Pushing the Paperless Envelope

Digital Recording and Innovative Ways of Seeing at a Classic Maya Site

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A CALL TO REALIZE THE POTENTIAL OF PAPERLESS ARCHAEOLOGICAL RECORDING

Increasing numbers of archaeological projects are "going paperless"—that is, adopting digitized versions of the paperwork they have long used to record detailed excavation information in the field. This technological transformation allows archaeologists to streamline their workflow in the field and to benefit from the many logistical advantages of digital technology. However, from a methodological viewpoint, most paperless systems translate the recording procedures that were previously in place, rather than exploiting the capabilities of these new systems in order to see sites and artifacts in different ways. We perceive an imbalance—and unrealized potential—in the development of the logistical and the interpretive sides of many digital recording systems in archaeology. This is the problem we address through the digital recording system that we developed and used in the field, as discussed in this article.

Our paperless recording system allows us to meet the requirements of our excavation permit (from the Belize Institute of Archaeology) and the umbrella archaeological project under which we work (the Programme for Belize Archaeological Project), while also using the capabilities of the technological system in order to transform how we record information and envision archaeological materials and spaces in the field. Our

ABSTRACT

Archaeological documentation is in the midst of a technological shift as recording systems transition from paper-based forms to digital formats. Digital systems effectively replicate the information recorded on paper forms, while also offering recording advantages for archaeologists in the field. In addition to such logistical contributions to archaeological workflows, digital technology also has tremendous potential to transform the ways that archaeology is done by shifting how we see our sites, and how we document them through diverse data types. With the goal of exploring this potential, we developed a tablet-based relational database, using FileMaker, which provides the ability to simultaneously record specific characteristics of artifacts and features according to two cultural perspectives—modern archaeological understandings and also those of the Classic Maya. In this article, we describe the database and discuss the results of a pilot field season using the database to record excavations at the site of Say Kah, Belize. Our experiences yield several broader reflections on the impact of using digital recording systems both for practical advantage and for productive shifts in perception.

La documentación arqueológica se encuentra en medio de un cambio tecnológico mediante el cual los sistemas de registro cambian del papel a formatos digitales. Los sistemas digitales replican de manera efectiva la información registrada en formularios de papel, y también ofrecen ventajas para los arqueólogos trabajando en el campo. Además de las contribuciones logísticas al trabajo arqueológico, la tecnología digital también puede transformar las formas de realizar la arqueología al cambiar la manera en que miramos los sitios, y cómo los documentamos a través de diversos tipos de datos. Con el objetivo de explorar este potencial, desarrollamos una base de datos relacional utilizando las computadoras tabletas, y el programa FileMaker, el cual ofrece la posibilidad de documentar simultáneamente características específicas de los artefactos y rasgos según dos perspectivas culturales, los entendimientos modernos de los arqueólogos y también los de los mayas clásicos. En este artículo se describe la base de datos y se discuten los resultados de la primera temporada de campo en que se utiliza la base de datos para registrar excavaciones en el sitio de Say Kah, Belice. Nuestras experiencias generan reflexiones sobre el impacto del uso de sistemas de registro digital tanto como ventajas prácticas y también para los cambios productivos en la percepción.

Advances in Archaeological Practice 4(2), 2016, pp. 176–191

DOI: 10.7183/2326-3768.4.2.176

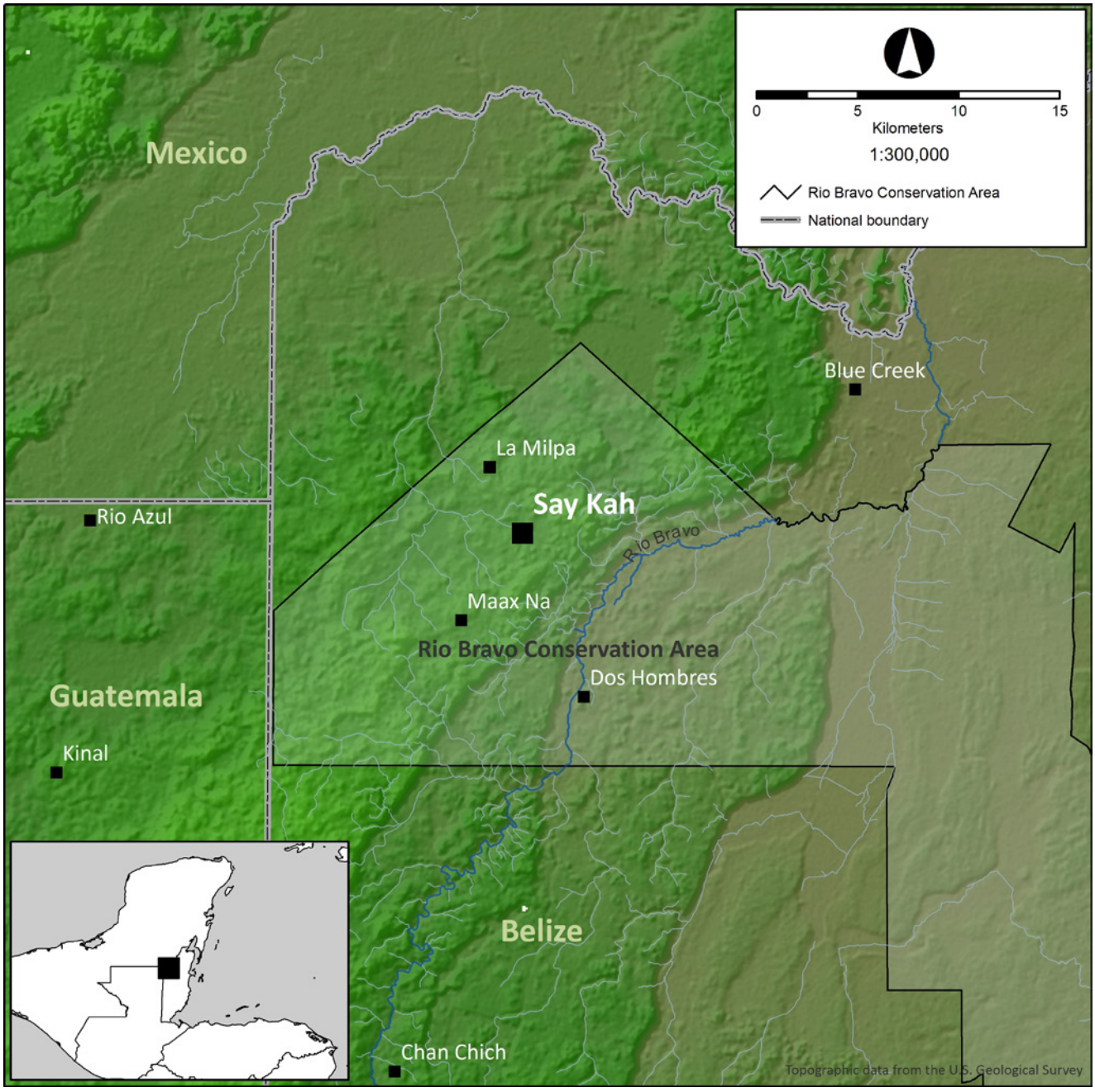

FIGURE 1. Map showing the location of Say Kah, Belize. Map created by Joshua Wright.

particular interpretive interest is in recognizing and decentering the dominance of modern, western archaeological visions of the material record, in order to make space for other, culturally specific understandings of artifacts and the contexts in which they are found. In our case, we explore the ways in which the Classic Maya described and understood their material world. In our Maya context, this means that data streams based on archaeological and hieroglyphic/iconographic data can be brought together in mutually influencing ways as part of the investigative process in the field.

