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# Mixing Analog and Digital: Personal Knowledge Databases

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## □ 要 旨

欧米の大学において日本歴史・文化に関する授業がカリキュラムに組み込まれている場合、学生は初めて接する異文化のコンテンツを理解したり覚えたり、身につけたりするのに苦労している。また、ある授業で学修した内容をいかにして他の授業に繋げるかも課題となっている。そこで、本研究では教育現場におけるアクティブラーニングの一環として、従来の学習ツール（アナログ）と新技術（デジタル）を組み合わせ、効果的に授業を形成する方法について提案する。本論文では、個人用の「ナレッジ管理システム形成」について論じ、後続の第2部では「データベース構造」、第3部では「データベース活用」をテーマにする。第1部である本稿では、ドイツの社会学者ニクラス・ルーマン氏の情報管理セオリー（“スリップカード”）に基づき、日本史料を題材として、「メモ管理システム」を「ナレッジ管理システム」に進化させる方法を紹介する。具体的には、手書きのメモを最適なハードウェアとソフトウェアを利用して、デジタルでキャプチャーし、人工知能（AI）や先進の光学式文字認識（OCR）などを利用して、アナログ（手書き）とデジタルを統合したナレッジデータベース構築の可能性を探っていく。

## □ キーワード

教育    アナログ    デジタル    光学式文字認識    個人情報管理ソフト

**Abstract.** This is the first of three articles in a series that tackles the problem of combining emerging technologies with traditional learning tools in the classroom. This article advocates creating handwritten notes, capturing them digitally, and taking advantage of commercially available hardware and software containing features such as Artificial Intelligence (AI) and advanced Optical Character Recognition (OCR) in

order to create personal knowledge databases that integrate the analog (handwritten) and digital content. It also suggests adopting organizing principles based on German sociologist Niklas Luhmann's work with his *zettelnkasten* ("slip-card") system, but in an active learning environment, where it is possible for students to more rapidly develop their databases' potential.

**Keywords:** pedagogy, analog, digital, OCR, PIM

Japan's oldest extant historical narrative, the *Kojiki* 古事記, supposedly originated in a prodigious feat of memory sometime around the seventh century. A talented young courtier named Hieda no Are 稗田阿礼 was once tasked by the emperor with memorizing correct versions of the imperial genealogies ("the framework of the state, the great foundation of the imperial influence") and stories about the past (historical memory for the community) to pass on to future generations.<sup>1)</sup> When Ōno Yasumaro 太安万侶 (?-723) later put brush to paper in the following century to actually begin turning the spoken words into written text, an explanatory section at the beginning of the narrative, commonly (and somewhat misleadingly) referred to as the "preface," stated that he was transcribing an oral history from the precious data stored for many years in the courtier's mind.<sup>2)</sup>

At that time [the reign of Emperor Tenmu] there was a court attendant whose surname was PIYEDA [Hiyeda] and his given name ARE. He was twenty-eight years old. He possessed such great native intelligence that he could repeat orally whatever met his eye, and whatever struck his ears was indelibly impressed in his heart. Then an imperial command was given to ARE to learn the *Sumera-mikōtō nō pi-tugi* [documents recording genealogical data for the Imperial House] and the *Saki-nō-yō nō puru-gōtō* [ancient myths, legends, and songs]... an imperial command [during the reign of Empress Genmei] was given to

me, YASUMARŌ [Ōno Yasumaro], to record and present the *Kuji* [ancient myths, legends, and songs] learned by imperial command by PIYEDA NŌ ARE [Hieda no Are].<sup>3)</sup>

Alas, the vast majority of us (students and teachers) have neither the mnemonical prowess that Hieda was said to have possessed nor an amanuensis on hand to record our thoughts. Even in Hieda's time, his ability appears to have been understood as a relatively uncommon gift, rather than a skill to be cultivated, and so the emperor could only rely on this lone, exceptional, and mysterious figure to correctly recall what others had purportedly misremembered over the years. Despite managing to convert an oral transmission, and amazing memory, into written form, the *Kojiki* was not widely read during much of the premodern period. Studies of the *Kojiki* experienced a kind of revival about one thousand years after Yasumaro, when the early-modern nativist (*kokugaku* 国学) scholar Motoori Norinaga 本居宣長 (1730–1801), working from his study in Matsusaka, devoted decades of his life to a philological project that would transcend what he saw as the corrupting influence of the Chinese characters used in the transcription process: one of his goals was to recover the original Japanese sound and meaning of the words that Hieda had spoken. Even though he was separated from it by many centuries, Motoori devoted his attention to the *Kojiki*, because he agreed with Emperor Tenmu's estimation of its importance, seeing it as one of the foundational components of the nation's identity—thus keeping alive Hieda's mnemonic accomplishment.<sup>4)</sup> In short, remembering, recording, and interpreting our thoughts can be a powerful creative act.

