Lesson Study in North America: Progress and Challenges[i]

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Abstract

This chapter addresses the development of lesson study in North America. Four areas of progress are described: the growth of interest in lesson study; the development of tools and resources to support conduct of lesson study; of growth of understanding of lesson study; and the initial "existence proofs" of lesson study's effectiveness in North American sites. There are also, however, many challenges facing lesson study, including the need for rich curriculum, research models, and ideas about expertise, and the need for a broad, cross-site learning community that would enable lesson study practitioners to learn from one another..

Introduction

In a 2001 report, I likened lesson study (*jugyou kenkyuu*) to sushi: two quintessentially Japanese traditions that have gained surprisingly large followings in North America. A program officer at the U.S. National Science Foundation pursued this comparison by asking whether the sushi and lesson study created by Americans were palatable – or even recognizable – to Japanese. With respect to sushi, we know the answer. Some North American inventions, such as the avocado-crab "California roll," are savored by Japanese and have been widely reverse-imported to Japan. But what about lesson study? Are we creating a lesson study analogue of the delectable California roll, or something closer to the peanut-butter sushi my 10-year-old son once concocted with a friend? (Not as horrible as it sounds, but *not* likely to be featured at a Ginza sushi-bar anytime soon.) This chapter describes the areas of progress and challenge in North American lesson study.

Areas of Progress in North American Lesson Study

Four areas of progress in North American lesson study are noteworthy: (1) spread of interest in lesson study; (2) development of English-language tools to support lesson study; (3) deepening understanding of lesson study and (4) initial demonstrations of lesson study's effectiveness in some North American sites.

(1) Spread of Interest in Lesson Study

Although English-language research on lesson study (Lewis & Tsuchida, 1997,1998) was published in the late 1990's, it was the 1999 publication of *The Teaching Gap* (Stigler & Hiebert) that provoked a cascade of interest in lesson study in North America. By 2005, lesson study had spread to at least 125 school districts in 32 U.S. states; an active listserve of more than 900 members exchanged advice, and public research lessons held in various regions of the U.S. regularly attracted hundreds of educators[ii]

Comments of teachers participating in lesson study suggest that it may respond to important gaps in U.S. professional development, by focusing both on content and on student learning, and by building collaborative networks:

> Until lesson study we never discussed the value of the content being taught. We discussed the different ways students learn (multiple intelligences), how the brain works, how to differentiate.... Never had those discussions involved…problem-solving techniques, how to develop a particular concept…what to expect for outcomes. (Lesson Study Communities, 2005)

> Being able to talk together as a whole group is such a big part of lesson study… you're not just going down this narrow little road of your own. (NWREL, 2005)

> The opportunity to focus on two to four students' learning was incredible…You feel like you are in a true research mode. (San Mateo-Foster City Lesson Study Group, 2005)

(2) Tools to Support Lesson Study

A number of North American websites provide information, tools, event information and print and video resources on lesson study. While there is not space to list all of them, the websites listed below provide various types of resources and links to many other websites.

Global Education Resources
www.globaledresources.com
www.lessonstudy.com

These websites provide event information on public lessons (including those at the Japanese schools located in North America) conferences, and lesson study tours supported by Global Education Resources, whose principal partners include Akihiko Takahashi (a veteran Japanese elementary educator now teaching at DePaul University) and Makoto Yoshida (whose dissertation formed *The Teaching Gap's* chapter on lesson study.).

Mills College Lesson Study Group
http://www.lessonresearch.net
Website featuring publications and video clips to be ordered or downloaded and news of lesson study events and funding opportunities related to lesson study.

Research for Better Schools
http://www.rbs.org/lesson_study/readings_and_resources.shtml
Online resources of lesson study readings, organizations, and other websites, including the TIMSS Resource Center and links to TIMSS-related resources.

Teachers College, Lesson Study Research Group
http://www.tc.edu/lessonstudy/

Mathstar, New Mexico
http://mathstar.nmsu.edu/lesson_study/index.html

These four websites provide a range of lesson study resources, including protocols for observation and discussion of research lessons, sample lesson plans, and print resources for practitioners and researchers. In addition, the Mills College site provides video of Japanese and U.S. practitioners engaging in lesson study and order information for video and DVD's of lesson study. The Teachers College website provides data on U.S. lesson study groups and hosts a listserve frequently used by North American practitioners to ask questions and share resources about lesson study. The Research for Better Schools site provides proceedings from lesson study conferences and an order link for *Lesson Study: A Handbook of Teacher-Led Instructional Change*. The Mathstar site provides video of lesson study in action in U.S. sites.