Two of us (Jackson and Brown) have long conducted archaeological work in the Maya area; the other author (Motz) brings technical experience in the development and use of digital systems in other archaeological contexts (Italy), as well as archaeological training; together, we designed and developed a FileMaker database run on iPads. We field-tested this database in May and June 2015 at the Classic Maya (250–900 A.D.) site of Say Kah, where Jackson and Brown co-direct the Say Kah Archaeological Project (SKAP) (Figure 1) and also run an undergraduate archaeological field school. Say Kah is a secondary site

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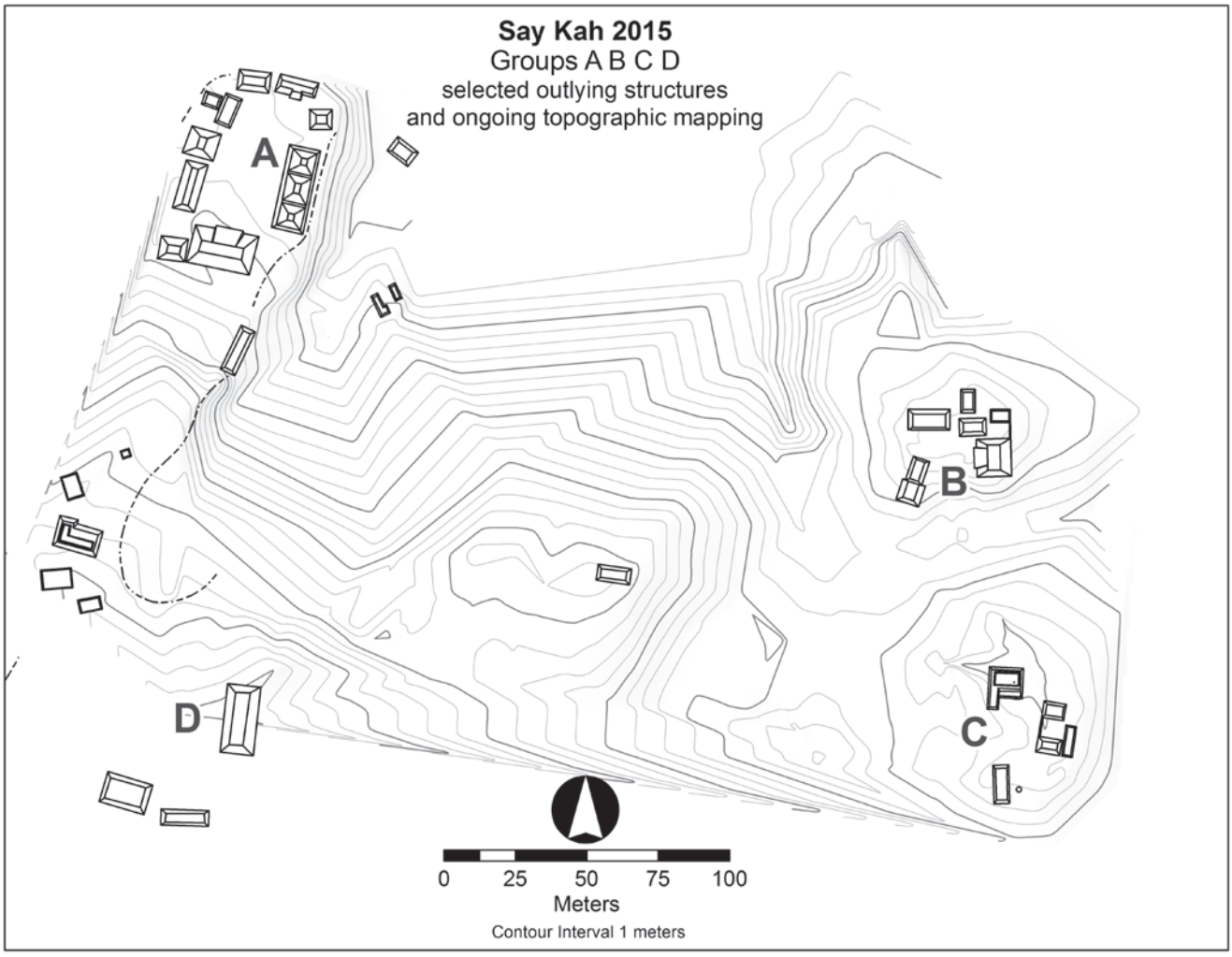

FIGURE 2. Map of the archaeological site of Say Kah, Belize. Map created by Joshua Wright.

near the ancient Maya city of La Milpa (Figure 2) and is part of the larger Programme for Belize Archaeological Project, located within the Rio Bravo Conservation Area in northwestern Belize.

Our case study indicates that paperless systems, such as the one we developed, allow for nimble movement between multiple ways of seeing material and recording data, a capability that can shift our perceptions of archaeological sites and materials while in the field. Certainly, this ability represents an opportunity for archaeologists who work in other areas of the world that have ancient textual traditions to integrate material and textual data streams in novel ways. Moreover, our database provides one possible way to actively incorporate indigenous voices (ancient or modern) into archaeological recording and in-field interpretive processes. More broadly, our use of a digital recording system to open up new ways of seeing, recording, and experiencing the archaeological record represents a call to archaeologists to use technological capabilities creatively in ways that address the evidentiary and analytical challenges that they face at their sites or in their cultural regions.

WHY PUSH THE PAPERLESS ENVELOPE?

The importance of "pushing the paperless envelope" is a timely one: as we move into the second generation or "wave" of using digital recording systems (Huggett 2015a), the potential of this technology can be realized and innovation can be driven forward, allowing us to move beyond technology for technology's sake.

In particular, we recognize important discussions, rooted in Science and Technology Studies, that underline the profound importance of relatively mundane activities like filling out paperwork: this work structures not only professional practice but also the interpretations that result. Our assumptions (material and otherwise) are encoded in paperwork, meaning that forms and associated practices act in powerful ways to guide our thinking and make real our assumptions (see related discussions in Berggren and Hodder 2003; Cobb et al. 2012;

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Hodder 1999; Webmoor and Witmore 2008; Yarrow 2003). Thus, archaeological paperwork involves the encoding of a particular vision, one that can be productively destabilized through the use of digital systems that actively remind us of the situated nature of our professional knowledge and that create space for other ways of looking. Notably, these directed ways of looking and recording occur *while in the field* and impact our data and interpretations from the earliest moments of discovery, meaning that our critical attention to alternate, or multiple, ways of looking, must similarly begin in the field (or at the trowel's edge, in Hodder's language [1999]).

Furthermore, engaging with other ways of looking at or understanding the world is important not merely as an academic exercise in making ourselves aware of our relative position and the ways in which we often privilege it. Rather, this is an important step in committing to the inclusivity of multiple voices, particularly ancient indigenous voices, in our reconstruction of the archaeological past and the archaeological narratives that we produce. The digital interface that we use is an intellectual tool that allows us to honor perspectives held by the ancient users and makers of the materials we excavate.

In the largest sense, the problem we discuss is timely because there is currently an opportunity for a turning point in the practice of archaeology. Technology is becoming more integrated into both our professional and personal lives. We argue that the increased uses of technology need not be limited to a data gathering tool (i.e., we have more data points, or data points of higher resolution); rather, we have to train our gaze on these digital systems and think incisively about how we can use them in ways that transform what we are accomplishing in our archaeological research. In this way, we seek to soften Caraher's (2013 [2015]) distinction between slow versus fast (or, inefficient versus efficient) archaeology (cf. discussions in Averett et al. 2016); the digitization strategies employed in our project were not adopted primarily to record more data, but rather to allow us to experience and perceive our archaeological site in a different and meaningful way, types of engagement that Caraher (2013 [2015]: 46-47) also emphasizes. Ultimately, we believe that digital technologies in the field should be used both to make our lives easier—per the many conveniences offered by paperless recording—*and* more intellectually challenging. Digital technologies can accomplish this by causing us to productively question our habitual ways of envisioning and recording materials in the field, yielding new awareness of material assumptions and alternate material perspectives. The case study we discuss is just one example of how digital tools can effect change in the archaeological process in the field; ultimately, we hope our research serves as an exhortation to other archaeologists to be creative in their use of digital tools.