## *Slow Learning and Personal Knowledge Databases*

Alas, the vast majority of us (students and teachers) also lack Norinaga's perspicacity in trying to recover memories. In the twenty-first century, though, we may soon reach a historical inflection point, where we can rely on technological tools to not only provide us with a virtual semblance of Hieda's gift in our new "electronic brains" (silicon-based) but also enable us to "quantify" the self, automatically collecting and analyzing a mind-boggling quantity of data that we previously could not access, much less put to use.<sup>5)</sup> Until we reach that landmark, we still have to make do with our "meat" (carbon-based) brains, taking better advantage of the tools we have at our disposal; specifically, slowing down the pace of reading together with a more deliberate creation of content through hand-writing (as opposed to the relatively passive acts of copying and pasting or highlighting) and an update to our methods of capturing the content we create, with the aim of discovering new insights and improving the quality of our thinking.

This essay focuses on personal knowledge databases—for the collection, analysis, querying, and organization of data for individual use—as a space in the classroom for mixing two types of media: analog (no batteries required) and digital (batteries required). In particular, its goal is to suggest a simple method for creating, capturing, and organizing content involving a minimal amount of cost or effort. First, it briefly addresses some theoretical considerations, providing an overview of research addressing select analog techniques for the recording and processing of course content. Then, it outlines a use case for designing a basic database that will grow over time to become a kind of research assistant, or secondary brain for students. This study is not a quantitative analysis of the efficacy of the methods examined, but rather a proof-of-concept for revolutionary workflows with a practical potential for further exploration in classroom environments over the coming years.

The ideal classroom for incorporating personal knowledge databases could be in any country with readily available Internet access, but as the opening paragraph suggests, the examples will be drawn from the author's experience teaching note-taking skills for topics related to premodern Japan. The specific content is actually irrelevant, though, because the general concepts expressed in the workflow should apply to any university course, regardless of the particular discipline (arts, humanities, sciences, and so forth). Likewise, the tools discussed are readily available. Some of the analog ones include writing utensils (pencils, pens, chalk, and whiteboard markers) and writing surfaces (paper, flashcards, notecards, chalkboards, and whiteboards) with which everyone is probably already quite familiar. The digital ones, on the other hand, include less familiar writing utensils (styli and keyboards), writing "surfaces" (smartphones, tablets, and computer screens), audio devices (microphones, headphones, and speakers), and the software needed to make it all work. While the digital ones may be more difficult, and sometimes prohibitively expensive to obtain, the use cases here are designed to be appropriate for anyone with access to even the most basic smartphone.

### *A Case for Note-Taking*

A fair question to ask as educators with specialties in our respective fields is: why should we take valuable time away from the course content to teach what essentially amounts to note-taking skills? It is still relatively early days for technology in the classroom, and it would be premature to abandon all of the tools that have been refined over many centuries. When considering how to navigate the digital age, if one of our learning outcomes is to have students retain information for more than a few hours or days, then there is research to suggest that we need to examine how our students take and organize notes—it is important to consider not only the efficient acquisition and manipulation of

information but also the physical actions that produce content.<sup>6)</sup> One working assumption in this essay is that taking notes on a computer, especially without giving considerable thought to how the content will be organized and used, leads to a missed learning opportunity for educators and students alike.<sup>7)</sup> A second assumption is that mastery of content, especially if acquired through handwriting notes, can slow down reading and encourage students to pay closer attention to the text, potentially leading to deeper insights into the material.

Although thumbs and keyboards handle a lot of our note-taking these days, students may actually fare better with analog pen / pencil and paper. The process of note-taking, especially by hand, has been shown to require a surprising amount of cognitive effort, though the resulting benefits of pen and paper may have less to do with the medium itself than the fact that students can avoid the distractions of multi-tasking that come bundled with laptops and mobile devices.<sup>8)</sup> Taking notes while reading may also disrupt habits such as skimming and skipping, which are useful reading techniques for certain purposes, but when dealing with premodern primary sources in the classrooms, students need to practice slow-reading by focusing attention on texts at the word, phrase, sentence, and paragraph level if they want to grasp the unfamiliar content. Of course, some students, especially ones with special learning needs, might well benefit from the use of computers or other digital aids for input.<sup>9)</sup> In general, though, the research tends to favor taking notes by hand.

Just because content is produced by hand, it does not necessarily follow that it needs to be organized that way as well. In fact, recent technological advances that allow or even encourage mixing analog and digital invite us to explore new possibilities for learning in the classroom without giving up analog pen / pencil and paper.

## *Choosing Software and Hardware*

When attempting to mix media, the Personal Information Management (PIM) software needed to make databases work can become an especially vexing problem. If we only avail ourselves of digital technologies using plain text (no images, videos, or other file types), we can make our work relatively future-proof (unlikely to be impacted by technological changes), and there are plenty of PIM applications available for little or no cost. However, by definition such a system does not allow for analog elements, and by failing to incorporate more traditional technologies into workflows, students lose the potential benefits of analog. Thus, the first recommendation for the classroom is to choose robust PIMs that can accommodate multiple media types.

Working with different operating systems does not make the software problem any easier to solve. Theoretically, in an exclusively Apple educational environment, both Windows and Apple software products could be used (using Boot Camp, for example), and a rich variety of PIM options could then be considered. An individual researcher can dictate the terms, cobble together complicated workflows involving multiple software applications, and generally enjoy experimenting with every PIM startup. However, practically speaking, mixed environments with Android, Apple, Linux, and Windows are the most common in the real world. It is also unlikely that all of the students in a classroom will have the funds for, or interest in, fiddling around with complicated solutions. Based on this, the second recommendation for incorporating personal knowledge databases into the classroom is to choose a single, inexpensive piece of cross-platform compatible software.

