

Broadening Grade 11 Students' Learning Conceptions of Web Authoring: A Phenomenographic Approach

Percy Lai Yin KWOK

Logos Academy, Hong Kong, China

drpercykwok@gmail.com

Abstract: In this paper, a phenomenographic approach was utilized to create learning spaces in which two groups of 78 Grade 11 students under the guidance of the teacher (the action researcher) learned to do projects on improving information-seeking efficiency of their school web. The projects were the compulsory school-based assessment (SBA) component of an open examination on the Computer and Information Technology (CIT) subject in Hong Kong in the school year 2007-08. Through iterative planning-acting-observing-reflecting cycles of action research in a learning study, the teacher experienced three substantive stages of gaining understanding of student learning conceptions and pedagogical changes on improving efficient information-seeking mechanisms of web authoring. Throughout the process, some learning and teaching conditions varied whilst others were kept invariant to articulate inter-student learning variations and thereby formulate feasible teaching approaches in SBA. In learning dimensions, the students experienced methodological and contextual variations on web authoring skills and web publishing knowledge, whilst in pedagogical dimensions, the teacher experienced variations in assessment means (such as devising assessment rubric descriptors) and made suitable in-step guidance for students to do their ongoing projects. Notably, a new learning space experienced by the teacher was found to deepen understanding of didactical interactions and those critical conditions accounting for individual learning differences.

Keywords: Learning spaces, web authoring, project works, phenomenography

Introduction

Research findings using phenomenographic methods have demonstrated a limited number of qualitative different means through which students, being unique in character, understand a particular phenomenon. Those different ways of phenomenal understanding necessarily involve cognitive discernment of a different set of critical aspects of the experienced phenomenon (Marton & Booth, 1997). If teachers pay close attention to such qualitative differences, they would gain better understanding of their students' learning concepts and be able to bring about their meaningful learning, provided that they can build on their prior understanding and experiences. This current study aims to explore feasible learning spaces (experienced by the teacher) by finding improved patterns of variation for dealing with intended and enacted objects of learning in a school-based continuous assessment of uses of web authoring skills for improving information-seeking efficiency. As a result, the teacher (the action researcher) knows more about individual learning differences and how to deepen their learning, facing such differences.

1. Background

Project-based learning or project work has been recognized as an important part of school curriculum and reforms in many East Asian countries. Project-based learning provides pupils and teachers with opportunities to break away from the compartmentalization of knowledge and skills that results from subject-area instruction. Broad themes are used to bring various aspects of the subject-based curriculum or cross-curricular ones together (esp. development of generic skills, Cheong & Goh, 2002). This will help pupils see the interconnectedness of their

learning and develop their life-long learning skills like creative and critical thinking, communication, collaborative learning and self inquiry skills, which are good preparation for future workplace areas under knowledge-based economies. Indeed, project-based learning is a complex cognitive and meta-cognitive process, which requires both hands-on and minds-on learning. It is action-oriented and focuses on doing something rather than learning about something (Moursund, 1999). Although project-based learning is such an important aspect of school curricula, its school implementation raises great challenges to many East Asian societies with strong stresses on open examinations. How to combine individual-based project work (assessing student learning process) and written open examination papers (assessing student learning outcomes) at senior secondary levels is an interesting assessment issue. Despite vast research literature on uses of computer-mediated or -supported technology (Dillenbourg, 1999; Janassen, *et al.* 1999, Hung, 2001; Puntambekar, 1997), there is still a lack of methodological parameters or theoretical frameworks accounting for individual learning differences among students in project work. Meantime, collaborative student learning using online learning platforms or knowledge building communities (Collins & Bielaczyc, 1997; Scardamalia & Bereiter, 1996) is infeasible in individual-based project assessment which is competitive in nature. Notably, phenomenographic research findings mostly focus on student learning variations *without the teacher's perspective* and there is insufficient empirical case study on articulating teachers' learning spaces or spaces shared by students and the teacher (Marton & Morris, 2002; Marton & Tsui, 2004). To bridge such research gaps, the current study endeavors to articulate new learning spaces experienced by the teacher to depict methodological and contextual inter-student learning variations on web authoring in an individual-based project work (combining formative and summative assessment) using phenomenographic methods.

