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Examining the Alignment of Subject Learning Outcomes and Course Curricula Through Curriculum Mapping

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Abstract: Content analysis has been used to conduct curriculum mapping to map the course objectives, course content, and the assessment tasks of 14 compulsory courses, onto the five Subject Learning Objective (SLO) factors of the Department of Curriculum and Instruction (DC&I) in a teacher education institution in Hong Kong. The results show that the SLO factors appear either as a cluster or a concentrated whole in the courses, suggesting a connective nature and dominated feature among them. The situation can be explained by the planned integrated learning experience as well as emphasis on specific SLO factors in response to change in educational context. Comparison of the coverage of SLO factors in the Bachelor of Education (BEd) and Postgraduate Diploma in Education (PGDE) is performed. The results suggest that the BEd program by design has more curriculum space for students to achieve this set of SLO factors than of the PGDE. It takes advantage of more curriculum space to adopt a spiral curriculum to facilitate complex learning in a logical progression. The study recommends that curriculum mapping is a useful tool to evaluate the extent to which the courses offered by an academic department are in alignment with its agreed SLOs. The methodologies can be used in other educational settings. Implications are made to enhance curriculum planning of teacher education programs.

Background

As a recurring education reform initiative, outcome-based education (OBE) emerged in the 1990s as the principal agenda of global higher education reform (Harden, 2002; Killen,

2000; Spady, 2001; University Grants Committee, 2008). OBE emphasizes the use of learning outcomes in designing curricula, and it expects students to demonstrate their knowledge and ability based on their learning for each lesson (King & Evans, 1991; Prideaux, 2000; Spady, 1994). In response to the claim made by University Grants Committee in setting its common focus areas of audit, “the institute is unlikely to achieve high quality student learning unless its objectives are clearly expressed and well understood by staff” (Quality Assurance Council, 2008, p.14), higher education institutions in Hong Kong, including The Hong Kong Institute of Education (HKIEd), have started to adopt an outcome-based education.

This study reports on the findings of a teaching development grant project, which was completed in 2012. Phase One of this project aims to identify the SLOs of the Department of Curriculum and Instruction (DC&I) at a teaching institute in Hong Kong and Phase Two aims to map the identified SLOs onto the courses (see Table 1) that were offered by this department. Phase One of the project begins by collecting ideas from DC&I staff members regarding the subject learning outcomes that they aimed to achieve in all teacher education programs. These ideas are developed into a digital survey to collect responses from staff members and students, which produces five SLO factors. Results of Phase One study have been reported in Lam, Brown, Tsui & Deneen (2010) and Lam & Tsui (2012). Phase Two of the project investigates the status (coverage) of these SLOs as reflected in the existing course curricula (planned curriculum), and the patterns of coverage in two major programs, namely, Bachelor of Education (BEd) and Postgraduate Diploma in Education (PGDE), through curriculum mapping. The design, implementation, and findings of this phase of study are reported in this paper.

This paper comprises of four major parts. The first part provides an overview of the trends, limitations, and opportunities of curriculum mapping as well as the justifications of this study. The second part discusses the focus of the study (Phase Two of the teaching development project), the five SLOs, the mapping methodologies, and the sampling courses to be mapped. The third part reports the findings on the distribution of the SLO factors in the sample courses and on the comparison of their distributions based on the curriculum plan and study period of the BEd (four-year full-time) and PGDE (one-year full-time) programs. The last part of this paper presents the implications of the study.

Curriculum Mapping as an Evaluation Tool

Curriculum mapping is used to evaluate the links between the curriculum content and its target learning outcomes (Harden, 2001; Jacobs, 2004; Morehead & LaBeau, 2004; National Council of Teachers of Mathematics, 1989; Plaza, Draugalis, Slack, Skrepnek, & Sauer, 2007;

Uchiyama & Radin, 2009). This method ensures that the curriculum objectives match those that are being taught to and learned by students (English, 1984). Aligning the curriculum objectives with what is implemented and learned can enhance the effectiveness of curriculum planning and implementation and adds meaning to the learning and teaching processes.

Curriculum mapping typically involves the gathering of data from course documents, curriculum developers, teachers, and students to check and monitor if their congruence with the objectives of a course or a program can be maintained (English, 1984; Harden, 2001; Morehead & LaBeau, 2004; Willett, 2008). Curriculum mapping is commonly used in the education sector (Jacobs, 2004) and is becoming popular in higher education (Spencer, Riddle, & Knewstubb, 2012) because of the promotion of OBE.

Most schools use curriculum mapping in their daily work to review the consistency in the progress of different classes taught by different teachers within a particular semester or school year. The curriculum map, also known as a scheme of work, is built by teachers to illustrate the content topics and intended learning outcomes set for a semester or academic year timeframe of the school, the main points of teaching, their respective teaching activities and resources, and the assessment strategies for different topics. The recent education reform encourages teachers to partake in the curriculum mapping (Jacobs, 1997). Usually, a computer template is developed for teachers to input their curriculum maps at the end of a semester/period to report the delivered curriculum. These maps are subsequently discussed in meetings that are organized by subject committees to refine the curriculum (Jacobs, 2004; National Council of Teachers of Mathematics, 1989). Koppang (2004) identified the benefits of curriculum mapping for improving learning and teaching, such as skills in lesson planning, organization of outings, and alternative assessments. Teamwork and collaboration are important in making the mapping process a useful, professional activity by engaging teachers to reflect on their competencies and improve their teaching methods.