University of Wisconsin

http://www.uwlax.edu/sotl/lsp/index.htm

This website provides information and tools for lesson study by university teaching faculty.

In addition to the protocols and guiding materials for lesson study available at the websites above, there is an English-language *Handbook of Lesson Study* (Lewis, 2002); video available for purchase that shows a whole mathematics lesson study cycle carried out by U.S. teachers (Lewis, 2005); and other video available for viewing that provides an overview of history lesson study carried out by U.S. teachers (downloaded 4/15/05 at www.teachingamericanhistory.us/lesson_study/index.html).

(3) Deepening Understanding of Lesson Study

What is lesson study? How does it result in instructional improvement? Lesson study has a set of visible features, shown in the left column of Figure 1. These features might be thought of as just the visible tip of a much larger landscape of underlying principles and pathways that connect lesson study's visible features to instructional improvement. Research suggests that one common route of failure for innovations is implementation of visible surface features without adequate attention to the innovation's underlying principles or mechanism (Fullan, 2001; Mclaughlin and Mitra 2001). For example, "reform mathematics" may be reduced to visible features (such as use of hands-on materials and real-world examples), while the underlying principle of active mathematical reasoning by students may be lost (Spillane, 2000; Cohen, 1990). In the early days of lesson study in North America, many educators seemed to think of lesson study primarily as a means to improve lessons, as shown in the top pathway (conjecture 1) in Figure 1. For example, I was often asked questions like "When do Japanese practitioners decide a lesson is good enough to be used widely?" and "If Japanese teachers spend so much time on one lesson, how do they ever get to all the lessons in the curriculum?" The view of lesson study labeled as conjecture 1 – that it improves instruction primarily through the improvement of lesson plans –characterized the early lesson study work of some North American sites, perhaps because the most widely available example of lesson study describes progressive refinement of a single lesson

(Stigler & Hiebert, 1999), although this is actually not a particularly common feature of lesson study in Japan.

An example from Bay Area School District (BASD) illustrates the deepening understanding of some North American sites about lesson study. Initially BASD teachers used the phrase "Polishing the Stone" to describe their work, and they originally planned to disseminate "polished" lesson plans on the district intranet as a primary outcome of their lesson study work. However, during their first year of work, BASD teacher-leaders began to redefine their work as teacher-led research on practice, and they began to regard the lesson plans as an inadequate representation of their learning from lesson study. As a result, they chose alternative methods to share their learning, such as open-house research lessons where visitors could participate in the whole process of lesson observation, data collection, and lesson discussion. In other words, their model of the connection between lesson study practice and instructional improvement expanded from a focus on lesson plans to a focus on the skills, habits of mind, and learning community developed through collaborative observation and analysis of lessons (Perry & Lewis, 2004). A number of U.S. publications explore the underlying principles that support lesson study, such as teachers' capacity to view lessons through a "researcher lens" and "curriculum developer lens" (Fernandez, Cannon & Chokshi, 2003) and the function of lesson study in connecting daily practice to long-term goals, building strong collaborative networks among teachers, and promoting deeper content and pedagogical knowledge (Lewis, 2002b).

Although many North American sites may still enter lesson study with an idea about lesson study's connection to instructional improvement like the one shown at the top of Figure 1, it is now common to hear North American lesson study practitioners, at conferences and over listserve, advise that lesson study "is not about creating the perfect lesson." The lower box in the central column of Figure 1 represents my current (though still evolving) thinking about the routes from lesson study to instructional improvement, based in large part on accounts of experienced Japanese lesson study practitioners; it needs further study in U.S. settings.