THE LANDSCAPE OF PAPERLESS ARCHAEOLOGY

While the use of digital databases in archaeology is not new, the shift to born-digital data—that is, recording that occurs digitally from the moment of discovery in the field—is a more recent phenomenon in archaeological projects, made possible by advances in tablet computing. Previous generations of tablet computers were heavy and unwieldy, had poor battery life,

FIGURE 3. A field school student using an iPad at Say Kah.

relied on fans and spinning hard drives, and used desktop operating systems that were poorly adapted for use with a digital pen, all of which made them ill-suited for field use. However, the introduction of the iPad in 2010 heralded a new generation of tablet computers with technological capabilities that made field use feasible. Modern tablet computers are lightweight, feature all-day battery life, have fast and durable solid-state storage, and can be used in challenging environments because they do not use fans for cooling and thus can be sealed completely (e.g., Vasilijevic et al. 2015). Operating systems such as iOS and Android that are designed for mobile devices with responsive touchscreen interfaces allow for fast and easy interactions with the devices in a field setting (Figure 3). Shortly after Apple introduced the iPad, it was put into use by archaeologists in Pompeii (Apple 2010; Ellis and Wallrodt 2011). In the following year, a handful of other archaeological projects adopted iPads or similar tablets (Butina 2014; Jennings 2011; Motz and Carrier 2013; Toumazou et al. 2015), and adoption has continued to increase (e.g., Berggren et al. 2015; Betts 2012; Bobowski 2012; Fee et al. 2013; Goodale et al. 2013; Houk 2012; Prins et al. 2014; Roosevelt et al. 2015; Vincent et al. 2014; White and Wilson 2013).

Despite the increasing numbers of archaeological projects choosing to pursue digital field recording, there is great variety in the software and technology used—and accompanying debate about which approach is best (e.g., Roosevelt et al. 2015:329). A key difference hinges on the use of pre-built record-

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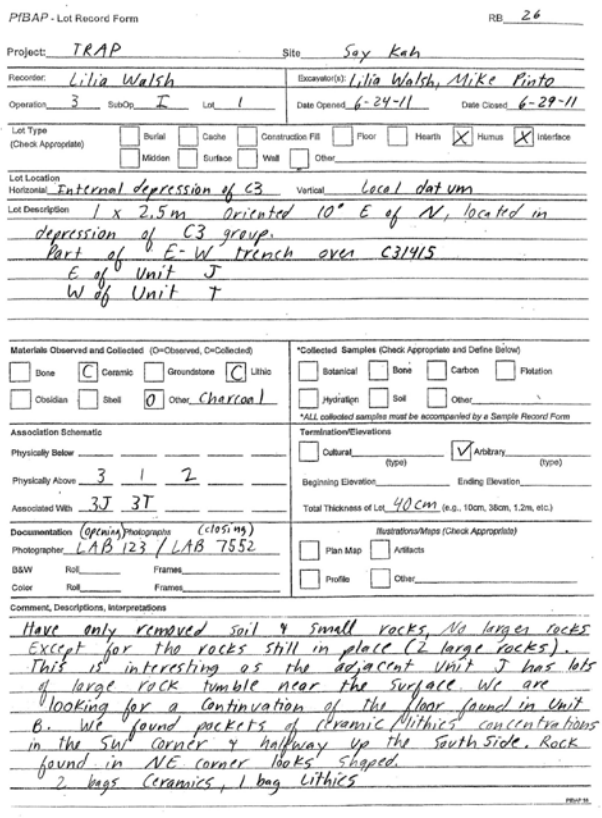

PfBAP - Lot Record Form RB 26

Project: TRAP Site Say Kah

Recorder: Lilia Walsh Excavator(s): Lilia Walsh, Mike Pinto

Operation 3 SubOp I Lot 1 Date Opened 6-24-11 Date Closed 6-29-11

Lot Type (Check Appropriate): Burial, Cache, Construction Fill, Floor, Hearth, Humus, Interface, Midden, Surface, Wall, Other

Lot Location Horizontal: External depression of C3 Vertical: Local datum

Lot Description: 1 x 2.5m oriented 10° E of N, located in depression of C3 group. Part of E-W trench over C31415 E of Unit J W of Unit T

Materials Observed and Collected (O=Observed, C=Collected): Bone, Ceramic [C], Groundstone, Lithic [C], Obsidian, Shell, Other Charcoal [O]

*Collected Samples (Check Appropriate and Define Below): Botanical, Bone, Carbon, Flotation, Hydration, Soil, Other

*ALL collected samples must be accompanied by a Sample Record Form

Association Schematic

Physically Below

Physically Above 3 1 2

Associated With 3J 3T

Termination/Elevations: Cultural (type), Arbitrary (type)

Beginning Elevation Ending Elevation

Total Thickness of Lot 40 cm (e.g., 10cm, 38cm, 1.2m, etc.)

Documentation (opening Photographs closing): Photographer LAB 123 / LAB 7552

B&W Roll Frames

Color Roll Frames

Illustrations/Maps (Check Appropriate): Plan Map, Artifacts, Profile, Other

Comment, Descriptions, Interpretations

Have only removed soil & small rocks, No larger rocks except for the rocks still in place (2 large rocks). This is interesting as the adjacent Unit J has lots of large rock tumble near the surface. We are looking for a continuation of the floor found in Unit B. We found pockets of ceramic/lithics concentrations in the SW corner & halfway up the South side. Rock found in NE corner looks shaped.

2 bags Ceramics, 1 bag Lithics

Print M.

FIGURE 4. Paper lot recording form used by the Programme for Belize Archaeological Project.

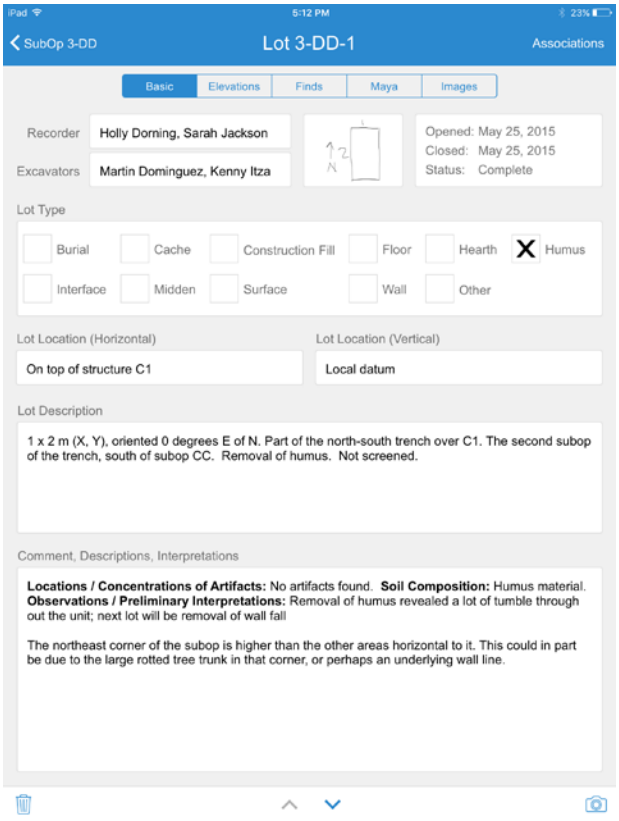

FIGURE 5. The primary lot recording page of the SKAP database.

ing systems, as opposed to custom-built recording systems. A variety of pre-built, institutionally or commercially supported archaeological recording systems exist, such as ARK, FAIMS, IADB, OpenDig, and Codifi. These require less development outlay to get up and running but are often not as customizable as solutions built from scratch. A far greater number of apps and databases have been built for individual projects; these require greater development effort but are highly customizable. Some archaeologists have critiqued such custom (or "bespoke") systems in favor of pre-built solutions, arguing that the latter offer easier interoperability with other data sets; in contrast, custom systems are favored by some projects for being more flexible in their structure and/or interface (see discussions in Averett et al. 2016). It is important to note, however, that there is a middle ground involving commercial products that are not designed specifically for archaeologists, such as the FileMaker Pro software that we used, which allows customization within an existing software environment.