Although university teachers are used to “fly[ing] solo” (Tierney, 1999, p. 40) and do not frequently hold meetings as school teachers do, their working environment is growing to put stress on accountability and teaching reformation, which in turn demands curriculum mapping in higher education institutions (Plaza et al, 2007; Uchiyama & Radin, 2009). Different mapping methodologies, which serve different purposes, are identified from the literature review.

The proponents of using curriculum mapping as a regular professional development activity for course development have suggested that university teachers must undergo cycles of continuous curriculum mapping. Uchiyama and Radin (2009) proposed six stages of mapping to describe a typical mapping process: (a) faculty members individually develop their maps for every course in real time; (b) instructors of a particular course work together to review and collate the maps; (c) all participating faculty members are divided into heterogeneous groups to review all the maps in a program or set the sequence of courses; (d)

all faculty members identify the areas that require alignment; (e) the maps are revised and/or eliminated, and (f) a plan is developed and subsequently executed. A complete mapping cycle encourages faculty members to base their teaching practices on the planned curriculum content. The cycle also improves the course and program curriculum by identifying the gaps, overlaps, inconsistencies, and strengths of a recommended action.

Most mapping methods are largely based on the teacher's experience, except for experience that is gained through face-to-face deliberation (dialogue and discussion). Sumsion and Goodfellow (2002) conducted a survey among the coordinators of a teacher education program to determine the generic skills that were encouraged, modeled, explicitly taught, required, and evaluated in an embedded program. Rather than focusing on a curriculum in general, Sumsion and Goodfellow focused on specific skills that are demanded at a specific time, such as 21st century generic skills that are required in professional training courses.

The demand for stakeholder involvement in curriculum development over the past few decades has extended both the scale and participation of curriculum mapping to include standards that are required by students and accrediting agencies of specific professions, such as the National Council for Accreditation of Teacher Education Standards. This demand increases the complexity of certain areas of the mapping process (e.g., objectives, content, and assessment) and the mapping results that are compared to those of various parties. Therefore, the mapping analysis must be quantified. Robley, Whittle, and Murdoch-Eaton (2005) evaluated the performance of a generic skills program of a U.K. medical school based on its externally agreed standards in addition to mapping the "declared" (planned), "delivered" (by teachers), and "learned" (by students) curricula. A fourth "assessed" map, which they have referred to as "alignment loop", (p.224) was constructed in all the stages of their study. Apart from curriculum documentation, feedback forms and focus group interviews were used to gather data. The status of alignment was reported in terms of fully aligned skills and partially or non-aligned skills.

Plaza et al (2007) used graphical map to examine the relative degree of concordance between teachers' and students' perceptions of coverage of learning outcomes. They also created two sets of graphical curriculum maps to compare teachers' and students' perceptions of curriculum coverage – one was to examine the intended/delivered curriculum by course and domain, while the other one was to examine the intended/delivered and the received curriculum by domain and professional year. They argued that the graphical maps could be used to identify the areas of intended learning outcomes that were adequately and inadequately addressed in the curriculum.

Content analysis is typically conducted to analyze the mapping results. This method is quantitatively carried out by counting the words and jargons that are to be mapped in the documents (Gjerde, 1981), and statistical analysis can be performed on the data gathered

from surveys and questionnaires. The method is also qualitatively conducted by decoding the meaning of the words and jargons (Sumsion & Goodfellow, 2002). Previous studies have also addressed the limitations of curriculum mapping in data gathering such as its retrospective nature, which makes mapping results prone to biases, and its inability to calculate an index of alignment between different parties (Plaza et al., 2007). On the other hand, textual descriptions, matrixes, and degrees or tendencies on the relationship of different learning outcomes within and across different courses are commonly used in presenting the mapping results. However, both the analysis procedure and the presentation of results are not always comprehensively discussed by authors due to the complexity of their studies (e.g., Plaza et al., 2007; Robley et al., 2005), therefore, readers may not learn any mapping skills from such studies.

The condition of successful curriculum mapping is also discussed in the literature. A successful mapping process requires a trusted environment. This is to ensure the participants' pre-reflective assumptions and biases are made apparent and available for reflection and challenge in the mapping process such that a mutually acceptable understanding can be reached (Hogan, 2000). While trust can be developed through teachers' collaboration in curriculum mapping, mapping can instill in university teachers a sense of teamwork to support organizational development (Tierney, 1999). It is sensible for a small group of people who share a keen interest in the topic to initiate mapping studies to review issues and refine procedures, thus preparing themselves for conducting large-scale studies in the future.

Another function of curriculum mapping is that its results can be used to understand the coverage of specific SLOs and pattern of distribution in the curriculum by domain and year of study in a study program. This understanding is helpful for teachers who serve as curriculum developer, in recognizing the nature of specific SLOs and also the connections of different SLOs in a subject discipline, in order to plan an effective curriculum which can result in integrated learning for students. Our study explores the potential of using mapping in these aspects.

