, and follow-up training after their first teaching experience is suggested as participants will realise there is a stronger need for student-focused teaching. Further emphasis on theory of teaching and learning approaches is suggested. Finally, integrating self-assessment and video capture could help improve participants' presentation skills (Smith & Sodano, 2011).

Corrective feedback coupled with self-reflection cycles such as in Kolb (2014) would support continued improvement in all subgroups. This method is suggested as over 80% of participants developed in their self-selected area of improvement (Lee *et al.*, 2015), including both teacher-focused and student-focused teaching skills.

Limitations and future direction

The results from this study come from analysing self-reported questionnaires and may differ from one's actual practices in teaching and learning. Nonetheless, these results may still inform future directions of course development.

Though the course comprised participants from diverse international backgrounds, most participants were from Hong Kong and mainland China. It would be of interest to investigate if similar latent subgroups and developments are observed in RPg training courses in other geographical contexts.

For many participants, the ATI was completed prior to any in-class teaching. Though the course provides opportunities to practice teaching, they differ from the in-class experience in both audience and expected content. Further longitudinal sampling beyond the course and after participants have experienced classroom teaching would more accurately describe any disparities between the self-reported approach, teaching approaches observed in the course, and actual in-class approaches. Extensions to training courses requiring in-class observations could also be implemented.

To support continued development beyond the course, structured feedback of peer observation from a self-selected tutor 'buddy' (Bell & Mladenovic, 2008) could serve as a self-regulating catalyst for improvement. Peer observation of teaching (Cosh, 1999) between members from different subgroups may help further support development, especially in the teacher-focused and Low-mixed subgroups. A commitment to improve teaching at the faculty level to promote, incentivise or make suggested developmental processes mandatory would help support a long-term training approach.

CONCLUSION

Latent Profile Transition Analysis (LPTA) of participants in an RPg training course revealed four subgroups according to self-reported teaching and learning approaches: Teacher-focused, Low-mixed, High-mixed and Student-focused. Stayers in all but the teacher-focused subgroup observed an overall increase in their deep learning scores. Stayers in High-mixed and Student-focused subgroups also saw an increase in their student-focused teaching scores. Training in deep learning and student-focused teaching included exposure, instruction and participant demonstration of active learning strategies coupled with reflective practice. Consistent with existing literature in teaching for undergraduate education, RPgs, who lack experience in teaching, were less likely to have a clear preference between teacher-focused and student-focused teaching approach. Movement between subgroups was scarce and restricted between Low-mixed and High-mixed subgroups, suggesting that a short training course is insufficient to promote entire shifts in intended teaching approaches. Therefore, a long-term approach should be taken, both before and after the course to promote the development of student-focused teaching approaches to support movement towards the student-focused subgroup.

ENDNOTE

1. TOEFL® and IELTS™ refer to the "Test of English as a Foreign Language" and the "International English Language Testing System" respectively. Both are standardised tests which measure the English language proficiency of non-native speakers.

2. The "mice package" refers to performing multiple imputation using chained equations.

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ABOUT THE CORRESPONDING AUTHOR

Alex Shum teaches mathematics and engineering in the Faculty of Science at the University of Hong Kong (HKU). He was also a lecturer in the Certificate of Teaching and Learning in Higher Education course at the university. His teaching and research interests cover training for teaching assistants, mathematics and engineering teaching, use of technologies in the classroom, peer instruction, and e-learning.

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