(4) Early Proofs of Lesson Study's Effectiveness

Lesson study is not a single, uniform practice, any more than teaching is. Lesson study takes diverse forms in Japan, from research lessons planned and viewed only by teachers within a single elementary school to those sponsored by teachers' professional organizations and open to visitors from all over Japan (Lewis & Tsuchida, 1997, 1998; Murata & Takahashi, 2002a,b; and Lewis, Perry, & Murata, 2005). Because of its diverse forms and the diverse capabilities brought to it by different educators, generalizations about lesson study's effectiveness (or ineffectiveness) are inappropriate, just as generalizations about the effectiveness of teaching are inappropriate, unless we specify how it is done. However, several cases reveal that lesson study *can* be used effectively by North American teachers. The lesson study cycle captured in the video "How Many Seats" provides one such "existence proof" of lesson study's impact on teachers' and students' mathematical learning in North America (Lewis, Perry, & Hurd, 2004, 2005). During the lesson study cycle, teachers progressively re-design a lesson so that it better promotes students' grasp of a problem in mathematical pattern growth. Over the cycle, teachers' own understanding of the connection between the numerical and geometric patterns in the problem also deepens, and they become more ambitious in their goals for students, realizing that they want students not simply to fill out the correct pattern on a worksheet, but to grasp the meaning of the pattern and the reason for it. In another North American lesson study case, teachers change their beliefs and knowledge about a standard that requires kindergarteners to add single-digit numbers with sums greater than 10, using concrete objects if needed. Initially teachers are convinced this standard is impossible for kindergarteners, but as they document students' capacity to decompose numbers (for example, to see five as made up of three and two) the teachers begin to see how they can teach addition as a natural outgrowth of decomposition (rather than primarily through paper-and-pencil drills) and they change their view of the standard (Murata, 2005).

Yet another North American researcher has tested a web-based, "lesson-study inspired" intervention that engaged high school science teachers in a systematic process of lesson planning, implementation, examination, and revision both within their own classroom and across classrooms; teachers substantially changed their instruction to incorporate inquiry-based methods as they engaged in this process (Ermeling, 2005).

Examples like these three make clear that North American adaptations of lesson study *can* enable teachers to expand their own understanding of subject matter and to change instruction. Accumulation of such examples should make it possible to discern the conditions and supports for effective lesson study in North America. The existing cases shift the dominant question in North America from "Can lesson study work here?" to "*How* can lesson study work here?"

What has enabled progress of lesson study in North America?

Several factors have probably been instrumental in lesson study's progress in North America. Although lesson study had been described in several English-language publications before 1999 (e.g., Lewis & Tsuchida, 1997, 1998; Shimahara & Sakai, 1995), *The Teaching Gap* achieved large circulation and presented lesson study both in conjunction with TIMSS achievement data showing a substantial gap between U.S. and Japanese mathematics achievement and with the TIMSS video study showing remarkably different lesson approaches in Japan and the U.S. Lesson study itself appeals to many teachers as a professional form of learning (Brown et al., 2002, Germain-McCarthy, 2001; Lewis 2002b; Lewis, Perry & Hurd, 2004) and to policy-makers and administrators as a missing link in school reform (Council for Basic Education, 2000; Kelly, 2002; Lewis, 2002b, National Research Council, 2002; Research for Better Schools, 2004; Wilms, 2003). Japanese educators have also contributed actively and extensively to the development of lesson study in North America. These contributions have been of several different kinds.

1. **Japanese schools on North American soil have served as sites for public research lessons.** The Japanese Schools of New York (Greenwich) and Chicago, regular full-time schools that follow the Japanese curriculum and serve Japanese nationals overseas, have hosted public research lesson days in which the site's own research lessons are opened up to outside educators with simultaneous translation. Hundreds of U.S. educators have had the opportunity to experience research lessons taught by experienced Japanese lesson study practitioners at these schools, through the auspices of Global Education Resources.

2. **U.S.- based Japanese educators have served as mathematics lesson study instructors, commentators, and consultants**. A small number of very active Japanese mathematics educators based in the U.S. have taught public lessons, commented on research lessons, collaborated in lesson study, and actively shared their knowledge of Japanese approaches to mathematics teaching with U.S. lesson study practitioners.[1][iii]
3. **Visiting Japanese educators have served as mathematics lesson study instructors, commentators, and consultants.** Japanese educators have also visited the U.S. for short stays with the specific goal of participation in U.S. lesson study, serving as instructors, commentators, or collaborators in U.S. lesson study efforts.[2] [iv]
4. **Video and print materials have captured Japanese approaches to mathematics lesson study in Japan and in U.S. classrooms**. Videos include, for example, experienced Japanese educator Akihiko Takahashi teaching a mathematics research lesson ("To Open a Cube"), or a series of lessons ("Can You Find the Area?"), to U.S. students and engaging in lesson study with U.S. teachers; lesson study cycles in mathematics and science in Japanese elementary schools (Can You Lift 100 Kilograms?; and Lesson Study: An Introduction); and translations of the Japanese elementary mathematics Course of Study and Japanese elementary mathematics textbooks