Applying Curriculum Mapping in Teacher Education Program

Although the inconsistency and lack of coherence in the teacher education curriculum are commonly addressed in the teacher education literature (Darling-Hammond, 2005; Russell & McPherson, 2001), efforts to examine the curriculum content of teacher education program are relatively few. This suggests the application of curriculum mapping in teacher education programs has the potential to contribute to filling the gap in this area of study. Recent literature have also pointed out that the curriculum of teacher education program should integrate education studies (professional knowledge and competencies required by

qualified teachers) and academic studies (discipline knowledge related to subjects to be taught in primary and secondary school curriculum) to enhance the integrity and authenticity of learning experience of student teachers (Huber & Hutchings, 2004; Schön, 1983). With regard to the model of teacher training program, teacher education literature switches to and fro between an undergraduate integrated model and a postgraduate professional training model. The former can be realized through a Bachelor of Education program in which the academic studies are integrated with education studies such as curriculum studies, learning theories, teaching methods and skills. The latter can be realized through a postgraduate professional program, also known as Postgraduate Diploma in Education, which mainly provides teachers the training in education studies so as to develop their professional knowledge and competencies for discharging their duties in schools. Although both models (teacher education programs) have pros and cons (Draper & Sharp, 1999; Fraser & Taylor, 1999), few attempts have been made to compare the curricula of the two programs in this direction.

In Phase One of our study, the five SLOs on curriculum and instruction are defined. These SLOs are deemed as necessary and useful if they can be distributed across individual courses and the program as a whole to determine how explicitly they are addressed in the teacher training programs. The organization of the five SLOs in the two types of programs must also be compared to clearly identify their difference, if any, with the feedback on the topic of the training. This approach may also determine the learning experience a program provides to students relative to the SLOs. These purposes are very useful in the evaluation of a program as the BEd and PGDE programs are both accredited for teacher qualification.

This study investigates curriculum mapping to determine the extent to which the learning outcomes specified for ‘curriculum and instruction’ as a discipline in teacher education are reflected in the ‘planned curriculum’ (course curricula) and to determine the distribution of the outcomes as reflected in the organization of the courses in the BEd and PGDE programs. The study provides a clear guide for curriculum mapping and offers insights into the planning of teacher education programs that consider the qualification and continued professional development of teachers.

Rationale for the Study

Curriculum mapping is useful in identifying the vertical and horizontal alignments of learning outcomes within a course and in the program as a whole respectively (Jacobs, 2004; Uchiyama & Radin, 2009). This method fits well to our study design which aims to experiment with a method for mapping SLOs onto specific areas of course documents and to examine the coverage and pattern of existence of the SLOs at course and program levels. It is

also useful in determining if the currently offered courses by the DC&I use these SLOs as indicators of the faculty's and the students' priorities. Reviewing the existing literature allows for determining if the mapping of SLO factors can also be used to identify the distribution pattern of SLOs. The results of the SLO factor distribution are discussed at the course and program planning levels to address the status of SLOs with regard to the curriculum they provide to students at the vertical (within a course) and horizontal (in the program as a whole) levels. The study begins with an experiment that involves four project team members, and aims to clearly understand the procedures and processes of our study so that they can be added to the accepted mapping literature and used in education institutions, especially by practitioners.

Five Subject Learning Outcomes

The five subject learning outcomes (SLOs) of all core courses offered by DC&I as a whole were identified in a Delphi study conducted in the first stage of the mapping project (Lam et al 2010; Lam & Tsui, 2012). To determine the SLOs, the project team employed the Delphi method, which collected opinions from a panel of experts (in this case, the departmental academic staff) who individually contributed information and expertise on the issue to a central moderator who collated these responses and fed it back to the panelists for further evaluation (Kerr, Aronoff, & Messé, 2000). The four research team members and the research assistants served as platforms of moderation in this part of the process.

In the Delphi Study, all DC&I faculty members were asked in what way the core courses offered by DC&I could contribute to the preparation of qualified teachers. Their suggestions were then organized and analyzed by the project team. A tentative list of expected learning outcomes was developed and sent to faculty members for endorsement. The finalized list was further developed into a 42-item digital survey to elicit the responses of staff members and graduating students to these items on a six-point, positively packed rating scale. Five SLOs were developed from a five-factor solution that was generated from an exploratory and confirmatory factor analysis of the students' ($n = 86$) and DC&I faculty members' ($n = 16$) responses. These results reflect the priorities of the department's academic faculty and students. As such the identified SLOs can be used as a reference to set course learning outcomes for developing specific courses in meeting the requirements of various teacher education programs. The definitions of the five SLOs are shown below:

i. Teacher Professionalism (TP)

TP refers to the skills and attitudes of a teacher that enable him/her to execute the duties of a teacher in school and in the society in a professional manner. This factor includes competent application of teaching strategies and professional practices in complex education and social settings, upholding responsible and ethical conduct, and reflection on one's practice.

ii. Student-centred Pedagogical Practices (PP)

This factor refers to the capability of teachers to engage students in effective learning regardless of their needs, backgrounds and abilities. Teachers must be competent in implementing pedagogical practices that appropriately address student diversity based on a repertoire of teaching/learning theories and strategies.

iii. Assessment and Evaluation (AE)

This factor focuses on the skills and knowledge that teachers need to assess student learning and needs, and make appropriate decisions related to student learning and development based on the results of assessment. The factor includes the ability to design, administer, interpret, and provide accurate and valid feedback and reports for communicating with students, parents, fellow teachers, and administrators.

iv. Curriculum Planning (CP)

This factor refers to teachers' practical abilities in designing, arranging, and implementing lessons and units of work that are appropriately aligned with the relevant curriculum statements, which can ultimately enhance the academic performance of students.

v. Curriculum Theory and Knowledge (CK)

This factor pertains to the theoretical knowledge that teachers need to make sense of the nature and purpose of curriculum policies and theories that are relevant to educational practices in Hong Kong. Curriculum policy and theory also connect to, and sometimes

overlap with, knowledge on teaching and assessment.