Beyond the technical elements that underwrite the possibilities of paperless recording, we must also be aware of the ends to which this technology is used. Discussion of the use of paperless recording systems in archaeological contexts to date has mainly emphasized the resulting logistical advantages of this technology (see overviews in Austin 2014, Motz and Carrier 2013; Berggren et al. 2015 discusses the reflexive implications of these advantages). Notably, Roosevelt et al. (2015) also explore the interpretive transformations possible when exploiting the capabilities of digital systems; in their case, they re-envision their site using volumetric terms. Our project is positioned in a similar intellectual landscape—we, too, use our database to see material finds and contexts differently. However, we suggest that our use of the database to integrate ancient indigenous perspectives represents a particularly innovative shift for archaeologists: not simply a clearer envisioning of data but a change in what constitutes our data and how we collect it in the field. In what follows, we discuss our database in terms of its technical elements, as well as its contributions to seeing material elements of the past differently in the field.

THE SKAP DATABASE: A CREATIVE SYNTHESIS OF DIFFERENT APPROACHES TO THE ARCHAEOLOGICAL RECORD

The SKAP database was built using FileMaker Pro (desktop) and FileMaker Go (mobile) software, commercial, off-the-shelf products that nonetheless required us to build the relational database structure and interface to produce an operable system. We chose to use a FileMaker database due to its ease of use, out-of-the-box stability, and Motz's extensive familiarity with the platform. Relational databases organize different types of entities (e.g., sites, lots, finds) into separate tables,

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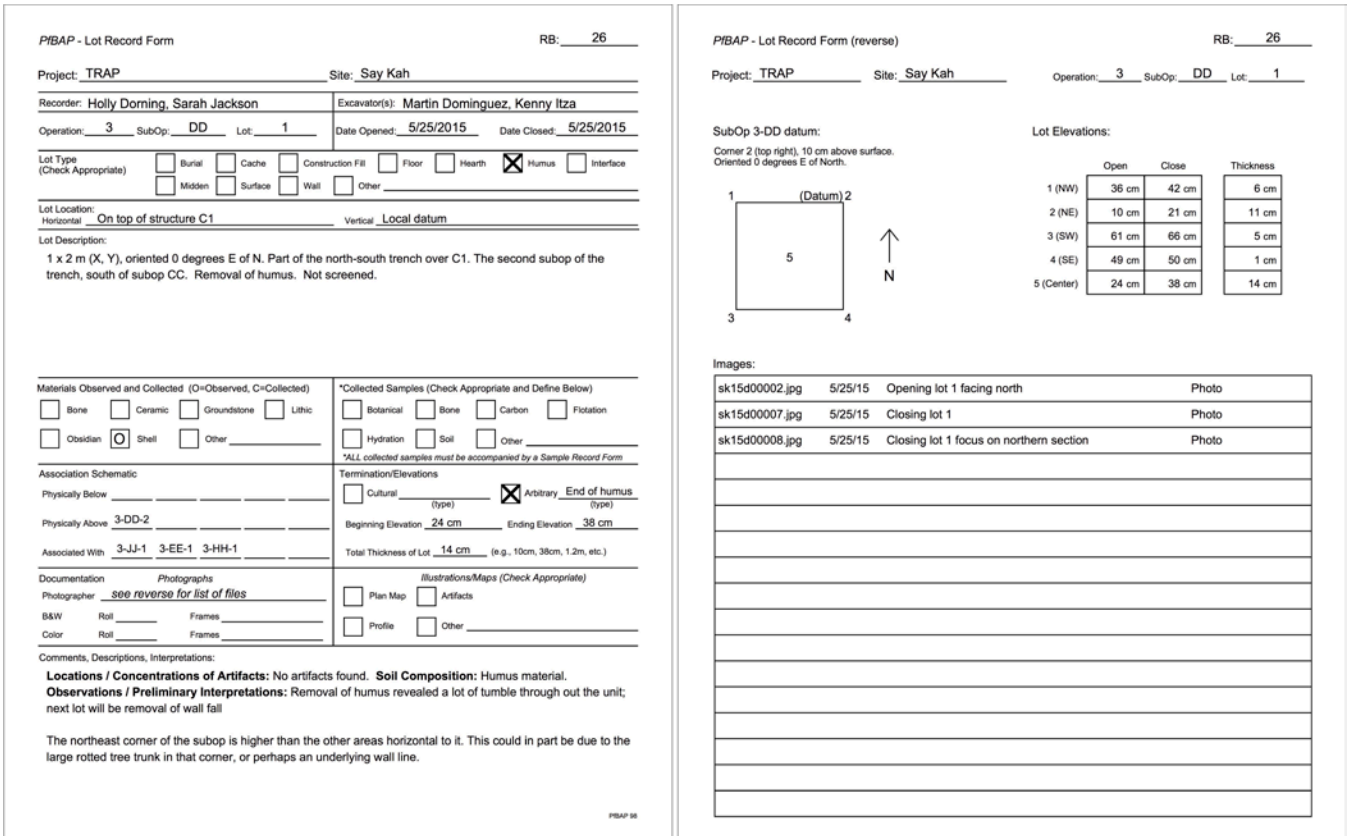

PfBAP - Lot Record Form RB: 26

Project: TRAP Site: Say Kah

Recorder: Holly Dorning, Sarah Jackson Excavator(s): Martin Dominguez, Kenny Itza

Operation: 3 SubOp: DD Lot: 1 Date Opened: 5/25/2015 Date Closed: 5/25/2015

Lot Type (Check Appropriate): ☐ Burial ☐ Cache ☐ Construction Fill ☐ Floor ☐ Hearth ☒ Humus ☐ Interface ☐ Midden ☐ Surface ☐ Wall ☐ Other

Lot Location: Horizontal On top of structure C1 Vertical Local datum

Lot Description:

1 x 2 m (X, Y), oriented 0 degrees E of N. Part of the north-south trench over C1. The second subop of the trench, south of subop CC. Removal of humus. Not screened.

Materials Observed and Collected (O=Observed, C=Collected): ☐ Bone ☐ Ceramic ☐ Groundstone ☐ Lithic ☐ Obsidian ☐ O Shell ☐ Other

*Collected Samples (Check Appropriate and Define Below): ☐ Botanical ☐ Bone ☐ Carbon ☐ Flotation ☐ Hydration ☐ Soil ☐ Other

*ALL collected samples must be accompanied by a Sample Record Form

Association Schematic

Physically Below

Physically Above 3-DD-2

Associated With 3-JJ-1 3-EE-1 3-HH-1

Termination/Elevations: ☐ Cultural (type) ☒ Arbitrary End of humus (type)

Beginning Elevation 24 cm Ending Elevation 38 cm

Total Thickness of Lot 14 cm (e.g., 10cm, 38cm, 1.2m, etc.)

Documentation Photographs

Photographer see reverse for list of files

B&W Roll Frames

Color Roll Frames

Illustrations/Maps (Check Appropriate): ☐ Plan Map ☐ Artifacts ☐ Profile ☐ Other

Comments, Descriptions, Interpretations:

Locations / Concentrations of Artifacts: No artifacts found. **Soil Composition:** Humus material.
Observations / Preliminary Interpretations: Removal of humus revealed a lot of tumble through out the unit; next lot will be removal of wall fall

The northeast corner of the subop is higher than the other areas horizontal to it. This could in part be due to the large rotted tree trunk in that corner, or perhaps an underlying wall line.