2. Theoretical Framework

In phenomenography, learning is considered as a dynamic change in the state of awareness or ways of experiencing the phenomenal world (Marton & Booth, 1997). Throughout the learning process, varied and invariant patterns of learning necessarily involve steps of drawing contrasts, generalization, separation and fusion. Notably, *discernment*, *awareness* and *simultaneity* are key components of learning and closely linked together, each of which being a function of another. The *space of learning* points to the pattern of learning variation inherent in a situation, observed by the researcher. Such space is a necessary condition or a set of necessary conditions for the learner's experience of that pattern of variation related to her or his previous learning experiences and the teacher's experienced perspectives. As a result, *creating a new learning space* means opening up a new dimension of learning variation, completely different from the take-for-granted nature of the absence of such variation (Marton & Morris, 2002, Marton & Tsui, 2004). In particular, the *object of learning* refers to those capabilities and necessary conditions in which students' inherent characteristics, didactical interactions and learning environments are considered for achieving *specific* learning and teaching goals. Current pedagogical discussion on student-centered and teacher-centered instructions merely focuses on *general* non-referential aspects of learning and teaching without paying great attention to *specific* referential aspects of learning and teaching. In the light of a specific object of learning, the space of learning is a specific characterization of didactical interactions in the classroom. In the teacher's angle, the *intended object of learning* aims to achieve the teacher's intended learning and teaching objectives whilst the *enacted object of learning* points to what the intended object of learning being actually enacted in the classroom specifically. Finally, the *lived object of learning* constitutes the ways of how students see,

understand and make sense of the object of learning after and beyond the lesson (Marton & Tsui, 2004, pp.224-225).

3. Research Design

3.1 Study Problem

The students were guided to reconstruct the existing school web to strengthen its information-seeking efficiency. Web information improvement included school announcements, schedules of extracurricular activities, open contests that students may participate in and so forth. Technical concerns covered establishment of specific sub-pages where frequently updated information was given, generic skills of using various web-authoring software and fulfillment of the needs of various types of web surfers such as students, parents, teachers and the general public. Presentation contents were divided into two sections. Section one was to propose two desirable solutions, aiming at efficient information seeking and comparing the two solutions (40%) whereas section two was to design and create web layouts on illustrating how a web user might seek information efficiently from the pages using one of the proposed solutions highlighted in section one (60%).

3.2 Working Procedure

Originally, such school-based assessment (SBA) project is so *individual-based* that it occupies 20% of the public examination in one of four elective modules called ‘web authoring and multimedia productions’. The duration of the project assignment lasted for six months for the two Grade 11 classes in a total of 78 students before they sat for the remaining three written papers. At the beginning, the teacher (the action researcher) endeavored to employ peer or group learning techniques to facilitate collaborative learning. Online discussion forum intended to stimulate students of the two classes to brainstorm, criticize and consolidate their preliminary knowledge about the studying problem, define key conceptual notions and technical terms found from search engines and other online references and draft out timeframes and plan their necessary working stages. Yet after forming their concrete ideas, sharing of ideas in the public domain of the online discussion forum was totally suspended for the fear that one’s original ideas would be borrowed by another under keen individualistic examination competition. According to the time schedule, individual students had to hand in their studying proposals (after the first month), first draft (covering the first version of section one after three months), second draft (comprising the revised version of section one and first version of section two after five months) and final draft (containing revised versions of the two sections after six months). Preliminary evaluation through interview and lesson observation showed that most student pairs or groups (containing 2 or 3 members) merely carried out superficial discussion without advancing their web-authoring skills or without strategic working steps to self-govern or monitor others’ studying progress at the start. Belated submissions occupied about 65% of the first drafts, 50% of the second drafts and 40% of the final drafts. Special consultancy meetings were held for those students with delayed submissions to resolve their learning problems and help regulate their working progress. Follow-up interview data and lesson observers (teaching colleagues and university professors) made helpful suggestions to improve the situation.

3.3 Identification of Specific Learning Goals

Through semi-structured interviews, collegial lesson observations and subject tests, the teacher identified qualitative differences in students’ understanding of web authoring software, navigational structure, information-seeking efficiency, web-hosting systems, and their learning

variations on the procedures, methods and important stages of doing project work.

3.4 Openness of Learning Space

For fulfilling the original aims of devising SBA (HKEAA, 2008), the teacher (the action researcher) did not intend to specify the concrete conditions circumstancing the studying problem. At the start, the teacher solely provided varied aspects of web-authoring systems in which the students could experience variations in figuring out their own desirable web authoring design without importing his own ideas into the students' working steps.

3.5 Action Research Team

An action research team, consisting of the action researcher (the teacher), co-researchers and lesson observers (teaching consultants and university professors), was set up to carry out the iterative cycles of planning-acting-observing-reflecting on teaching and learning instructions through lesson observation, reflexive journal writings, surveys and interviews with the involved 78 student subjects and some of their parents (c.f. Somekh, 1995; The State of Florida, 2008). Suitable strategic changes and didactical adjustments were made after the resulting learning variations were being categorized or further conceptualized. Cross-person and cross-data source triangulation was carried out when data in multiple perspectives was interpreted from time to time. Inter-rater reliability was utilized among the action research team members to articulate agreeable data patterns. The main directions of action research was to depict learning and teaching variations in the teacher's perspective, and thereby broaden understanding of students' learning conceptions and deepen the usage of school-based assessment using phenomenographic methods.