These five SLO factors, as a whole, represent the subject knowledge base of 'curriculum and instruction' as perceived by the faculty and students of the DC&I. Since these SLO factors were newly generated from our study in 2012, all the existing courses being offered by DC&I were developed without making reference to these SLOs. The research team initiated this teaching development project to scrutinize the existing courses by conducting curriculum mapping and making use of these SLOs.

Method of Study

We conducted a content analysis of the compulsory Professional Studies (PS) courses in the Bachelor of Education (BEd) and Postgraduate Diploma in Education (PGDE) programs that were offered by the DC&I. Table 1 shows the 14 selected and analyzed courses. These courses were offered in a range of teacher training programs with different tracks (teaching subjects and levels), study modes (full-time and part-time), and entry levels (postgraduate and undergraduate). The 14 courses are offered in the one- and two-year Postgraduate Diploma in Education (PGDE) (full-time and part-time); four-year Bachelor of Education (BEd) (full-time); three-year BEd (mix-mode); three-year BEd (Language Teacher) (mix-mode); and four-year BEd (Professional and Vocational Education) (full-time). Except for BEd PVE, all programs offer both primary and secondary schemes. BEd is a full degree program with study in education as the key discipline for preparing qualified teachers. BEd (mix-mode) programs are offered to students who are in-service teachers requiring an upgrade in their teacher education qualifications to the degree level. BEd (PVE) is a relatively new program designed for participants who are teachers in schools or vocational training institutions, but do not have degrees or teacher education qualifications. The PGDE programs provide a route for university graduates to obtain qualified teacher status.

Course Code	Program Code	Course Title
CUI5046	PGDE (P/S) /(F/P)	Curriculum and Assessment
CUI5048	PGDE (P/S) /(F/P)	The Professional Teacher in Classroom, School, and Community
CUI1086	BEd(P/S) /(F/P)	Teaching and Learning
CUI2087	BEd(P/S) /(F/P)	Assessment
CUI2088	BEd(P/S) /(F/PT)	Promoting Positive Classroom Environments
EPC3148	BEd(P/S) /(F/PT)	Understanding and Managing Diversity
CUI4089	BEd(P/S) /(F/PT)	Curriculum and Innovations
CUI2062	BEd (P) MM/(F/PT) BEd (S) MM/(F/PT)	Assessment for Learning
EPC4107	BEd (P) MM/(F/PT) BEd (S) MM/(F/PT)	Understanding and Managing Diversity
CUI1031/ CUI 2030	BEd (LT) MM/(F/PT)	Teaching Strategies & Classroom Organization (Secondary)
CUI3012	BEd (LT) MM/(F/PT)	Curriculum Development and Assessment in Schools
CUI1108	BEd (PVE) PT	Strategies for Teaching and Learning in PVE
CUI1107	BEd (PVE) PT	Assessing and Recognizing Learning in PVE
CUI1109	BEd (PVE) PT	Instructional Design in PVE

Table 1: Compulsory courses offered by DC&I (for incoming students of academic year 2009–2010)

The Mapping Process

Four members of the research team, including the two authors of this paper, participated in the mapping process as raters. They were a group of colleagues who volunteered this teaching development project for initiating the mapping project, and they developed the methods that guided the data collection, analysis and interpretation of results. All of them were faculty members of the DC&I who had mutual interest in the application of OBE in course delivery. Two of them are of Western descent, whereas the other two are local Chinese citizens. They had spent an average of 14 years and 8 years in teacher education and DC&I, respectively. Although they had varied work experiences in local education context, all members had working experience in teacher education institutions, specifically in the area of curriculum and instruction. The cultural diversity of the research team boosts its credibility by the advantage of accessing diverse perspectives which in turns enhances the validity of the interpretation of data analysis results.

According to an agreed coding system, each member worked independently to rate the extent to which the three course areas, namely, course objectives (O), assessment tasks (A), and course content (C), specified in the course documents could be mapped onto the five

SLO factors. For instance, if three course objectives are listed in the course document, the team members will map each objective onto the five SLO factors. Furthermore, to ensure good inter-rater reliability of the mapping process, the team adopted a common set of rating criteria for mapping the course documents. When the team members finished their rating tasks independently they came together to discuss and review their ratings given. Team members could adjust their ratings based on consensus reached at the meeting. In case the members have not reached a consensus, the ratings of a course area are only considered when two or more raters share the same judgment (i.e., $r > 1$). The example below illustrates how this rule operates.

Table 2 shows the ratings of course CUI5046 in three areas. The statistics of ratings given by the raters are presented on the left side of the table; the numbers 0 to 4 represent the number of raters' endorsement of the mapping results. The right-hand side of the table shows the 'agreed' results for further analysis when the abovementioned $r > 1$ rule is applied.

SLO Factors	No. of Raters Responded			Agreed Ratings			
	O	A	C	O	A	C	Total
1	4	1	1	4	0	0	4
2	1	1	1	0	0	0	0
3	4	4	4	6	6	10	22
4	3	2	4	3	3	5	11
5	3	3	3	4	5	6	15

Key: O = Objectives, A = Assessment Tasks, C = Course Contents

Table 2: Interpretation of the overall mapping result of a given course

When all the four raters agree that factor 1 can be mapped onto the course objectives, 4 is recorded in both the left- and right-hand sides of the table under column O. Conversely, if only one rater agrees that factor 1 can be mapped onto assessment tasks and the course content, then 1 is recorded under columns A and C respectively, on the left-hand side of the table; while 0 is recorded instead on the right-hand side of the table, under columns A and C, this indicates that the coverage of factor 1 is totally absent from course areas assessment tasks and course content. Tables 3 presents the results of mapping SLO factors onto the selected course documents and Table 4 presents the relative significance of the SLO factors identified in these courses. The SLO coverage in the selected courses is represented in radial diagrams in Figures 1 to 3.