PBAP 98

PfBAP - Lot Record Form (reverse) RB: 26

Project: TRAP Site: Say Kah Operation: 3 SubOp: DD Lot: 1

SubOp 3-DD datum:

Corner 2 (top right), 10 cm above surface.
Oriented 0 degrees E of North.

1 (Datum) 2
5
3 4
N

Lot Elevations:

	Open	Close	Thickness
1 (NW)	36 cm	42 cm	6 cm
2 (NE)	10 cm	21 cm	11 cm
3 (SW)	61 cm	66 cm	5 cm
4 (SE)	49 cm	50 cm	1 cm
5 (Center)	24 cm	38 cm	14 cm

Images:

sk15d00002.jpg	5/25/15	Opening lot 1 facing north	Photo
sk15d00007.jpg	5/25/15	Closing lot 1	Photo
sk15d00008.jpg	5/25/15	Closing lot 1 focus on northern section	Photo

FIGURE 6. PDF output of a lot form generated by the SKAP database.

within which each entity or "record" (e.g., Lot 1, Lot 2, Lot 3) is described by multiple attributes or "fields" (e.g., lot name, date excavated, soil composition). The true power of a relational database structure comes in linking tables to each other, thus telling the database that, for example, Finds X and Y came from Lot 2, which in turn is part of Site Z. This structure allows entities to be linked and cross-referenced without duplicating data, and it enables data to be sorted, filtered, and presented in multiple ways without altering the data themselves.

From the outset, we had no existing model to turn to for archaeological field recording that combines emic and etic approaches (per longstanding anthropological discussions about different worldviews and their intersections with classification [e.g., Ford and Steward 1954, Pike 1954, Spaulding 1953]), either in paper or digital format. Thus, we spent a significant amount of time experimenting with different ways for users to enter and interact with our data. Since the "Maya view" elements that we were adding to the recording process are quite unlike traditional archaeological forms, we knew that we needed to develop the system carefully so that it felt like a single entity. Significantly, digital forms allow for different views and navigational experiences of data. Given our interest in multiple visions of the material world, being able to display data in various ways (e.g., through multiple pages and through connections between pages) is particularly important in allowing for fluid and dynamic understandings of material data, in contrast to traditionally static and fixed paper forms.

Standard Archaeological Recording

Our primary goal for the standard archaeological page was to allow us to emulate the standard Programme for Belize Archaeological Project (PfBAP) forms in digital format (Figures 4 and 5). When we submit end-of-season reports and paperwork, we are required to provide paper copies of all forms; the database is built so that these forms can be printed out or saved as a PDF in a format identical to the handwritten versions that have been used in the past (Figure 6). However, the digital format means that the actual recording experience on the tablet is not constrained by this end goal and can be organized differently.

During development, we considered how we might streamline the standard part of the recording process in order to free up archaeologists' time, energy, and attention in the field, both to optimize the flow of the process but also to allow for the additional recording involved with the Maya view, discussed below. We focused on several elements of the recording process that we identified as arduous or time consuming and that could be eased by automating processes. One such contribution involves the digital form providing prompts that standardize the information recorded (a contribution to the overall utility of lot forms as records of the site as a whole) and that remind the recorder what information he or she needs to provide. For example, on the paper form, the final (and important) area for comment is an open field that reads "comment, descriptions, interpretations." For the digital version, tapping on that field opens a pop-up

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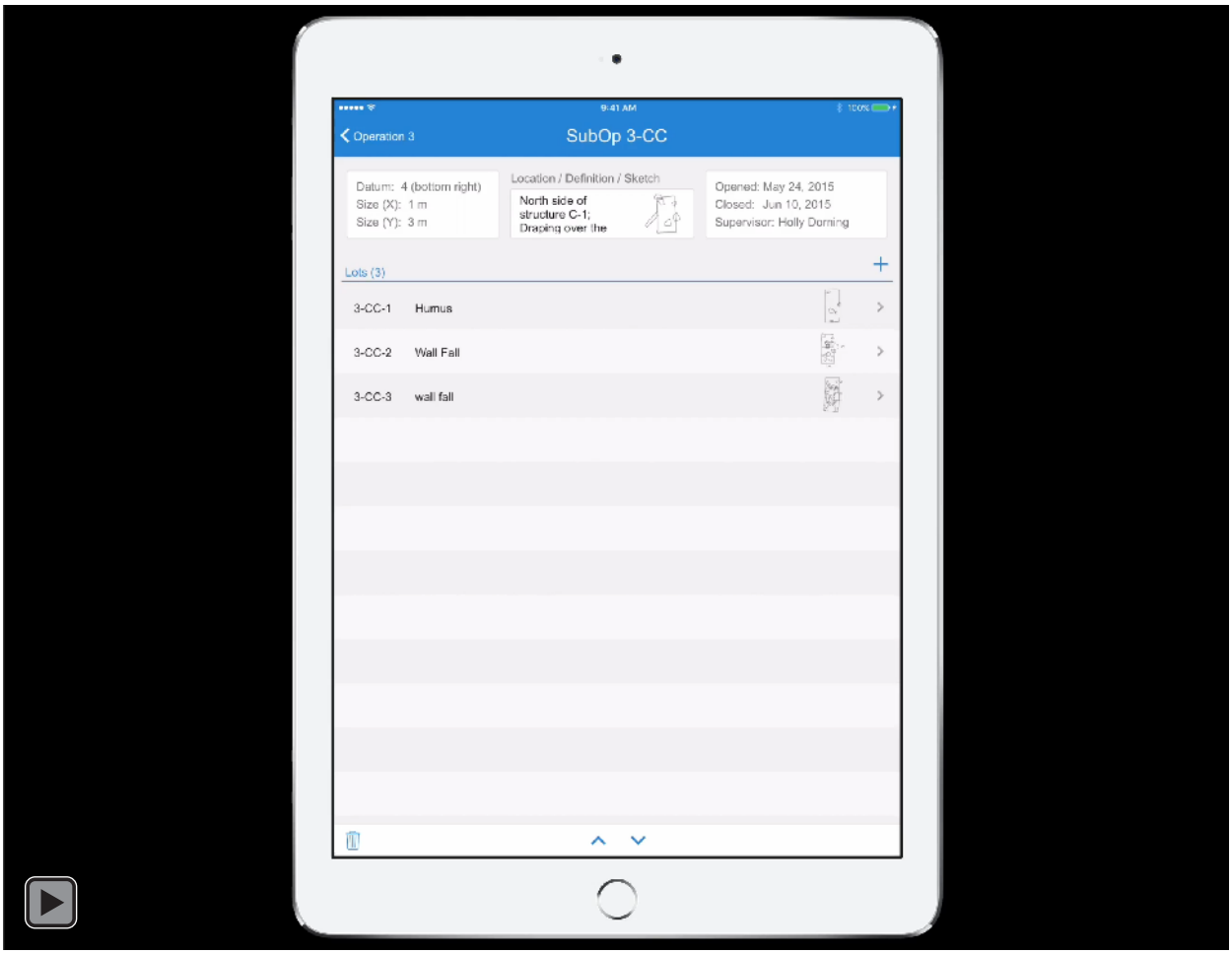

FIGURE 7. Video showing the SubOp datum pop-up in the SKAP database.

that includes three prompts for archaeologists to comment on (Table 1). We replaced the original open field with a calculation that concatenates these three text fields, allowing them to be displayed on the digital form and on the printed form in a way that is compact and is consistent with the structure of the standard PfBAP form (see Figure 6).

Another such contribution of the digital version of the form is to reduce the need for tasks that are onerous or time consuming and can be easily automated. We identified the recording and calculation of relative elevations as a task that would benefit from this treatment. Motz designed a graphic depiction that the recorder uses to set up the orientation of the unit when each suboperation is opened (Figure 7); subsequently, recorders can fill in opening and closing elevations, and the thickness of the lot is automatically calculated, a process that is neater, easier, and reduces human error, compared to the back-of-the-page calculations that characterized the paper version.