4. Results

Qualitative data (semi-structured interviews, reports written by lesson observers and self-reflective action research journal writings) and quantitative data (student structured surveys) methods were used to articulate three substantive stages. University professors and teaching colleagues helped the teacher (the action researcher) adjust teaching guidance and testify new pedagogical means.

4.1 First enculturation stage: student learning spaces were totally determined by the teacher and learning outcomes were expected in a fixed boundary. In detail, students were guided to exercise generic research and web-authoring skills with case study scenarios. Formats of solutions in section one had particular instances for recommendation including search engines, content management system (CMS), online log-in systems, specific web design, multiple language versions and navigation structure. Individual guidance and suggested working steps in general were devised to interpret the study problem in the teacher's own perspective. Subsequently, the majority of students frequently requested 'standardized' formats of the two solutions in section one and concrete working steps on web authoring in section two from the teacher. Such 'mandatory' sphere of learning and teaching under tremendous open examination pressure still dominates the senior secondary curricula in Hong Kong without any free learning spaces in catering for individual learning differences for intra- and inter-student variations over time.

4.2 Second transitional stage: After detecting some unexpected new student interpretations of the problem, new commensurability parameters for comparing the two solutions in section one and innovative technical contextualization of the desirable solution when marking the first

report drafts, the teacher started to re-examine the study problem from student perspectives or tended to step ‘beyond his own standpoints’ to re-interpret the study problem from other angles and realize the ‘narrowness’ of his previous interpretations. In the new learning spaces, some rubric contextual descriptors (despite their broad and abstract in nature) were altered from time to time so as to accommodate a new enacted object of learning. Meantime, follow-up class and group discussions were facilitated by the teacher to help students make conceptual clarifications or consolidations after the emergence of unexpected student interpretations. The teacher no longer actively pinpointed the students’ misconceptions from his own perspective. Instead, he offered some guiding thought-provoking questions or provided some reference books or web links to ask group members or studying pairs to detect any possible errors or correct any possible misconceptions by the students themselves. Interestingly, some students started to learn the study problem from new angles and compare the two desirable solutions in peer or even the teacher’s suggested perspectives. Some even went deeper to make self-improvements by considering innovative interpretations. Most students developed a sense of appreciating others’ alternative interpretations without totally rejecting their own. The teacher increasingly became very careful not to intervene during the critical process of data collection and interpretation. Notably, the teacher built on new learning spaces by *varying* some learning aspects or didactical conditions whilst keeping other *invariant*, depicted in the following table 1. Students experienced new conceptions of learning and conceptual relationships on web authoring tools and web publishing techniques in the teacher’s perspectives.

4.3 Final acculturation stage: rubric contextual descriptors were finalized by the teacher without fixing their boundaries to allow students to create more open learning spaces. And there was no definite form of solutions that the teacher expected or no best solution that he wanted to argue for when assessing the final report drafts. On one hand, those learners with good articulation of research problem and skilful strategic research techniques could develop self-reflective working plans (placed at the beginning of their written reports), workable timeframes, and use illustrative diagrams and figures to visualize newly learned concepts or correlate their interrelationships. Some could find out their own research literature by themselves and even establish strong theoretical frameworks in which two desirable solutions were in juxtaposed comparisons and formulate clear-cut key definitions or concepts, far beyond the scope of Grade 11 level. Some with strong motivation to get higher grades tended to study the rubric assessment descriptors closely to make their working steps or contents in line with those contextual descriptors. On the other hand, those learners without good articulation of research problems or skilful strategic research techniques frequently delayed their submissions and requested the teacher to give standardized formats, or concrete working directions. Concepts or misconceptions were loosely presented without any linkage between the two sections. There was no juxtaposed comparison of the two desirable solutions or commensurable parameters for comparing the solutions. Details for inter-student variations of learning conceptions and learning outcomes are summarized in the following tables 2 and 3 respectively, marked with total numbers in each category for the Arts/Commerce class SA and the Science class SB. As the projects were done beyond school hours, dishonest cases of seeking extra help from elder family members or private tutors would be detected and marks would be deducted if the students could not trace back their own ideas during their oral presentation.