Given the two parameters above, web-based applications might seem to be the most promising solution, because any smartphone can access the Internet, regardless of the operating system. However, it is generally not possible to guarantee a constant, stable Internet connection for every device, and so the



possibility increases for data loss resulting from dropped connections. Or, in particularly bad situations, there are students who are simply unable to access their databases at all when needed. In a classroom environment, a problem like this on even a single device could bring the entire mixed media endeavor to a halt, as students attempt in vain to participate, and the teacher takes on the role of an information technology professional trying to troubleshoot for each student. The third recommendation is that the software be able to operate independent of the Internet, and that means having a local PIM client downloaded onto a device (as opposed to accessing a service through a browser). At the time of this writing, very few software options fulfill all three conditions. The workflows introduced in this essay use the Evernote application, which performs well with almost any system, even on mobile applications, which are often not given feature parity with their desktop brethren.<sup>10)</sup>

### ***Capturing and “Organizing” Content in the Personal Knowledge Database***

Once you have the PIM software, it is time to begin building a database, and for that, this essay suggests an organizational model that was first developed in the 1950s for an analog world. In his *zettelkasten* (“slip-card” or “card index”) system, the German sociologist Niklas Luhmann (1927–1998) took notes on A-6 size papers; gave them unique identification numbers; filed them into drawers according to certain categories; kept an index that enabled him to find them again; and connected the notes by either filing them as sub-notes of the original one or “linking” them by recording the numbers of related cards.<sup>11)</sup> It functioned similarly to Yahoo!, which in its early days aggregated sites, organized them according to categories, and used hyperlinks to connect them. It should be noted, though, that Luhmann’s system was created long before the

Internet, even while including some of its distinguishing features. This prescience on his part would have been impressive enough, but Luhmann also discovered something unexpected lurking in his zettelkasten.

As a result of working for a long time with this technique, a kind of second memory arises, another ego with which you can communicate on an ongoing basis. It is similar to one's own memory, with no fully developed order, no hierarchy, and certainly no linear book-like structure. Through this alone, it gains a life independent of its author.<sup>12)</sup>

This is a pretty bold claim. According to Luhmann, his drawers of paper slips became more than simply an aid to memory, but an interlocutor of sorts that he could query and from which he could receive answers that he could not predict, even though he was the author of the cards themselves. Certainly, one could attempt to imitate Luhmann's analog methods to create a kind of research partner, and perhaps similar results could be enjoyed, but in the interest of full disclosure, the author has not yet been able to create something so impressive. From a pedagogical standpoint, what is exciting about shifting from analog to a digital database today, something unimaginable in Luhmann's time, is that PIMs allow work to be shared and developed together with classmates. With the help of artificial intelligence (AI), the second brain that took Luhmann years to develop can be up and running in a matter of hours or days, but it can also contain other voices that help to deepen our understanding of classroom materials. As a result of the sharing, there is constant communication about course content among students that can be very satisfying to see as an educator, and unlike conventional software solutions for coursework, the content stays with all of the students after the class ends.

Undoubtedly, the quality of the content put into the personal knowledge database helps determine the utility of the independent research partner that is

created, and it is unrealistic to expect everyone (or, indeed, anyone) in a classroom to create an artificial life form. Falling short of the ideal, however, still gets students pretty far. One element of Luhmann's system that will eventually produce some of the desired results is time. First, there is the amount devoted to building and maintaining the database, something that Luhmann, who produced some 50 books during his lifetime, said "takes more time than writing the books."<sup>13</sup> The hours students spend making queries and connecting data together are also hours spent reviewing, rethinking, and perhaps developing new ideas for the database. In addition, there is a long-term commitment to the database, and the PIM software helps by stepping in to speed up the process by which notes from one class resurface again in other ones. Instead of being left with only a vague recollection of some stories about ancient Japan, or having to rummage through cardboard boxes for old notes, the software makes connections for the student (often ones they would not normally have made themselves), pulls up notes related to whatever query is being made, and refreshes the student's memory. In other words, software can now do the legwork by making the connections that Luhmann needed a lifetime and tens of thousands of notes to accomplish.

### *One Suggestion for a Workflow Mixing Analog and Digital Tools*

As the explanation above suggests, this Luhmann-inspired organizational method is not about helping students to memorize content (something covered in later installments in this series of articles), achieving perfect memory, or "quantifying" the self. It is about ruminating—regurgitating, reconsidering, and continuing to receive mental stimulus from a note over a lifetime. We are after new insights and deeper, more profound understanding in the classroom. For a personal knowledge base to work towards this goal, you cannot skip this rumination step by simply copying and pasting Wikipedia articles into it,

because then the personal database becomes a personal data dump of information, with things of value surely buried somewhere in it, but almost impossible to find. By slowing down and writing by hand (fostering engagement with the text, as discussed in the first section of this article), students are forced to curate the data as it comes in, which also “teaches” the database (through selection of data the student thinks is important) to make distinctions and prioritize the content.