TABLE 1.

Field	Type
Comment, Descriptions, Interpretations	Calculation
Locations / Concentrations of Artifacts	Text
Soil Composition	Text
Observations / Preliminary Interpretations	Text

Thirdly, the digital version allowed for automatic generation of information that archaeologists might typically have to search for or remember (and that might otherwise involve errors). For instance, when recording and bagging a find, excavators can open a pop-up window that automatically generates the information that the recorder must write on the bag tag. In fields where the date has to be filled in, the recorder is first given the option of today's date (though they can change that manually, if needed). The creation of new records such as subops and lots also involves automatic numbering, such that the recorder does not need to determine the highest existing record number.

Additionally, our digital system allowed us to integrate data streams at an earlier point in the process. For instance, photographic images have long been a burden for archaeologists, both in terms of issues with captioning and labeling, and in terms of access when they are in a separate format from paper forms (e.g., in folders on a computer). Using the FileMaker database allowed us to immediately integrate digital photos (either

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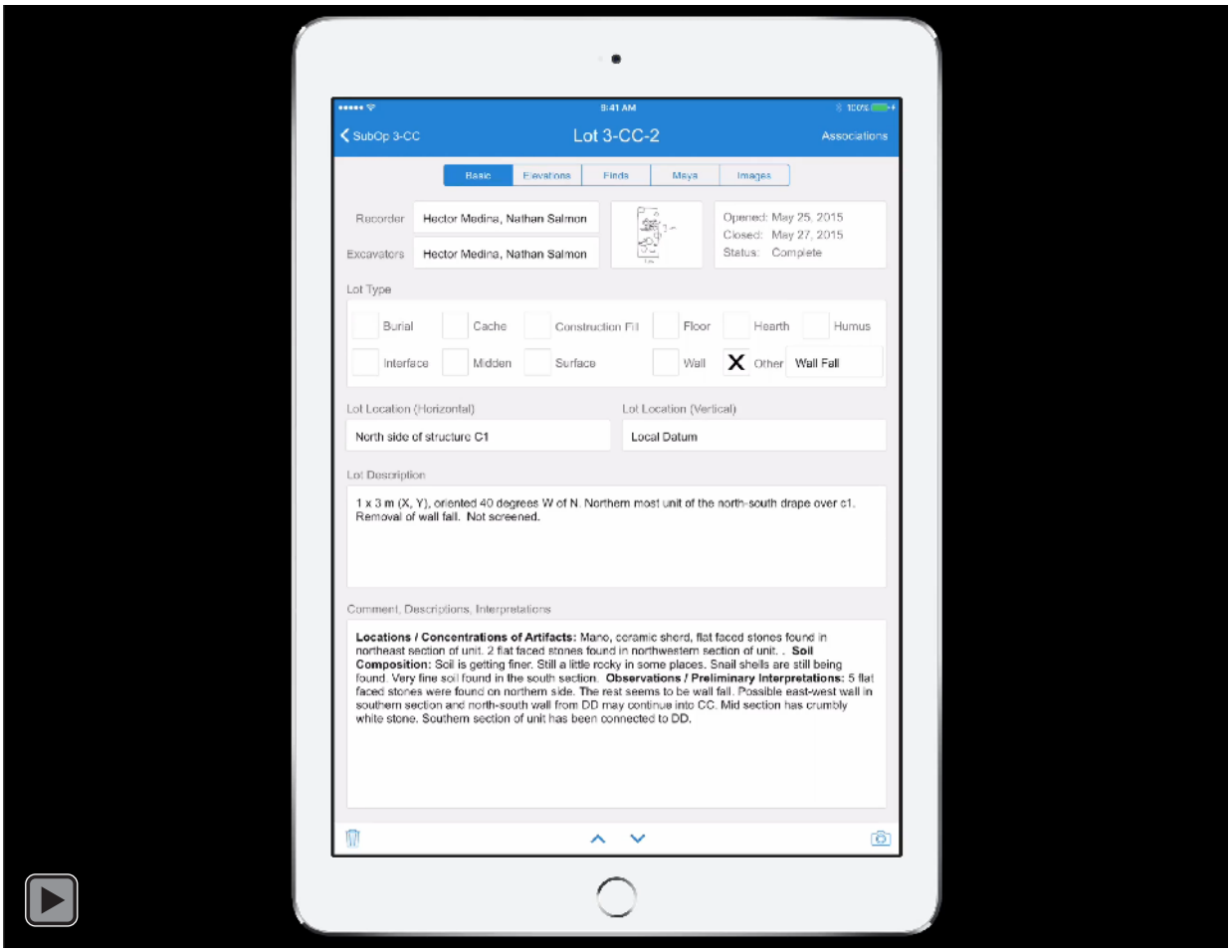

FIGURE 9. Video showing the image handling process in the SKAP database.

taken directly with the iPads, or taken with a DSLR camera and transferred to the iPads in the field with a card reader [Figure 8]), connecting them with appropriate lot records and captioning them, allowing for visual reference as well as preservation and connection of important descriptive information (Figure 9).

FIGURE 8. Using a card reader to import digital photos from a DSLR to an iPad.

We were also interested in impacting the supervisors' workflow in terms of processing of objects and completion of documentation. Our previous field experience has taught us that juggling multiple open units, while supervising graduate students, undergraduates, and workers, can mean that tasks may get overlooked. For this reason, we built in a series of checks that would allow us to actively document when certain elements of our workflow were completed: these included digitally checking off and initialing when a lot was closed, when the paperwork was completed, and when the artifacts were brought from the field to the lab. Additionally, we included a way of flagging particular objects that required additional attention—such as more formal photography or drawing once back in the lab—so that such notes were not left to memory or jotted down elsewhere. These flags could then be turned off once the additional needed action was carried out.

Maya View

Beyond the clear logistical advantages, our project's goal in adopting this digital system was to transform our archaeological

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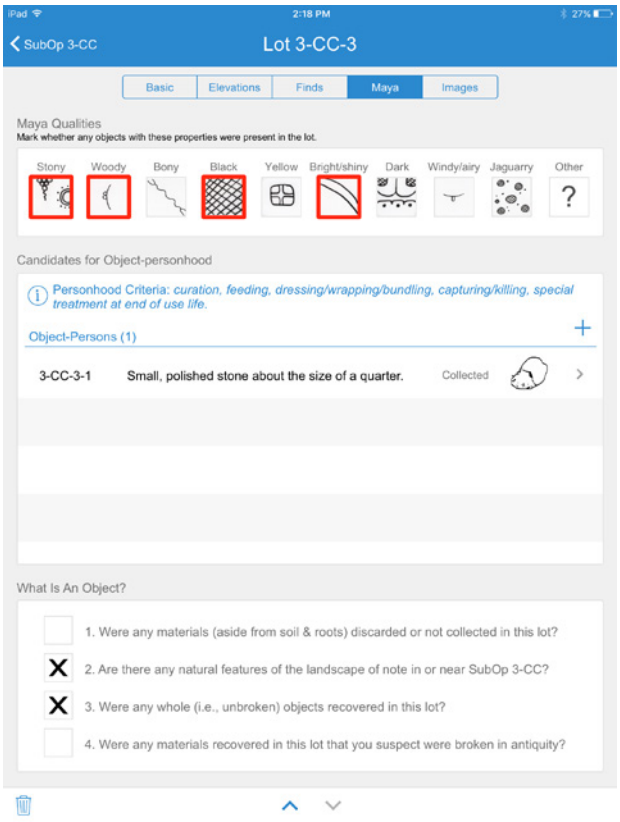

FIGURE 10. The primary Maya view page of a lot form in the SKAP database.