Findings and Discussion

This section discusses the results of mapping the SLO factors onto the 14 selected courses. It describes the composition and nature of SLO factors covered in these courses. The pattern of composition largely falls into two categories. One is in the form of a cluster composed of two to four SLO factors in various weightings (e.g., TP, PP, CP, and AE in EPC3148). The other is in the form of dual-factor in which one is dominant in terms of weighting (e.g., AE in CUI2087). These two categories of composition or coverage of SLO factors in a course represent two different approaches in course design in teacher education program, which will be discussed further below, by addressing the benefit of ‘integrative learning’ that can be achieved by the current combination of SLO factors in the findings.

The results of mapping in Table 4 can provide useful information to understand how well the SLO factors were covered in the curriculum as a whole and structured for delivery through courses in the BEd and PGDE programs, two of the most preferred routes of teacher training worldwide. The BEd program had a wide coverage of SLO factors, which was studied over a four-year period in a progression to produce a spiral curriculum. In contrast, a full-time PGDE program was found to collate SLO factors in one course with a limited study period of one year, which provided opportunities for integrative learning. The attempt to use a visual representation of the SLO coverage provides a better depiction of the fundamental problems in PGDE, compared to BEd, in terms of the breadth and depth of SLO factor coverage. Overall, the findings confirm that the five SLO factors were planned as a broad knowledge foundation for DC&I courses.

SLO Factors Covered in the Course

Table 3 shows the results of mapping the SLO factors onto the 14 selected courses. Interestingly, several courses, such as CUI5046, were found to be associated with different SLO factors, whereas others, such as CUI2087, were mainly associated with only one or two SLO factors.

SLO factors	CUI 5046	CUI 5048	CUI 1086	CUI 2087	CUI 2088	EPC 3148	CUI 4089	CUI 2062	EPC 4107	CUI 1031	CUI 3012	CUI 1108	CUI 1107	CUI 1109
TP	4	28	10	0	26	3	0	2	2	17	0	20	4	0
PP	0	22	39	3	29	41	0	4	32	35	0	45	0	19
AE	22	0	0	46	0	11	0	38	8	0	31	6	45	0
CP	11	0	6	0	0	14	21	2	8	2	21	0	0	43
CK	15	0	0	0	0	0	31	0	0	0	14	0	0	6

Table 3: Results of mapping SLO factors onto the Selected Course Documents

SLO Factors	PGDE		BEd							
	CUI 5046	CUI 5048	CUI 1086	CUI 2087	CUI 2088	EPC 3148	CUI 4089	CUI 2062	EPC 4107	C
TP	8%	56%	18%	0%	47%	4%	0%	4%	4%	
PP	0%	44%	71%	6%	53%	59%	0%	9%	64%	
AE	42%	0%	0%	94%	0%	16%	0%	83%	16%	
CP	21%	0%	11%	0%	0%	20%	40%	4%	16%	
CK	29%	0%	0%	0%	0%	0%	60%	0%	0%	

Table 4: Relative significances of SLO factors identified in Courses offered DC&I in different programs

Table 4 shows the relative significance or coverage, in terms of percentages, of the five SLO factors in each course. The pattern of relative significance can be explained by taking into consideration the specific purposes (aims) of a course and the type of program that the course is based upon. Courses which aimed at helping student teachers develop competencies in the area of 'diversities'. 'Learning and teaching' appeared to have a wider coverage of SLO factors. It is generally agreed that the concept of diversities can be interpreted in a wide spectrum of domains (Milem, Chang, & Antonio, 2005), thus the wide coverage of SLO factors in a course on diversities becomes reasonable. For instance, the course EPC3148, 'Understanding and Managing Diversities', was found to cover four SLO factors, namely, TP (4%), PP (59%), AE (16%), and CP (20%). This means that the course adopted an integrative approach to developing student teachers' understanding and management of diversities which was based on knowledge and skills connected to a wide range of SLOs.

Similarly, courses such as CUI1086 Teaching and Learning and CUI1031 Teaching Strategies and Classroom Organization, which by nature had special focus on a range of pedagogical theories, strategies and skills, and professional attitudes under the generic term 'learning and teaching'. Thus both courses were designed to cover three SLOs, namely, TP (18% and 31%), PP (71% and 65%), and CP (11% and 4%), respectively, aiming at developing student teachers' competencies in and attitudes toward effective classroom practice.

In contrast, a number of courses were designed to achieve more specific learning outcomes. For instance, in the course CUI2087 Assessment, the title implies that the course was based on a specialized knowledge base, namely, 'assessment'. A single SLO factor, AE (94%), dominated this course. The unique design of the course CUI2087 considered the contextual factors of the current school system in Hong Kong. 'Assessment' was recently advocated as an essential competence for effective teaching in the 2000s, as the current curriculum reform in Hong Kong emphasizes the effective use of both 'assessment for learning (AfL)' and 'assessment of learning (AoL)' (CDC, 2001) to support student learning. Schools and the government have strongly demanded that all newly trained teachers be competent to support the schools in implementing assessment reform and developing a new culture of AfL in the classrooms.