With this slow-learning approach in mind, when doing a reading assignment, there are two simple ways of getting the handwritten “analog” content into the “digital” database. If using a tablet and stylus, it is possible to write notes on the tablet, where “optical character recognition” (OCR) can be automatically applied, so that content put into the database is searchable with a high degree of accuracy.<sup>14)</sup> Alternatively, students can take notes with pen / pencil and paper, and then photograph, or “scan,” the pages.<sup>15)</sup> At least one service available at the time of this writing (Evernote) will automatically recognize two languages at once when performing OCR, making it very useful for students who are able to work in both Japanese and English.<sup>16)</sup> Either method of inputting the notes is seamless, taking no time at all for the tablet, and only a few seconds for the scanning (photographing) method.

At this point, the student has created a file of some kind in their database, usually with the note appearing as an image or a PDF. There are certain benefits that can be realized by converting the analog into digital text in this manner. First, the note is available to the student on their mobile device 24/7, so that they no longer have to worry about bringing that day’s notebooks to school, misplacing the notes somewhere, suffering from natural disasters (a real concern for analog researchers whose lifetime of work can disappear in a fire or flood), or being at the mercy of dogs (who have acquired a reputation for eating homework). Second, it is searchable, meaning the information can be recognized by search tools, sometimes appearing unexpectedly in answer to a

query, which is precisely the effect Luhmann was aiming for with his database. Third, AI can identify related text or patterns and suggest connections to other data existing within a database, or even to data indexed by Internet search engines, thereby far exceeding the suggestions Luhmann could have hoped to receive from his paper-slip partner. Fourth, students can share their data with the instructor or classmates, encouraging a wiki-like effect that pools the resources of everyone in the class to help create new knowledge.<sup>17)</sup> Fifth, the note can be freely reorganized and connected to other notes through the use of tags or hyperlinks, meaning that the note does not need to be physically moved from one place to another, but can exist in multiple relationships to other notes at the same time. Finally, after inputting the note into a database, the original note (if it is in paper form) can be used in a conventional manner without making a permanent commitment to a system the students may be uncomfortable with or unwilling to adopt.

How does all of this look in practice? For the sake of argument, let us say that the instructor gave the next week's discussion leader an assignment to read some primary sources in translation, and in the next class meeting, to share their notes on it with everyone. One of the sources, for our purposes, is the selection from the *Kojiki* that appeared at the beginning of this essay. The process of transforming an analog note into part of a digital database involves just two steps. First, use an application to "scan" it into an iPhone—the borders of the image are automatically recognized and the image is displayed on the screen. Second, tap a button to save it into a PIM on the iPhone—the note then automatically syncs to the cloud, and within a few seconds it is OCR'd. In this case, the entire conversion process described here was completed in about the same amount of time it took to read this explanation.

A partial screenshot of the note in Figure 1 shows what it looks like when it is digitized in a PIM application.<sup>18)</sup> A search of the note for the words "and" and "indelibly" reveals that they have been correctly identified by the application.

The OCR is rarely perfectly accurate, but, despite the author's atrocious handwriting, many of the words were still recognized correctly, in whole or in part. In PIMs with the capability to OCR, and a robust search grammar, it is unnecessary to title the note or file it away, because everything is searchable, and it can easily be located along with relevant, related notes. This is where the students can avoid some of the time-consuming effort that Luhmann put into his zettelkasten, yet still reap some of the benefits by taking notes and storing them within a comprehensive system.

The handwritten note in Figure 1 actually began as an unremarkable part of

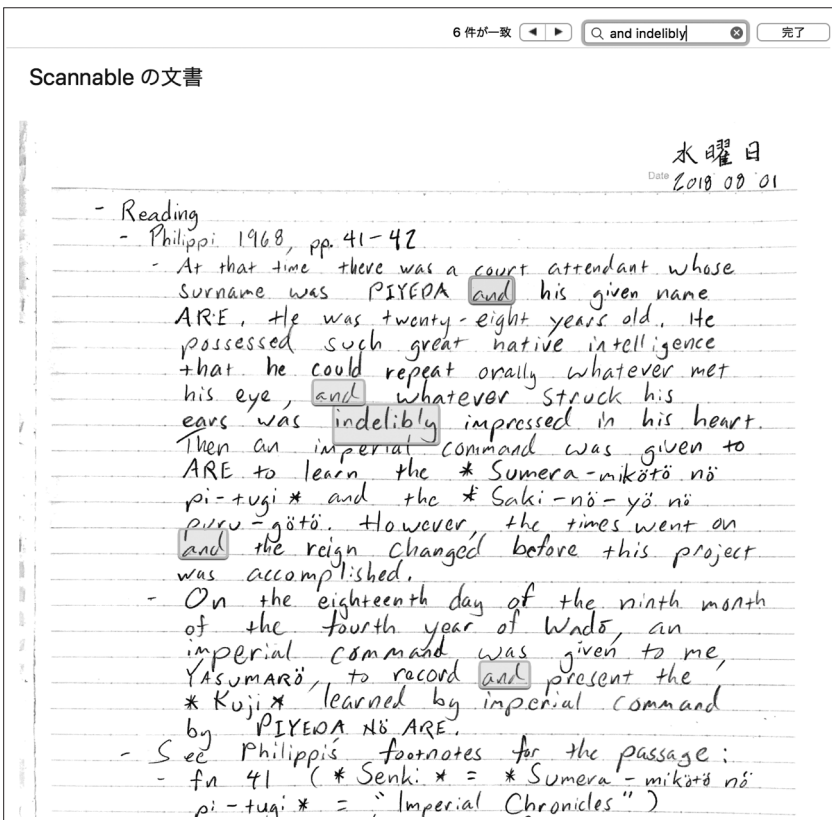


FIGURE 1 Initial Version of Note in Personal Knowledge Database (partial)