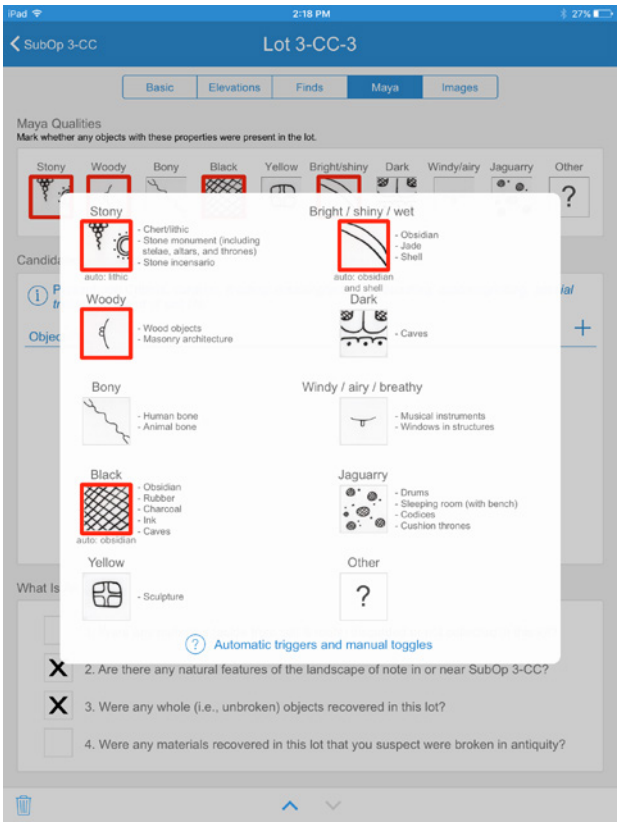

FIGURE 11. Pop-up showing the detailed Maya Qualities section in the SKAP database.

vision by incorporating other ways of seeing and understanding archaeological materials encountered in the field; here is where our database departs more radically from traditional recording. Previous work by both Jackson (2014, 2015, 2016) and Brown (2000, 2005, 2015) has explored the ways in which Maya individuals understood and interacted with the material world in distinctive ways, based on information drawn from hieroglyphic and iconographic data, as well as comparative ethnohistoric and ethnographic sources. Knowing that the ancient Maya labeled objects and features according to their own understandings of their salient properties, our present project employed this historical textual information to create a different way of understanding the archaeological record. For the purposes of our field recording system, we focused on three elements (Figure 10): qualities or characteristics of materials to which ancient Maya individuals would have been attuned (and that might in some cases contrast with the types of material qualities that archaeologists are trained to emphasize) based on hieroglyphic descriptions; the possibility of personhood for certain objects, and how this state might be recognized in archaeological contexts; and what is recognized as an "object" and how we might broach the boundaries of archaeological understandings in this realm.

Qualities of Materials. The first section of the Maya view page invites archaeologists to look at the material record differently. While archaeologists are trained in explicit material qualities that are considered meaningful or important to observe (e.g., artifact technologies—polished stone, chipped stone, ceramic; constituent material—jade, chert, fired clay; size, shape and color, etc.), we can also reconstruct properties and qualities that the ancient Maya would have found meaningful in the material world (see related discussions in, for example, Houston 2014; Houston et al. 2006; Houston et al. 2009; Looper 2003; Plank 2003; Stone and Zender 2011; Stuart 1996, 1997). Based on Jackson's previous work, we used hieroglyphic and iconographic sources to identify nine material qualities and descriptions used by the ancient Maya to describe the same objects and contexts we were excavating; these were incorporated into the database. Some of these are qualities that sound at least familiar to archaeologists (e.g., woodiness, stoniness, boniness), while others are harder for us to imagine or recognize (e.g., bright/shiny/wetness, windy/airiness; jaguaryness). Some of these Maya properties auto-filled from the standard finds page based on recognized associations, such as the connection of obsidian with blackness and bright/shiny/wetness. Recorders could also use manual toggles (accessed through an explanatory pop-up that provided reference and additional information for users [Figure 11]) to encourage the person recording to include additional descriptive detail on a unit (e.g., selecting "woody" to note all contexts found within masonry structures [Figure 12]). These qualities not only recast the ways in which we observe and describe materials and material contexts, but also open the door to looking differently at artifactual distributions and areas of activity or use, based on these additional "types" or categorizations of materials.

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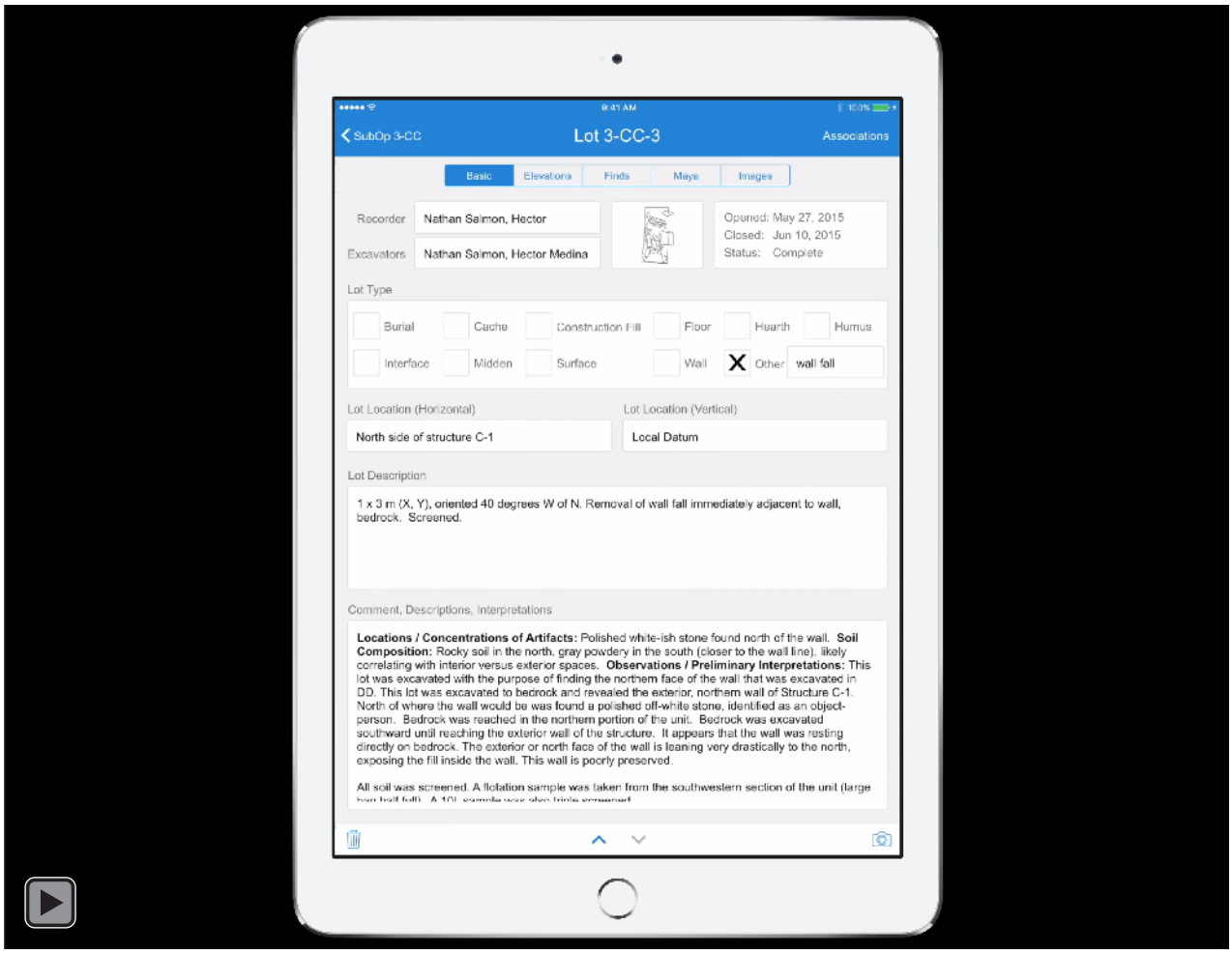

FIGURE 12. Video showing the use of the "Maya Qualities" section of the SKAP database.