The mapping results indicate that each course was designed to achieve an array of SLOs by combining SLO factors, as reflected in the course objectives, course content, and assessment tasks. The situation is desirable, as the identified SLO factors were truly represented in the courses offered in different programs. Though in some cases, specific SLO may appear to be more focused and concentrated because of its unique nature and the demand from the educational context, which is relevant and sensible, as discussed. Moreover, the results demonstrate the curriculum planning of the courses to achieve 'integrative learning' (Huber & Hutchings, 2004), which implies learning through the connection of knowledge in different knowledge domains or the connection of knowledge and practice, such as CK and AE, PP, and TP, as shown in the combination of SLO factors in the courses. With regard to professional training of teachers, this connection is important because teaching is a combination of ethics and attitudes, as well as knowledge and skills. Participants can be trained to adopt the thinking of a reflective practitioner (Schön, 1983) as a result of integrative learning. Participants can reflect on their action based on not only a single perspective, but also multiple ones, as teachers are not only trained in one knowledge/skill aspect in the courses, but also in the connection of one another. They are trained both in the knowledge/skills and the capacity of being able to act in a professional manner.

The traditional intellectual model of training typically provides students with a set of segregated courses with minimal interconnections. Students fulfill their graduation requirements by completing these courses. In an integrated curriculum design intended to provide integrative learning, relevant disciplines are combined into one course, and students are provided learning opportunities that are highly focused on general and professional skills training. This curriculum design enables students to develop the capacity "to see connections, and hence, an ability to make fundamental decisions and judgments" (Rothblatt, 1993, p. 28). Teachers are required to obtain a repertoire of competencies and attitudes to perform their duties. A series of studies on teacher cognition (Lam, Chan, Cheng, Lim, Zhang, 2012; Korthagen, Loughran, & Russell, 2006; Russell & McPherson, 2001) have argued that

teachers should develop situated knowledge and procedural knowledge in actual teaching situations to enable them to act spontaneously and effectively. Shulman's (1986) study on teachers' knowledge base suggested that teachers utilize different domains of knowledge in teaching. Furthermore, he suggested a unique "analogical reasoning" (p. 12) that refers to a powerful integrated ability underlying a practitioner's decision making. This type of reasoning can be regarded as teaching expertise. In similar vein, Berliner (2004) suggested that expert teachers should fluently interpret a situation through the integrated use of knowledge from various domains. It is clear teacher education literature has supported an integrative approach in curriculum design and recommended for preparing teachers to work in a very challenging school environment.

Furthermore, in a carefully planned curriculum or program of study, the whole is greater than the sum of individual parts (Glaser, 1984; Harden, Davis, & Crosby, 1997). The SLO factors identified in the C&I courses were interconnected. Factor TP, for instance, was identified in 10 out of 14 courses in the current study. As TP is considered essential to any professional practice, it generally can be integrated with the knowledge and skills necessary in most C&I courses. Table 1 shows the difference in the number of courses offered by the C&I in different programs. A review of whether SLO factors were adequately addressed in a program of study is important in verifying whether the curriculum design of a C&I subject can reasonably cater for the needs of course participants. The next section reports the comparison of the distribution of SLO factors with reference to BEd full time (FT) and PGDE (FT) programs, which are the biggest initial teacher training programs in the HKIEd, at the undergraduate and postgraduate levels, respectively. As these programs are also commonly offered in many places outside Hong Kong, the results can be shared in different contexts.

Comparison of Course Design Approaches Adopted in the PGDE and BEd Programs

Figure 1 is a radial diagram that illustrates the coverage of SLO factors in the two compulsory courses of the PGDE program, namely, Professional Teachers in Classroom, School, and Community (CUI5048) and Curriculum and Assessment (CUI5046). The shaded areas represent the degree to which the SLO factors were covered by these two compulsory courses. The course CUI5048 covered TP (56%) and PP (44%), whereas the course CUI5046 covered TP (8%), CK (29%), CP (21%), and AE (42%). It is worth noting that the two courses complemented each other by sharing the coverage of the five SLO factors with only a very small overlap in TP.