a daily journal that loosely follows some of the conventions in the “bullet journal” system developed by Ryder Carroll.<sup>19)</sup> In this case, the journal for that day, which had several pages (including the notes taken on the *Kojiki* passage), had first been scanned into the PIM as a separate note. In everyday practice, it is only when something in the journal needs to be expanded upon at some length that a quick screenshot of the relevant section(s) is taken, and a new note is made from that.<sup>20)</sup> As with Luhmann’s original system, the idea is to let unnecessary items be forgotten (some of the content in the original journal note might never be seen again), and to expand on content in the database that is of use (the *Kojiki* section of the notes). Now, this new note has taken on a “life” of its own, and it is in “dialogue” with all of the other notes and sources used in this article, because the software reads the notes and suggests related notes.<sup>21)</sup>

There is more to be done with this note, which is, after all, only a copy of the original text at this point, and a discussion with classmates could be useful, but how to do that? Fortunately, the software also allows the note to be shared immediately with everyone, allowing a copy of it to appear inside all of the personal knowledge databases (here is where having carefully-chosen software that best fits the particular classroom environment pays off in a smooth transition to the next class activity). Classmates can take notes directly on it by marking up the image, or take notes separately and append them to the note at a later date. In a case like this, the instructor could encourage the author to write the complete bibliographical information at the beginning of the note, or “scan” the bibliographic information along with the relevant pages, putting this supplementary information into the file together with the scanned handwritten note in order to clarify the content for other students. A particularly demanding instructor could suggest making room for marginalia, where the student is encouraged to write comments and pose questions about what they are reading; these can become student-generated springboards for discussion. Finally, the instructor could conclude by sharing some of their own notes on the

text in order to provide a model for further improvement. In the author's experience, having students regularly write about the texts and share their notes in this way with others in the class improves the quality of everyone's notes, and by the end of a semester, students can be counted on to stretch themselves to incorporate some more advanced content, especially when they are asked to lead discussions.

### *A Use Case Scenario for an Intermediate or Advanced Course*

For advanced students, the same task of introducing a text could be assigned, but with the expectation that students also use Japanese language materials (if possible), or expand their notes beyond just producing a handwritten copy of the source, and circulate a digital copy of the note before the next class. The partial note in Figure 2: 1) divides the information into sections in order to aid in comprehension; 2) contains images (omitted in the screenshot) of the source material that are displayed alongside the text; 3) facilitates linkages with other notes; 4) contains questions for further research along with links added later to the answers (omitted); 5) fits it into a more comprehensive system for the personal knowledge database; and 6) takes advantage of features unique to the PIM being used (in this case, the hyperlinks to other notes in the database). There is not much original, critical thinking at this point, but there is engagement with the material. Especially when first attempting to incorporate the PIM and personal databases into a course, it helps to first establish a firm foundation for further research and deeper discussion. If the student goes on to devote time and energy to cultivating the content of the database—by establishing links to other notes, for example—the work with the material can later lead to deeper insights.

Introducing new technologies into the classroom often involves some trial and lots of error, and one of the gentlest ways to begin incorporating personal



#### ■ 出典 (Source Text)

- Yamaguchi Yoshinori 山口佳紀, ed., Kojiki 古事記, *Shinpen Nihon koten bungaku zenshū I* 新編日本文学全集 (Tokyo: Shōgakukan 小学館, 1997), 22-25.

#### ■ サマリー (Summary)

- Preface to the Kojiki dealing with Hieda no Are in Japanese and English with some commentaries.

#### ■ 史料 (Source Original)

- 早稲田大学図書館所蔵, Kan'onchō (Kyoto) 観音町(京都): Fūgetsu Sōchi 風月宗智, Kan'ei 寛永21[1644]. See [http://www.wul.waseda.ac.jp/kotenseki/html/bunko30/bunko30\\_e0119/index.html](http://www.wul.waseda.ac.jp/kotenseki/html/bunko30/bunko30_e0119/index.html)

