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知識建構的教學理論

『知識年代』的一個重要特徵是社會的健康發展取決於它的創新能力。這表示社會的大眾，不單是某些專業精英，都須要能夠創造性地運用知識，並把創建新知識變成他們日常生活的一部分 (Scardamalia, in press)。知識建構的理論正正反映二十一世紀知識型社會所著重的能力，強調創新；並且從個別學習轉到群體學習，群策群力，解決問題，創建新知。

知識建構的理論是由加拿大多倫多大學心理學教授 Carl Bereiter 及 Marlene Scardamalia 根據多年在寫作及學習理論的研究的基礎所創建。他們提出知識建構與其他傳統學習活動的三個不同之處。第一點，學生及組內的伙伴需要為提升各成員的知識水平負上很大的責任；要注意的是這裡的重點在於知識建構的過程及共同成果。第二點，對學生而言學懂課程內容並不是教育的終點，反而如何在學習的過程作出貢獻更為重要。第三點，於知識建構活動裡，學生所探討的問題不應只是流於事務實踐的層面，而應是知識處理層面的問題。

建構新知理論所關注的重點是意念的創造與改良，它的過程是群體性的，創造出共同擁有的知識。傳統教育所關注的是個人擁有的知識，建構新知理論卻是建基於群體共同創造知識。

建構知識源自社會建構主義(Social Constructivism)，這種理論可以追溯到心理學家維果茨基(Lev Vygotsky) 的研究，他提出了人是透過社群環境下與事物接觸而產生知識的。因此，知識不是儲存於個人腦袋中的真理，而主要是通過群體對事物的探究、研討得出的認識，這些知識是對參與探究的群體有重要的意義，而且是可以並且必須與時並進。通過建構新知，群體得到的認識比個體各自探究所得的總和會更深入、更廣泛，並且由於得到群體的廣泛參與，建構過程亦促使群體自身文化有所轉變，使新知更能融合於群體的已有知識和文化，發揮知識的實踐潛質。真正的教學並不著重教師灌輸知識，而是著重引導學生自我監控及在群體中學習，擴闊知識領域，促進人際關係。 隨著科技發展，知識建構平台更能發揮小組討論的優勢，將學習從課堂內伸延到課堂外，提升學生共同建構知識的能力。通過知識建構平台的討論，學生提出自己的問題和意見，就別人的意見作補充、澄清別人的質疑，總結大家的知識和看法，使整個團體能夠共同進步。這種學習過程使學生能達到新的學習領域，使知識、技能及價值觀得以提升。

Extracted from

陸慧英 (2003)。 利用網上協作改變教育範式：以建構新知為教育目標與手段。編者: 陳德懷，書目：*邁向數位學習社會*。(161-171 頁) 台北：遠流出版事業股份有限公司

馮婉嫻、區如冰、羅燕琴、陳桂涓編 (2004)。中文科課程新嘗試：高思維能力的教學實踐。香港：麥苗教具有限公司。

Knowledge Building Principles

知識建構原則

Scardamalia (2002) identifies twelve interrelated principles of Knowledge building:
Scardamalia (2002) 區分了十二種相互聯繫的建構新知過程的特徵：

To help you understand these principles, you may consider the extent to which you have experienced these principles in your teaching and learning?

Real ideas and authentic problems Unlike textbook problems, authentic problems in real life are ones that students really care about. In the knowledge building community, students gain understanding by producing real ideas based on authentic problems.	**認識從生活中真實的問題出發** 真正能引起學生關注的是生活中的真實問題，而不單是課本中的問題。在知識建構的群體當中，學生透過處理真實的問題，建立深刻的想法和概念，以達至建構新知。
Improvable ideas All ideas from students are treated as improvable. Students work continuously to improve the quality, coherence, and utility of ideas. The learning culture must make students feel safe and comfortable to take risks in revealing ignorance, voicing half-baked notions, giving and receiving criticism.	**所有的概念與想法皆可改進** 學生的概念和想法皆被視為可改進的。學生需要持續改進他們的想法和概念，以提升這些想法和概念的質素。在這樣的學習過程中，學生要經歷一些挑戰，包括要勇於發表未完善的意見、要面對別人對自己的意見的批判。因此，學習的文化必須讓學生感到安全，能自在地表達自己。
Idea diversity The diversity of ideas raised by students is essential to the development of knowledge advancement. To understand an idea is to understand the ideas that surround it, including those that stand in contrast to it. Idea diversity creates a rich environment for ideas to evolve into new and more refined forms.	**多元化的意念與想法** 學生提出多元化的意念和想法，正是知識進深的必要過程。我們要了解一個概念，就必須了解所有與之相關的概念，當中也包括與之相反的概念。一個充滿多元化的意念和想法的學習環境，能有效促進概念的進化，達至更新和更高的層次。
Rise above Through working with growingly diverse and complex problems, students sustainably improve their ideas and understanding. They eventually achieve new syntheses, more inclusive principles and higher level concepts.	**自覺提昇討論層次，開展更深入的討論方向** 通過愈來愈多元化和複雜的討論，學生持續改進他們的想法及對知識的理解，逐漸能綜合知識，創建出新的理論，學習到更廣泛的原則和更高層次的概念。
Epistemic agency Students themselves actively find their way to knowledge advancement. They fully consider the various ideas given by the learning community and negotiate a fit between each others' ideas. They set their own learning goals	**自覺參與主導知識建構的過程** 學生主動尋找提升知識的方法。他們充分考慮知識建構群體提出的各種意念和觀點，並互相協商，尋求適切的結論。他們自主地訂立學習目標和計劃，主動參與，並作出自我評估。