[1] For example, Akihiko Takahashi of DePaul University is a 20-year veteran of Japanese elementary teaching and leader of mathematics lesson study in Japan, who has served as advisor, instructor, commentator, or organizer of more than 100 research lessons in the U.S. and Canada. Makoto Yoshida, whose dissertation provided the basis for *The Teaching Gap's* chapter on lesson study works closely with Takahashi as principles in Global Education Resources. Tad Watanabe, professor of mathematics at Pennsylvania State University, is also an active advisor to U.S. lesson study groups.

[2] For example, more than a dozen well-known Japan-based mathematics educators (both school-based and university-based) have participated in lesson study in BASD for periods ranging from several days to more than a week, and have provided formative feedback on both the lessons and the lesson study effort.

(Global Education Resources, 2002, 2005; Hitsotsumatsu, Okada, & Machida, 2005; Mills College Lesson Study Group, 2000, 2003a,b, 2005).

This support from Japanese educators for the emergence of lesson study in North America, and the video and print materials produced by it, may be of interest to educators in other regions of the world seeking to build lesson study.

Challenges to Lesson Study in North America

Rich Curriculum

Lesson study typically begins with *kyouzai kenkyuu* (study of curriculum materials) focusing on such questions as what are the key points in the mathematics under study, and how various textbooks treat these. While there are many excellent research-based mathematics curricula in the U.S., what is easily available to many U.S. teachers are standard textbooks, based on a dramatically different set of principles than the textbooks available to Japanese teachers. Compare, for example, the ideas about proportional reasoning that can be learned from Figure 2, a traditional U.S. textbook treatment in which students are taught to cross-multiply, vs. Figure 3, an approach from Asian textbooks (Lo, Watanabe & Cai, 2004). What can be learned about the underlying mathematics and about likely student thinking from each of these curricular examples?

The California teachers featured in the video "How Many Seats" (Mills College, 2005) initially based their lesson on a textbook example in which a 2-column chart was used to help students find patterns in the number of perimeter units corresponding to any given number of equilateral triangles arranged contiguously in a row (see Figure 4). Only by noticing the gap between students' correctly filled out worksheets and their inability to describe the patterns in words did teachers see that the chart had "spoonfed" the pattern to students. The textbook provided a pedagogical model that spoonfed not just students but teachers as well, for it provided little opportunity to learn about the interesting connections between the numerical and geometric patterns in the problem. For example, only through careful study of student learning methods did teachers notice these patterns. As one teacher notes:

> I noticed kids counting the seats different ways, and this was a kind of a big aha for me . . . When I've done the problem myself I've always counted [shows counting

around the edge] and it didn't occur to me that there was another way of counting it . . . But [student name] had laid out 20 triangles . . . and she was counting [demonstrates counting top and bottom alternately, followed by the ends] and then it looked totally different to me; I could see there's 10 triangles on top, 10 on bottom, and a seat on either end. Now I was seeing the pattern a different way. … That's why I thought it might be helpful to have kids talking about how they're counting it. How are you seeing the seats, and the numbers, and the increases, and where does that come from?

While Japanese teachers use textbooks and teachers' manuals with coherent, rich explorations of mathematical and scientific content, US teachers must often make do with procedural materials like those in Figure 2. It would hardly be surprising if materials like those in Figure 2 lead to procedural discussions. Ironically, U.S. *teachers* (not the curriculum) often get blamed for conversations that stick at the level of procedure.