#### ■ 解読文 (Transcribed Text)

- 時有舍人。姓稗田、名阿礼、年は廿八。為人聰明、度目誦口、私耳勒心。即、勅語阿礼、令誦習帝皇日繼及先代旧辞。詔臣安万侶、撰録稗田阿礼所誦之勅語旧辞以献上者、

#### ■ 読み下し文 (Japanese Transliteration)

- 時(とき)に舍人(とねり)有(あ)り。姓(うち)は稗田(ひえだ)、名(な)は阿礼(あれ)、年(とし)は是(これ)廿八(はたちあまりやつ)。為人聡(ひととなり)く明(さと)くして、目(め)を度(わた)れば口(くち)に誦(よ)み、耳(みみ)に私(ひ)るれば心(こころ)に勒(しる)す。即(すなは)ち、阿礼(あれ)に勅語(みことのり)して、帝皇日繼(すめろきのひつぎ)と先代旧辞(さきつよのふること)とを誦(よ)み習(なら)はしめたまひき。臣(やつこ)安万侶(やすまろ)に詔(のりたま)はく、稗田阿礼(ひえだのあれ)が誦(よ)める勅語(みことのり)の旧辞(ふること)を撰(えら)ひ録(しる)してとのりたまへば

#### ■ 現代語訳 (Modern Japanese--Yamaguchi Yoshinori 山口佳紀)

- 時に舍人(とねり)がいた。姓は稗田(ひえだ)、名は阿礼(あれ)といい。年は28であった。人がらは聡明で、目に触れると口で読み伝え、耳に一度聞くと心にとどめて忘れることはなかった。そこで阿礼に仰せられて、帝皇の日継と先代の旧辞とを誦(よ)み習わせなされた。臣安万侶(やすまろ)に仰せられて、「稗田阿礼(ひえだのあれ)の誦(よ)むところの勅語の旧辞を撰録して献上せよ」とおっしゃったので、

#### ■ 英訳 (English Translation)

- Donald L. Philippi, *Kojiki: Translated with an Introduction and Notes* (Tokyo: University of Tokyo Press, 1968), 41-42. [page image omitted: see Figure 1] See [notes on Philippi 1968](#). [hyperlink]

#### ■ 用語 (Terminology)

- 旧辞 きゅうじ  
「くじ」とも読み、「本辞(ほんじ)」「先代(せんだい)旧辞」ともいわれた(『古事記』序文)。帝紀(ていき)(帝皇日繼(ていおうのひつぎ))とともに『古事記』編纂(へんさん)のための主要な資料となり、また『日本書紀』の編纂にも使われた古代の神話・伝承の記録。その内容は『古事記』の文から推すと、神代の諸伝説、歴代天皇の巻々の諸説話、歌物語の類があり、これを伝承の性格から分類すれば祭祀(さいし)、氏族、芸能の3種となるといわれる。もともと各氏族にはそれぞれの神話、伝承が伝えられていたが、5~6世紀のころ大和(やまと)王権の発展とこれに伴う国家的自覚の成長を背景にして、大王を中心に各種旧辞の統合が図られ、統一的な政治構想をもつ記録がつけられたと考えられる。[黛 弘道]『日本大百科全書』より

■人物 (Person)

• Hieda no Are 稗田阿礼

- ひえだ-の-あれ【稗田阿礼】天武天皇の舎人（とねり）。記憶力がすぐれていたため、天皇から帝紀・旧辞の誦習（しょうしゅう）を命ぜられ、太安万侶（おおのやすまろ）がこれを筆録して「古事記」3巻が成った。→文献資料「古事記」\*ひえだ【稗田】『広辞苑第六版』より
- 稗田阿礼【ひえだのあれ】生没年未詳。古事記序文に、天武天皇が、当時28歳で舎人であった阿礼に帝皇日継と先代旧辞とを<誦習>させたといい、太安万侶が阿礼の<誦むところの勅語の旧辞>に基づいて古事記を撰録したと記す。<誦習>は書かれた文を読むことを意味し、阿礼が古い伝承を口誦で伝えたというのではない。『岩波日本史辞典CD-ROM版』より
- 稗田阿礼 ひえだの、あれ 飛鳥～奈良の女性。阿礼とも〔国史大辞典〕CD-日本史人名よみかた辞典
- Hieda no Are 稗田阿礼 650?-? Attendant (toneri) of Emperor Temmu; commissioned by the court to quote from memory the imperial genealogy and ancient legends so that Ōno Yasumaro could record them in what became Japan's first written chronicle, the Kojiki. It is not known whether Hieda no Are was a man or a woman. See also kataribe. *Encyclopedia of Japan* より
- 稗田阿礼 ひえだのあれ 生没年不詳『古事記』（『原古事記』）の撰修に際し、天武天皇の勅により、著述を終えたその『古事記』をその文字に臨んで誦習し、やがて和銅四年（七一）元明天皇の詔により太安万侶がこれを補注再編する作業をたすけた人物。この結果和銅五年の撰上、現にみる『古事記』となる。天武天皇の勅をうけた年時は未詳であるが、諸種の徴証から天武天皇十三年（六八四）前後と推定される。当時二十八歳、身分は舎人。聡明を伝える（『古事記』序文）。姓の稗田については、『西宮記』裏書に縫殿寮に貢進する猿女（さるめ）につき「田」の姓がみえるので猿女君（公）氏に属することが知られる。この氏は天鈿女（あめのうずめ）命のあとと称し（『日本書紀』神代宝鏡開始章本文）、『弘仁私記』序また阿礼をそのまま「天鈿女命之後」とする。この氏の猿女貢進の職掌から、阿礼を女性とする説もあるが、記序の「舎人」の表記からみて男子であろう。→古事記（こじき）〔参考文献〕本居宣長『古事記伝』二（『本居宣長全集』九）、倉野憲司編『古事記大成』六、川副武胤『古事記の研究』、柳田国男「稗田阿礼」（『定本柳田国男集』九所収）（川副 武胤）『国史大辞典』より
- Ōno Yasumaro 太安万侶 (?-723)
  - 太安万侶【おおのやすまろ】?-723(養老7.76?) 古事記の撰者。安麻呂とも。父は壬申の乱に大海人（おおあま）皇子方で活躍した多品治（おおのほむち）という。704(慶雲1)従五位下、711(和銅4)正五位上。同年元明天皇の詔を受けて稗田阿礼（ひえだのあれ）の誦する「旧辞」を撰録し、翌年古事記を完成させた。その序に漢字で日本語を表現する苦勞を記している。715(龜龜1)従四位下、翌年氏長（うじのかみ）、没した時は民部卿従四位下。日本書紀編纂にもあたったとする史料がある。1979年奈良市東郊の墳墓から遺骨と墓誌(重文)が発見された。『岩波日本史辞典CD-ROM版』より