and plans, be self-motivated and engage in evaluation by themselves.	
Community knowledge, collective responsibility Students' contributions to shared goals of the learning community are prized and rewarded as much as individual achievements. Team members produce ideas of value to others and share responsibility for the overall advancement of knowledge in the community.	共有的知識，集體對認知負責 學生對群體的共同學習目標作出貢獻。個人對群體的貢獻會如個人的學習成就一樣，得到同等的重視和表揚。作為知識建構群體的成員，學生提供對群體的學習有價值的意見，並共同承擔令群體知識進升的責任。
Democratizing knowledge All individuals are invited to contribute to the knowledge advancement in the classroom and take pride in the achievement.	創建新知民主化 所有學生不論成績能力參差都能參與知識提升的過程，並因為參與創建新知而值得驕傲。
Symmetric knowledge advancement Expertise is distributed within and between communities. Symmetry in knowledge advancement results from knowledge exchange and from the fact that to give knowledge is to get knowledge.	知識上的共同增長 一個知識建構群體內的各成員或各個不同的群體都擁有各自的專門知識。當他們將自己的知識分享和交換，就能得著共同的知識增長。
Pervasive Knowledge building Knowledge building is not confined to particular occasions or subjects but pervades mental life—in and out of school.	不受時空限制建構新知 知識建構不受特定的情況或科目所局限。無論在校內或校外，知識的建構滲透在日常生活中。
Constructive uses of authoritative sources To support their learning, learners need to respect and understand authoritative sources to get in touch with the present state and growing-edge of knowledge with a critical attitude.	有建設性而不盲目地利用權威文獻 學生需要以批判性的角度，關注和理解具權威性的文獻，從中接觸一些知識的現狀及它們的最新發展。
Knowledge building discourse Students are engaged in discourse to share, refine and transform knowledge to reach for the goal of knowledge advancement.	以建構新知為目的的討論 學生參與討論不單為了分享交流，他們還要改善和革新他們的想法，達至建構新知的目的。
Embedded and transformative assessment Assessment is part of the effort to advance knowledge— it is embedded in the day-to-day learning process and used to identify problems as the learning proceeds. The community creates and engages in its own internal assessment, which is more fine-tuned and rigorous than external assessment.	評估嵌進知識建構的過程中，以提升和改進群體為目標的 評估是促進知識增長的重要元素。評估應包含在每天的學習過程中，用以識別出學習進行期間出現的問題。學習群體自主地設計和參與內部評估。這樣的評估比外界的評估更加適切和準確。

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Some sections may be missing, some information may be wrong, spelling and grammar may have to be improved etc. Use your judgement !

Contents

Definition

We define **Knowledge-building community model** is a socio-constructivist pedagogic strategy developed by what we can call the "Toronto school". that emphasized instructional design models that focus on a combination of situated learning, writing-to-learn, knowledge building, community, etc. It does have points in common with inquiry-based learning, i.e. the idea that learners should create knowledge through collective and collaborative inquiry. There is also a relation to transformative pedagogy and community of learning concepts.

Bereiter and Scardamalia believe a knowledge-building community should be modeled after scientific research centers, where “problem redefinition at increasingly high levels is the goal, based on a fundamentally social process. Researchers benefit from the advances of others, with continual interplay of findings, not just among scientists working concurrently but from generation to generation.”(1994). Knowledge-building communities support discourses that aim to advance the knowledge of the members collectively, while supporting individual growth with the aim of producing new experts and extending expertise within the community's domain.

A KB community can engage in collecting information, supporting discourse and exchanges, encouraging a social and professional network of learners and experts and making the knowledge acquired collectively available for future use. That even children in elementary school levels can engage in knowledge-building makes the process accessible to all levels of education.