Rich Ideas about Lesson Study Expertise

Jackie Hurd, one of the pioneers of lesson study in the U.S., commented that during her first years of teaching she thought that once she learned a particular things she would "arrive" at being a good teacher; several years into teaching, however, she realized that what she needed to know was changing and unpredictable, and that what she really needed was a "system like lesson study that would enable me to keep learning" (Hurd, 2005). Like teaching itself, lesson study is not a fixed set of things that is mastered in a short time, making one an expert forever. It is a set of dispositions, skills, and knowledge that are challenged (and can be developed or undermined) each time a new situation is encountered (Akita, 2004). Just as we wouldn't expect someone with a few years of teaching experience to be an expert teacher, we shouldn't assume someone with a few years of lesson study experience as an expert lesson study practitioner. Looking at Japanese lesson study practitioners who have several decades of experience reveals many kinds of knowledge, skill, and disposition that are developed over time, such as:

- *Knowledge of curriculum:* How different textbook series treat various topics, the particular tasks and problems that reveal and promote student learning of

a particular concept, the trade-offs of presenting the subject matter in different ways, etc.

- *Knowledge of student thinking:* The student learning trajectories for particular topics, the data collection strategies likely to reveal student thinking, the common misconceptions, etc.
- *Knowledge of lesson study:* Acquaintance with various lesson debriefing strategies that may be particularly appropriate depending on the weaknesses and strengths of a particular lesson study group; familiarity with the protocols and practices likely to support efficient lesson study (e.g., notetaking, facilitation, meeting agendas, lesson plan formats, etc.).
- *Collaborative skills and dispositions:* Willingness and capacity to work with a wide range of colleagues, valuing both their learning and one's own, skill to help shy, domineering, or hostile members of lesson study groups become committed, productive contributors, strategies for building motivation to keep learning.

Knowledge, skills, and dispositions like these are unlikely to develop in the course of one or two lesson study cycles. Yet, because of the newness of lesson study in North America, we may consider people lesson study experts if they have engaged in a few cycles of lesson study. Teachers who have engaged in even one cycle of lesson study can be important mentors for those new to the practice, but if these "experts" stop seeing themselves as learners, premature expertise may pose a danger to lesson study's development in North America. North American practitioners need to remain aware that expertise develops over decades, not months.

A correlated danger is the idea that North Americans already know enough about lesson study in Japan. The entire North American lesson study effort is based on just two examples of Japanese lesson study cycles available in English (the doctoral dissertation of Makoto Yoshida, summarized in *The Teaching Gap* and now available in book form, Fernandez and Yoshida, 2005), and the science lesson shown in the videotape "Can You Lift 100 Kilograms?" (and summarized in Lewis, 2002b). Since lesson study has evolved in thousands of sites across Japan in many varied forms which may be relevant to the diverse circumstances faced by North American educators (Lewis, Perry, and Murata, in

press), it would be unfortunate if the two cases available in English are considered a sufficiently broad foundation for our entire North American lesson study future.

Rich Ideas about Research on Teachers' Learning

U.S. educational history is a graveyard of once-promising innovations that have been discarded without being understood or implemented deeply, often because an innovation's surface features are implemented without adequate attention to the underlying principles or mechanism (Fullan, 2001; Mclaughlin and Mitra 2001). For example, "reform mathematics" may be reduced to visible features (such as use of hands-on materials and real-world examples), while the underlying principle of active mathematical reasoning by students may be lost (Spillane, 2000; Cohen, 1990).

Lesson study is a *system* of teacher learning – an amalgamation of practices, habits of mind, knowledge, interpersonal relations, structures, and tools which support teachers to collaboratively study and improve practice. But our research models are typically designed to evaluate well-specified, delimited interventions. From a researcher's perspective, the ideal intervention is something like an aspirin, which is easily characterized and transported, changed little by local entities, and acts in quite a predictable way across many circumstances. Researchers have also learned to cope with interventions that are recipe-like: general sets of procedures that are implemented somewhat differently depending on local conditions. However, lesson study is more complicated than even the "recipe" model captures. One can imagine going through the steps in the left column of Figure 1 without building any instructional improvement. For example, teachers may be too polite to say what they think about research lessons conducted by colleagues, resulting in little learning; they may study curriculum that do not support their own learning or that of students. Lesson study cannot be defined simply by the set of surface features shown in the left column of Figure 1. Rather, it is the practice of those features in such a way that they result in the kinds of changes shown in the central column of Figure 1.