■先行研究 (Secondary Scholarship)

- On Hieda, see Yoko Williams, *Tsumi - Offense and Retribution in Early Japan*, 15-16.
- On dating the Preface, see Miura Sukeyuki 三浦佑之, *NHK "hyappun de meicho" bukkusu, Kojiki* NHK「100分de名著」ボックス、古事記(Tokyo: NHK, 2014), Chapter 1 (不自然な「序」)

FIGURE 2 *Final Version of Note in Personal Knowledge Database* (partial)

knowledge databases into courses is for the instructor to share their own research notes; hence, the note with Japanese text and detailed information displayed in Figure 2. It is meant as a starting point for thinking about the possibilities of notes within a PIM rather than a roadmap that has to be followed, and so it ought to be replaced or supplemented by examples from each instructor. In this way, students can see how research is done, getting a glimpse of what it is like to engage with primary sources and secondary sources through a look inside the instructor's own secondary brain. The research process viewed in this way can provide a model, at the very least, and perhaps even inspire students to innovate within their own databases.

## *Conclusions*

What is revolutionary about the techniques introduced in this essay? The combination of digital and analog opens up new possibilities for understanding classroom materials not only to experts in a field, who have the time and motivation to invest in constructing a database, but also to students taking their first steps into unfamiliar intellectual territory. PIMs enable students to carry around in their pocket everything they need (a smartphone) to create a unique knowledge databases of their own, tailored to their needs. The automatic organization achieved without needing to manually organize the content (OCR and connections made to notes deemed to be relevant) frees students to focus on creating and capturing content. For basic databases, this can be a powerful way to introduce PIMs without overwhelming students with the task of learning or adjusting to a new organizational system.

In addition, notes on premodern sources like the *Kojiki* can break free of whatever notebook, cardboard box, or landfill they typically get put into after a class finishes, and continue to exist in databases alongside material used in other courses, where they can establish new kinds of relationships among these

materials. Content thus has utility beyond each individual course, because it lives on in both the students' carbon- and silicon-based brains. This educational outcome may not always be realized in practice, but that is the ideal, and the lifelong relevance alone might be worth the effort of embedding databases into a course.

### *References*

The author is an associate professor in the Department of Communication at Kōgakkan University in Ise, Japan. This is the first installment of a three-part article that originated in a talk given at the Association of Asian Studies Annual Meeting in March 2017 under the title “Analogging Premodern Japanese Sources to Build a Personal Database.” The author would like to thank the organizers and participants involved in the panel as well as the audience members for their comments.

- 1) This is the emperor's evaluation of the importance of the texts he ordered to have memorized. For an English translation of the passage, see Donald L. Philippi, *Kojiki: Translated with an Introduction and Notes* (Tokyo: University of Tokyo Press, 1968), 41.
- 2) See, for example, Edwin A. Cranston, *The Gem-Glistening Cup* (Stanford: Stanford University Press, 1998), 3.
- 3) *Ibid.*, 41-42.
- 4) On the significance of this text for the nation, particularly the discovery of meaning in the *Kojiki* by Motoori Norinaga in the eighteenth century, see Harry D. Harootunian, *Things Seen and Unseen: Discourse and Ideology in Tokugawa Nativism* (Chicago: University of Chicago Press, 1988), 76-105.
- 5) For a positive outlook on the potential of technology to assist us in the evolution of our minds, see C. Gordon Bell and Jim Gemmell, *Total Recall: How the E-memory Revolution Will Change Everything* (Boston: Dutton, 2009).
- 6) For research showing the benefits of handwriting, see Timothy J. Smoker, Carrie E. Murphy, and Alison K. Rockwell, “Comparing Memory for Handwriting versus Typing,” *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* 53, Issue 22 (2009): 1744-1747.
- 7) There is even evidence that laptops and notetaking have a detrimental impact on others around students using them. See Faria Sana, Tina Weston and Nicholas J.