Bereiter and Scardamalia's knowledge-building model for educational contexts suggests a way to organize instruction so that student initiated contributions to the collective knowledge and peer evaluation of knowledge produced is possible. Knowledge forum is their technological response to the needs of building a KB community through "knowledge-building discourse".

Knowledge-building discourse

Knowledge-building discourse has certain characteristics defined by Bereiter and Scardamalia (1994) and outlined here:

- Focused on problems, not topics: knowledge is advanced through discussion and argumentation in the effort to understand concepts and resolve discrepancies.
- Decentralized, open knowledge building, with a focus on collective knowledge: through constructive social interactions with others engaged in similar or related problems.
- More knowledgeable members are engaged in the knowledge-building process, but do not delineate the limits of investigation.
- Less knowledgeable members' participation is valued as it determines the gaps, inadequacies, difficulties in the knowledge being created that can demand a clarification of ideas by the 'experts'.
- Engages a broader knowledge community than that involved in the current local problem, bringing in views from the outside.
- Makes for a "second order environment" (one where the one's adaption to the environment changes the environment itself) where one's contributions can determine what contributions will follow, thus changing the direction of the discourse and the knowledge constructed.

These characteristics are built into the framework of CSILE designed as “an enabling technology for knowledge-building discourse.”

A summarizing excerpt from the poster session "Sustaining knowledge building communities: E-learning and knowledge building environments" at an ikit.org event in 2004

Sustaining knowledge building communities online requires the creation of electronic environments that support both formal and informal learning, and capture significant tasks and activities that are central to the day-to-day work of the participants. These environments must provide supports for real world activities and learning, while providing the potential for something more. That something more is knowledge building, or the production and continual improvement of ideas of value to a community (Scardamalia & Bereiter, 2003). Knowledge building is emergent; an environment that supports it must evolve from the contributions of team members and demonstrate collective knowledge advances.

The instructional design model

The Toronto school advocates a model that differs radically from the current trend of strong scenarisation that we can find in various schools of thought in CSCL or learning design. To state it bluntly, modern learning-design and CSCL is about filling in forms and acquiring existing beliefs and such these approaches are not that different from very traditional instructional systems design.

The model is somewhat related to the inquiry-based learning. The major difference is that advanced teachers not necessarily follow a rigid inquiry circle, but rather opportunistically (in the sense of artificial intelligence planning vocabulary) guide the process. Beginning teachers however, can be encouraged to follow a more structure model. Knowledge building is not unguided ("radical constructivist") discovery learning, since the teacher does play an important role to insure that knowledge-building activities will lead to results.

Research approaches and tools

Recent versions of knowledge forum have built-in data-collection and analysis tools. Most Toronto school research can probably be situated in the design-based research tradition founded by Ann Brown in the early 1990s.

To measure increase in scientific thinking and knowledge gain, Jianwei Zhang et al. (2007:112) present a table of research questions and analysis that we reproduce in *summarized* form:

Dynamics	Specific questions	Analyses	Expected performances
Idea improvement	How do questions and ideas evolve and refine over time ?	Trace the change of student's ideas.	Students shift toward a more scientific view.
Real ideas, authentic problems	How are real-world empirical data used ?	Use of empirical data as evidence on quality of ideas.	Students bring valuable data into the discourse and make sense of them.
Community knowledge	How do individual contributions spread and how are they used ?	Analyze contributions to the work of others and related knowledge gains.	Students interact in a way that supports conceptual advancement.
Constructive use of authoritative sources	What are the patterns of their use ?	Use of expert resources.	Students integrate expert and go beyond given information to generate and improve their ideas.
Overall	Overal measure of knowledge gains	Pre- and post-test comparisons; analyses of student portfolios. Correlations.	Improvement of performance pre- to post-test; Students? portfolio notes reflect high levels of scientificness and epistemic complexity. Indicators of the dynamics correlate with quality of ideas in portfolio notes.

Examples

- This wiki (to some extent only, i.e. DKS believes that he and some of his students learnt something about educational technology by writing and linking concepts)
- Social software websites like built with tools like ELGG (e.g. [1] or [2]) may other partial implementations of this model).
- Most "strong" examples can be found in various knowledge forum websites and that are usually not open to the public.
- KP-LAB (A EC project focusing on creating a learning system aimed at facilitating innovative practices of sharing, creating and working with knowledge in education and workplaces. 2006+).

Technology

- CSILE and Knowledge Forum
- Wikis, in particular sophisticated wikis like Mediawiki on which this one is based
- C3MS and other kinds of portalware

- LMSs (by repurposing the way they are intended to be used !).

Links

- Institute for Knowledge Innovation and Technology (IKIT)
- Knowledge building (Wikipedia)

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