Rather than "aspirin" or "recipe," lesson study might better be regarded as a flexible system for learning from practice that requires particular supporting materials and knowledge, conditions, habits of mind, and institutional structures to flourish. This

flexible learning system interconnects intimately with many local structures, both adapting itself to them and is also transforming them. So, for example, a site that has a mathematics curriculum designed to promote deep understanding of mathematics on the part of students and teachers, a history of effective collaboration among teachers, a culture of observation of classroom practice in one another's classrooms, and a sense of mutual responsibility for students starts lesson study in a very different place than a site that has none of those things. While simple print and video tools showing the steps of lesson study might be sufficient to support lesson study in the first case, it likely would not be in the second. This doesn't mean that lesson study *couldn't* work at the second site, but that it would need a different set of experiences to build the capacity that already existed at site 1. And this may be more difficult than it sounds, because the collaborative habits, structures and culture at site 1 might not even be consciously "known" in such a way that they could be described and exported to other sites (Rogoff, 1995; Wenger, 1998).

Capacity to Learn Across Sites

A fourth challenge to lesson study in North America is the creation of opportunities to work across sites to build and refine lesson study. Japan concentrates a large population (about two-fifths that of the US) into a geographically small area (roughly the same size as California), providing many relatively close opportunities for teachers to travel to lesson study events outside of their school, district, and region (Lewis & Tsuchida, 1998; Lewis, Perry, & Murata, 2005). In this way, effective features of lesson study – such as new strategies for collecting and sharing data and for organizing the post-lesson discussion – can spread. Lesson commentators who may visit 50 or more lessons a year are a particularly strong conduit for the spread of lesson study strategies in Japan (Lewis, Perry, and Murata, 2005; Watanabe 2002). The 73 national university-affiliated elementary schools and the professional subject matter associations (for example, the Japanese National Science Teaching Association) both provide opportunities for individuals from many regions of Japan to experience various models of lesson study. In North America, however, there have as yet been relatively few opportunities for lesson study practitioners to experience one another's cultures of lesson

study. Where they do, there may be little push compare the models and forge a better model (as there would be, for example, if the various groups were responsible for jointly planning a lesson study event).

Commercial interests may also hamper learning across sites. In North America, both for-profit companies and non-profit organizations own particular tools for lesson study and have a proprietary interest in keeping them for paid users (rather than allowing widespread use) and in earning from them as much revenue as they can, even if this is beyond the amount that would-be lesson study practitioners can afford. When research reports technology-based lesson study conducted using commercial systems not available to the public (or available only at a steep buy-in cost), the research may contribute little to advancing the understanding and practice of lesson study beyond the sites that are able to buy into that commercial technology.

Collaboration Around Long-term Goals

Lesson study typically begins by asking what are the qualities we want students to have a 5-10 years down the road (Lewis, 2002b). It is precisely this focus on the long-term and the whole child, as well as on the particular content students learn, that makes lesson study appealing to many North American educators. As one said,

> A lot of [American] schools develop mission statements, but we don't do anything with them. The mission statements get put in a drawer and then teachers become cynical because the mission statements don't go anywhere. Lesson study gives guts to a mission statement, makes it real, and brings it to life.[v]

But the pressures on educators to focus on the immediate bottom line – test scores – is overwhelming in many settings. Lesson study is most likely to flourish with support from both teachers and administrators. However, in reality, there are sites where classroom teachers' lesson study efforts have garnered little support from administrators (Perry & Lewis, 2005) and other sites where administrators have attempted to initiate lesson study but been unable to build broad interest among practitioners (Sisk-Hilton, 2005). For lesson study to improve instruction over time, the smooth cooperation of the two groups is needed, since both groups control important resources. Practitioners' motivation to improve instruction is central to lesson study. But administrators generally

control other key resources, including time, funds, substitutes, and policies that can make or break lesson study.

Concluding Remarks

In just over five years since the North American publication of The Teaching Gap, there has been a remarkable growth of interest in lesson study, tools and resources to conduct in, initial "existence proofs" of its effectiveness, and understanding that it is a system of learning that goes well beyond the design and revision of a lesson plan. There are also, however, many challenges facing lesson study, including the need for rich curriculum, research models, and ideas about expertise, and the need for a broad learning community that would enable lesson study practitioners to learn from one another. To return to the sushi metaphor at the outset of this article, North Americans have not yet produced an export that will achieve the universal thumbs-up of the California roll. But some delicious-looking slices of avocado and crab are now arranged on the counter.

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