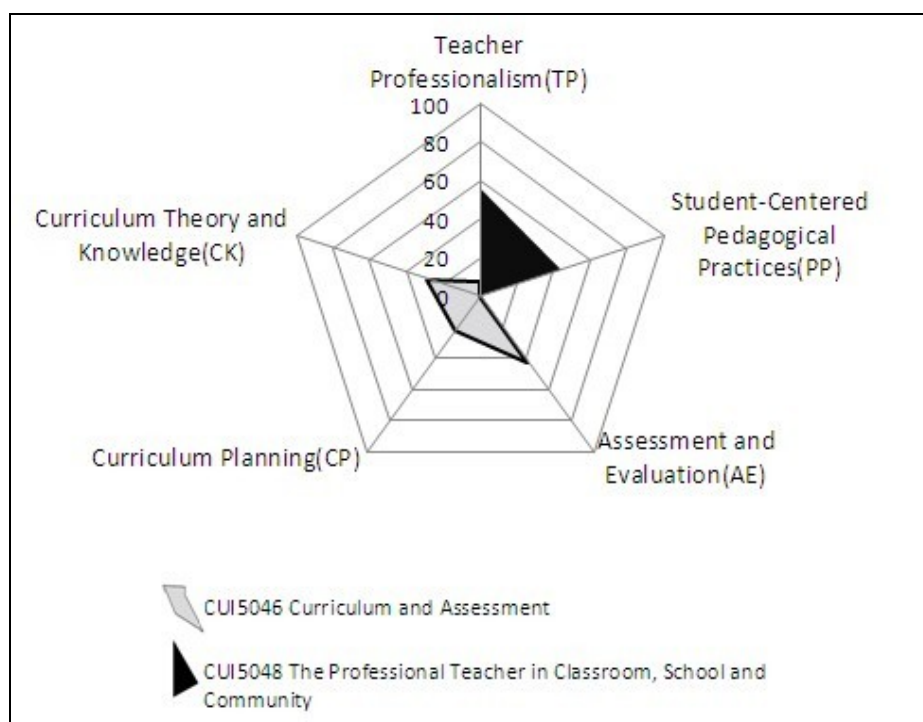


Figure 1. Coverage of Subject Learning Outcomes in the PGDE Program

Figure 2 shows the coverage of SLO factors in the compulsory courses of the BEd (FT) program. Five compulsory courses were offered in this program and the coverage of the five SLO factors in each course is shown by the shaded areas in the figure. Course CUI1086 covered TP (18%), PP (71%), and CP (11%). Course CUI2087 mostly covered AE (94%), with a slight coverage of PP (6%). Course CUI2088 covered TP (47%) and PP (53%); course CUI4089 covered CP (40%) and CK (60%); and course CUI3148 covered TP (4%), PP (59%), AE (16%), and CP (20%). Interestingly, in a close look of the weightings of individual SLO factors found in these courses, a dominant SLO factor stands out in four out of five courses, namely, PP in CUI1086 and AE in CUI2087, CUI2062, and CUI1107 (see Table 4). All these courses were offered in the BEd program. The weightings of these factors were more than 70% in their respective courses. Obviously the existence of a dominant SLO factor will affect the nature or design of a course. As is shown in Figure 2, the uniqueness of the course CUI2087 is illustrated by its needle-like shape, which clearly shows that the course has a special focus on the AE factor. In contrast, the course EPC3148 is represented by a flat shape which had more evenly distributed coverage of four SLO factors. This implies the course was more integrative in nature.

As previously mentioned, the PGDE and BEd programs are both well-established routes for preparing qualified teachers in Hong Kong and elsewhere (Leung, 2003). The PGDE program admits university graduates holding a relevant degree in their major teaching subject. In Hong Kong, undergraduate programs normally last three years full time whereas PGDE programs last one year, if full time, and two years, if part time. The BEd program adopts an

integrative four year full time (3+1) model of teacher training. The program admits secondary school leavers and grants them an undergraduate degree with both academic and professional qualification upon graduation. In the four year of study, students receive academic training in their chosen teaching subjects, as well as professional studies to obtain qualified teacher status. In practice students graduate from both programs are awarded the same teacher qualification status, as such, they should have received similar training in professional studies (PS) courses offered by DC&I. However, owing to the differences in program structure and duration, students of PDGE and BEd would have to study two and five PS courses, respectively, to achieve the same set of SLO factors.

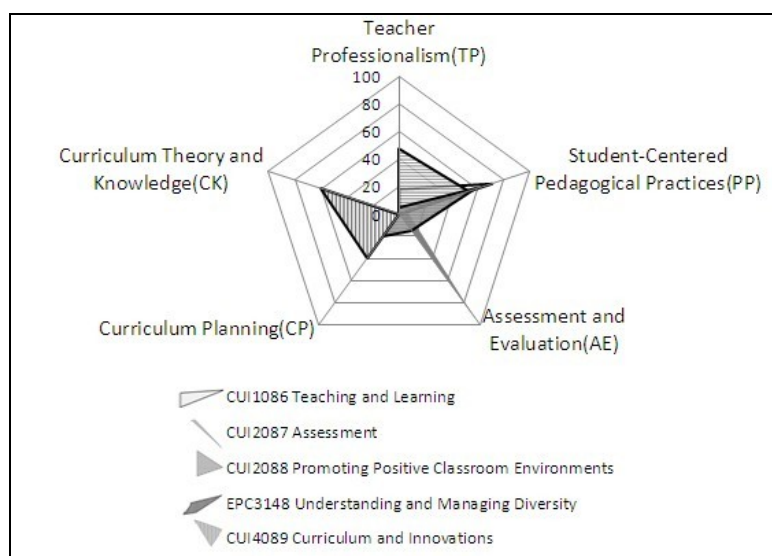


Figure 2. Coverage of Subject Learning Outcomes in the BEd Program

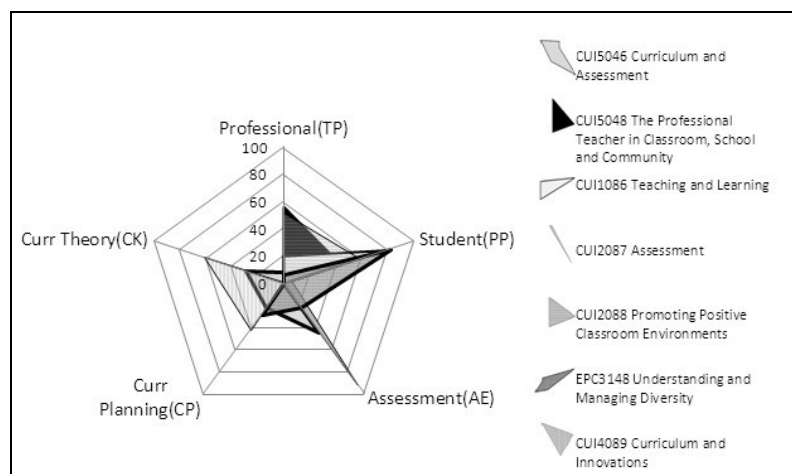


Figure 3. Scope of Subject Learning Outcomes reflected in the BEd and PGDE programs

Figure 3 shows the results of mapping the five SLO factors onto the courses offered in the BEd and PGDE programs. However, a closer examination of the mapping results reveals

different patterns of coverage of SLO factors in these two programs. In PGDE program, only two PS courses were offered; factors TP and PP were associated with course CUI5048, and factors AE, CP, TP and CK were associated with CUI5046. Although more than one SLO factors could be identified in both CUI5048 and CUI5046, the integration of SLO factors in the PGDE program could only be partially imposed, due to the constraint of very short study period and limitation of number of courses to be offered in a one-year PGDE (FT) program. As a result, the time provided to students was insufficient for integrating, developing, and practicing the knowledge, strategies, attitudes, and skills learned from the courses.