- Cepeda, "Laptop Multitasking Hinders Classroom Learning for Both Users and Nearby Peers," *Computers and Education* 62 (March 2013): 24–31. Of course, arguments in support of laptops and notetaking also exist. See, for example, Patrick Gaudreau, Dave Miranda, and Alexandre Gareau, "Canadian University Students in Wireless Classrooms: What Do They Do on Their Laptops and Does It Really Matter?," *Computers and Education* 70 (January 2014): 245–255.
- 8) On the cognitive effort involved, see Annie Piolat, Thierry Olive, and Ronald T. Kellog, "Cognitive Effort during Note Taking," *Applied Cognitive Psychology* 19, Issue 3 (April 2005): 291–312. For research on the pros and cons of laptop use in classes, see Carrie B. Fried, "In-Class Laptop Use and Its Effects on Student Learning," *Computers and Education* 50, Issue 3 (April 2008): 906–914, and Sana (2013).
  - 9) On the importance of "working memory" in the note-taking process, and the benefits digital note-taking can provide to students with a poor working memory, see Dung C. Bui, Joel Myerson, and Sandra Hale, "Note-taking with Computers: Exploring Alternative Strategies for Improved Recall," *Journal of Educational Psychology*, 105, no. 2 (May 2013): 299–309.
  - 10) Specifically, the two mainstream options that stand out are Evernote and OneNote. In practice, I have found Evernote to be the most effective of the two in classrooms, especially for its highly accurate OCR of handwritten notes, ease-of-use, and ability to share content with classmates. The two figures in this essay are from my Evernote database, but for my own research, I rely heavily on DEVONthink, which is only available on Apple's OSX and iOS devices.
  - 11) This is only a thumbnail sketch of a lifelong project. For more detail, including images of cards from Luhmann's zettelkasten, see Johannes F. K. Schmidt, "Niklas Luhmann's Card Index: Thinking Tool, Communication Partner, Publication Machine," in *Forgetting Machines: Knowledge Management Evolution in Early Modern Europe*, edited by Alberto Cevolini, 289–311 (Leiden: Brill, 2016). Luhmann's zettelkasten has recently been made available online at <https://niklas-luhmann-archiv.de/> in an impressive feat of digital archiving that enables one to navigate the zettelkasten as Luhmann intended, while also viewing approximate English translations of the content.
  - 12) Niklas Luhmann, "Kommunikation mit Zettelkästen: Ein Erfahrungsbericht," in *Öffentliche Meinung und Sozialer Wandel*, edited by Baier Horst, Hans Mathias Kepplinger, and Kurt Reumann K., 222–228 (Darmstadt: VS Verlag für

Sozialwissenschaften, 1981), 225. This passage is the author's translation from the German.

- 13) Schmidt, 289 and 291.
- 14) Although Evernote has an app for this on the iPad, called "Penultimate," I have found "GoodNotes" to be a far superior solution. But, in either case, the process of digitizing the analog input is seamless. As a matter of personal preference, I find writing with plastic on glass (Apple's iPad Pencil) to be tiring.
- 15) As a matter of personal preference, I use pencil and paper (Mitsubishi's "Hi-uni" B and Kokuyo's "Campus" B "dotto iri" ドット入り), and write both vertically and horizontally. However, at the time of this writing, informal testing with a dark pen and plain white paper while writing horizontally generally produces the best results with Evernote's OCR.
- 16) Evernote's "Scannable" app can be used for the scanning and, if students have a paid account or the teacher could purchase an account (even for only a month) and share a notebook with them, then the content would be made searchable within a few seconds (it is OCR'd in the paid account). Naturally, the accuracy of the OCR varies from one person to the next, depending on legibility. One distinguishing feature (crucial for advanced learners and researchers) of Evernote's service is that it can perform OCR for two languages at once, making it possible to have both English and Japanese on the same page and searchable.
- 17) Despite the existence for at least two decades of software and a model for implementation, the idea does not seem to have received an enthusiastic reception among educators. For early efforts at accomplishing this sharing, see Richard C. Davis, James Lin, Jason A. Brotherton, James A. Landay, Morgan N. Price, and Bill N. Schilit, "A Framework for Sharing Handwritten Notes," *UIST '98: Proceedings of the 11th Annual ACM Symposium on User Interface Software and Technology* (1998): 119-120. Note that many of their ideas for improving the service have now become important features of Evernote and other applications.
- 18) I typically mix Japanese and English in my notes, so I prefer to use Evernote, which can handle OCR for two languages at once. To the best of my knowledge, it is the only commercially available PIM that can do this with handwriting. Using other applications for OCR, assuming they can handle handwriting, means that one language will end up as gibberish, and that is something you want to avoid putting into your second brain.

- 19) For more on this clever system of taking handwritten notes, keeping track of “todo” lists, and scheduling, see <http://bulletjournal.com>.
- 20) For clarity and space concerns, though, the page was rewritten.
- 21) There are many translations available for the text, but I chose the one nearest at hand. Ideally, with more time, and the intention to research the passage in more depth, many more commentaries and translations would be included in the note. For the source of the Japanese (original, transliterated, and modern), see Yamaguchi Yoshinori 山口佳紀, ed., *Kojiki* 古事記, *Shinpen Nihon koten bungaku zenshū* I 新編日本文学全集 (Tokyo: Shōgakukan 小学館, 1997), 22-25.

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