Table 1. Variations and Invariant Parameters During Learning Process

Learning Instructions	Variation	Invariance
Based on one particular info-seeking mechanism, find out suitable features of web publishing	Features for web construction or web publishing	Info-seeking mechanisms
Under a web construction dimension, compare efficiencies of info dissemination and info-seeking mechanisms, evaluate their interrelationships	Efficiency of info dissemination and info-seeking	One particular or a fixed set of web construction or publishing feature(s)
Using a particular desirable solution, figure out feasible means for improving info-seeking mechanism	Means for improving info-seeking mechanism	One particular solution
Based on one particular criterion, compare two feasible solutions	Two feasible solutions	Commensurable criteria (through generalization)
To suit a certain group of web surfers, consider desirable aspects of efficient info-seeking	Efficiency concerns on info-seeking	Certain type of web users
For one particular info-seeking feature, analyze needs of various types of web users	Various types of web users (similarities and differences and underlying reasons)	One fixed set for fulfilling efficient info-seeking
Articulate possible dimensions for comparison of two solutions by considering one by one	Possible commensurable criteria for evaluating web authoring techniques and authoring tools	One chosen solution
Consider possible format of one solution when considering the combination of web authoring tools and web authoring techniques	Variety of web authoring tools and web authoring techniques	Fixing one solution

Table 2. Student Conceptions of Learning in Two Sections

Levels of understanding (total no. students for each class)	Student Conceptions of Learning	Referential Aspects In Section One	Structural Aspects Between Section One & Section Two
0 (SA: N=15; SB: N=11)	No comparisons	Simple formats of solutions without theoretical inputs	No linkage between section one and section two
1 (SA: N=8; SB: N=5)	Mere description of the two solutions without commensurable parameters	Formats of solutions articulated without self-reflection or practicality concern	No linkage between section one and section two
2 (SA: N=12; SB: N=6)	Juxtaposed comparisons under commensurable dimensions	Commensurable items increasingly added to enrich contents of two solutions in section one, and rational choice of the preferable solution in section two	Loosely connecting between section one and section two

3 (SA: N=6; SB: N=15)	Penetrating comparisons	Reflexive articulation of commensurable dimensions and conceptual reformulation of the two solutions and consistent illustration	Linking the two sections tightly , developing ability to differentiate between two sections
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Table 3. Pattern Variations in Student Learning Outcomes

Assessed categories	High grades (SA: N=5; SB: N=10)	Average grades (SA: N=17; SB: N=12)	Low grades (SA: N=19; SB: N=15)
Objectives	Clearly-defined	Partially defined	Poorly defined
Analysis	Complete articulation of studying problems	Incomplete articulation of studying problems	No articulation of studying problems
Design	Innovative design	Standardized or less creative design	Incomplete design
Implementation	Most earlier and final drafts submitted on time	Some time delays but final drafts finished on time	Delayed submission of earlier and final drafts
Testing & evaluation	Some have hypothesis testing or self-evaluate their own interpretations	Incomplete tests or self-evaluation	No testing or evaluation
Conclusion and discussion	Directly answering the problem with significant implications for self-improvement	Indirectly answering the problem without significant implications for self-improvement	No conclusion or overall discussion
Documentation	Full documentation of research literature	Documentation of some literature	No documentation
Creativity	Other related key concepts such as info-push / info-pull theoretical frameworks mentioned	Varying from case to case	No new notions
Process behavior	Timeframes, studying paths and self-reflections for further improvement	Varying from case to case	No timeframe, studying paths and no self improvement

5. Conclusions and Implications

The aforementioned learning theory of variation succeeds to create new learning spaces by specifying the intended and enacted objects of learning during the three substantive stages. The teacher experienced spaces of learning for deepening understanding of inter-student learning variations on advancing information-seeking capabilities of a school web site in multiple perspectives. In the teacher perspectives, the student subjects experienced methodological and contextual variations in approaching the studying problems by building communal sharing areas in which they could appreciate other interpretations, correlate with their own and even make self improvements. The teacher in turn experienced new dimensions of modifying contextual rubric descriptors and devising suitable pedagogical strategies in catering for individual learning differences (e.g. allowing students to reflect upon their pre-graded works and look for further improvement), and assessing the studying problem both in teacher and

student perspectives. On one hand, by complementing past literature on project works, the research findings succeed to articulate new inter-student learning variations in doing school-based assessment in the teacher perspectives. On the other hand, it helps demonstrate new learning spaces experienced by the teacher to fine tune rubric SBA descriptors for enriching research literature on using phenomenographic methods.

6. Limitations

This paper solely aims to articulate feasible new learning spaces in the teacher perspectives without evaluating the learning effectiveness of the phenomenographic approach. Nor is there any in-depth analysis of students' cognitive gains (in inter- and intra-student learning variations over time) throughout the process, due to the limited length of the paper.

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