In contrast, the BEd program curriculum fulfilled the achievement of the five SLO factors through the study of five PS courses. Although AE and PP were the dominant SLO factors in courses CUI2087 and CUI1086, respectively, all the SLO factors except CK were associated with at least two courses. This finding indicates the BEd program adopted a spiral curriculum development model in curriculum planning, which allowed student teachers to learn new content and revisit previously learned content in a structured and developmental manner through four years of study, thereby deepening their learning and the application in different contexts. Such curriculum design demonstrates the effective planning of integrated learning.

Conclusion

This study provides several insights into program planning and course development for teacher education. The discussion regarding BEd or PGDE teacher education programs being the preferred route for preparing teachers is no longer new. The topic has been frequently and widely discussed, but teacher educators have not reached a consensus on it (Lai & Grossman, 2008). The findings of this study as shown in the radial representation of the SLO coverage in different courses may provide a better depiction of the fundamental problems in the curriculum design of PGDE program, compared to the BEd program, in terms of the breadth and depth of SLO factor coverage in the courses offered, though all the SLO factors were adequately covered as a whole in both programs. The BEd programs had the advantage of allocating more curriculum space (number of courses) for students to achieve a set of SLO factors in four years' time. However, their counterparts, the PGDE participants could only learn in a more condensed manner in a one-year program. Obviously they had less curriculum time to prepare the professional competencies when compared to the BEd participants, though all the SLO factors are adequately covered in both programs. To fill this gap, this study recommends school employers provide more structured tailor-made induction and on-the-job professional development programs to graduates of PGDE programs to further develop their professional competencies in the early stages of their career. This can be done through mentoring, on-the-job training, and professional community sharing. This

recommendation is in line with those suggested in the literature (Fessler & Christensen, 1992; Lam & Yan, 2011).

The present study also contributes to a better understanding of the content structure and knowledge base of DC&I courses, particularly, in teacher education. Previous studies, such as those by Sumison and Goodfellow (2002) and Plaza et al. (2007), have mainly examined the discrepancy between planned and delivered curricula. The current study adds to the existing literature on curriculum mapping by addressing the issue whether the core competencies identified for a profession are truly reflected in the course and curriculum planning. This study utilizes the result of curriculum mapping to discuss the curriculum plan at the program level, which supplements the effort of the current literature in confirming outcomes in course planning. The discussion is useful in preparing course development and re-development.

Compared to other curriculum mapping studies, this study takes an educational planning perspective to understand the wider application of curriculum mapping in curriculum design approaches and learning experience. The spiral curriculum found in the BEd program can work effectively during the four-year study period, allowing students to learn the subject matter in a progressive sequence. In addition, students can enjoy a more integrative learning experience by revisiting the SLO factors in various courses during the four-year study period. Thus, students may be exposed to a context of gradually developing their 'reflective capacity' and 'situated cognition' well before joining the profession. This feature of curriculum planning is favorable and can be further used in the future planning of teacher education programs, especially in the context of Hong Kong where the period of teacher education program has been extended to five years. We think it is desirable that all the SLO factors be appropriately covered in the courses, however, it is also sensible that some SLO factors might be dominant in a certain course on need basis, such as change of teachers' role and requirements for professional practice in response to new education policy, changing education environment, and implementation of curriculum reform. The examination of SLOs by the mapping method can also identify the short half-lives of SLO factors; the connections between the SLOs may further suggest that more comprehensive assignments should be designed for enhancing the integrative nature of the courses.

This study introduces a process for conducting an outcome-focused course review by mapping the SLO factors onto the curriculum documents. The graphical illustration of data provides a structure for better understanding of the mapping statistics. As Mandler (1983) stated, meaning does not exist until some structure and organization is achieved. Based on the respective percentages of each SLO factors identified in the courses selected in this study, we have examined the relationship between the patterns of factor composition and the nature of respective courses. The radial diagrams provide a spatial representation to understand the integrated nature of the five courses offered in the BEd program and the two courses in the PGDE program. Applying the aggregation method and the mapping rules (Table 2) among

members as well as utilizing radial diagrams (Figures 1 and 2) have enabled us to explore the relationship between SLO factors and the course design adopted in the BEd and PGDE programs. The potential applications of curriculum mapping that have been further realized in our study may fill the gap of this part of literature. The mapping exercise can be regarded as successful as we have started as a four-member team working collaboratively in a team meeting setting, experiencing meaningful dialogue in deliberating issues, and managing diverse opinions into agreement in a professional manner. Overall, the mapping exercise provides a real example of using mapping in higher education.

Further studies are suggested regarding the alignment of SLO factors among the planned, and delivered, and learned curriculum through the inclusion of students' and teachers' reflections and feedback. Based on such investigation, the knowledge base for teacher education could be further strengthened.

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