Object-Personhood. The qualities section of our Maya view page focuses on artifacts in aggregate (e.g., the presence of "windy" materials in a context); however, we know that the ancient Maya were also interested in specific, powerful objects, particularly special objects that exhibited elements of personhood and could act in person-like ways (e.g., Astor-Aguilera 2010; Brown 2015; Gossen 1994; Hendon 2012; Houston and Stuart 1998; Hutson 2010; Looper 2003; McAnany 1998; Meskell and Joyce 2003; Monaghan 1998). The Maya understood personhood through a relational model in which various types of agents, be they human or not, acquire significance and power through interactions in which they learn how to "act as a person" in mutually constitutive social relationships (Hallowell 1976 [1960]:363). Within such an understanding, objects afforded personhood are treated differently from those not given such a status—for example, they might be fed, clothed, taken captive in war, murdered, etc. The unique social lives of such object-persons can leave distinctive material traces in the archaeological record. Thus, the second section of the Maya view page prompts archaeologists to consider such materials with reference to a list of distinct contexts and unique treatments of objects (Table 2). Excavators are then asked to describe and explain the reason for inclusion of a particular object or feature in this category.

What Is an Object? Finally, we were interested in asking excavators to raise their awareness about some fundamental assumptions about what "counts" as the archaeological record or as artifacts. The third section of our Maya view page expands into a pop-up that asks four questions (Figure 13) that are intended to encourage archaeologists to look more carefully and to raise their heads out of their units and look around (ideas paralleled in Caraher 2013 [2015]), as well as to think about processes by which the objects they found arrived within their unit. Accordingly, excavators are asked first about their choices for collection/non-collection of materials, in recognition of the fact that archaeological ways of looking privilege specific materials as "artifacts," a professional vision that can potentially neglect other material elements (for instance, in the case of the Maya, natural materials that would have been culturally meaningful, such as unmodified chert cobbles, shiny stones, or specially collected/curated items [see Brown 2000]). The second question asks excavators about their assumptions regarding what counts as worthy of recording, with regards to Maya engagement with the natural environment. Additionally, we were curious about exploring ideas of wholeness and brokenness in terms of contrasting Maya and modern, Western ideas about life cycles of artifacts and the different meanings attributed to whole versus fragmented objects; therefore, in the final two ques-

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TABLE 2.

Personhood Criteria	Details
Curation	Is there any evidence that an object has been curated or maintained in a use context over multiple generations?
Feeding	Is there any evidence that an object or structure has been ritually fed with food, drink, blood, fire, smoke, flowers, music? For architecture, this includes subfloor caches in the center of the structure, and offerings at the corners.
Dressing / Wrapping / Bundling	Is there any evidence that an object is/was wrapped or associated with clothing?
Capturing / Killing	Is there any evidence that an object was intentionally broken or mutilated?
Special Treatment at End of Use Life	Is there any evidence that an object was found in an atypical context? Is there any evidence of special treatment prior to final deposition, such as smashing, burning, intentional burying, coating in pigment, etc?

tions we asked recorders to pay particular attention to artifacts that were recovered whole, or artifacts recovered that seem to have been broken in antiquity. In each case, if the person recording checked the box in response to the questions on the screen, they were then asked to provide additional details on which materials were involved, and why they met the criteria in question.

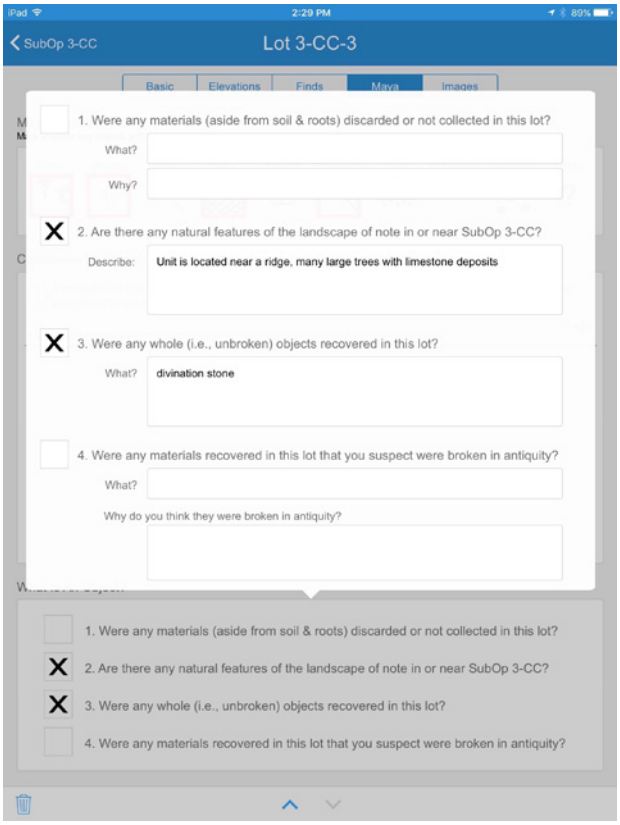

FIGURE 13. Pop-up showing the detailed questions in the "What Is An Object?" section of the SKAP database.

REFLECTIONS AFTER THE FIRST SEASON OF USE

Logistical Advantages

Like other researchers (e.g., Fee et al. 2013; Roosevelt et al. 2015; Toumazou et al. 2015), we noted multiple positive impacts to the archaeological recording process through the use of the digital database. Rather than reiterating these logistical advantages, we briefly highlight here a few specific observations related to changes we noticed in how we conducted our archaeological work.

We particularly noted the value of our digital recording system as a memory aid for excavators and supervisors. As on traditional paper forms, fields within the database prompted excavators to enter specific types of information in particular places. However, project members also routinely used the database to automatically generate documentation needed during recording, such as the information needed on artifact bag tags, dates, and lot numbers. The project directors relied on our digital flagging system to be certain that all tasks were completed and to easily recall items needing attention (such as a special find requiring an in-lab photograph). Additionally, the fact that information could be integrated into the database in the field (versus later) meant that crucial details were preserved in the moment. We especially noticed this with the abilities of our database to handle photographic imagery. As noted above, photographs taken in the field were instantaneously linked with their appropriate excavation unit and lot. Reliance on these digital elements, each of which incrementally eased the burden of paperwork and the number of details to be kept track of, helped to free time for the additional layer of recording that our Maya view page involved.

At the same time that we relied on the database to support and facilitate our individual recording tasks, we also observed that it better unified project members in terms of data sharing and data availability. In practical terms, our use of the database involved important regular integration of data. When we were in the field camp in the evenings, we synced the data collected on each individual tablet using a laptop computer (for the syncing method, see Wallrodt 2011a, 2011b), and all iPads were updated with the latest data, allowing project members to access the most recent excavation records from all units. Furthermore, by regularly syncing the iPads, we created secure backups of the latest versions of our excavation records, thereby eliminating recording mishaps typical of paper-based recording, such as lost or damaged excavation forms. Intellectual and interpretive collaboration was facilitated for project members by making information sharing easy (and expected): the availability of data updated daily on the iPads to everyone streamlined the exchange of information and allowed project members working

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in different areas of the site to be up-to-date on investigations happening elsewhere. For us, this was especially important because we were excavating in multiple, separate locations; we were easily able to stay abreast of developments with separate patio groups.

We also benefited from the flexibility of the digital format, which is notably capable of change in contrast to paper forms; this encouraged us to continue to tailor the database to our needs in an evolving fashion. For example, on the standard recording pages, we were able to modify categories of data in the field as needed, in our case, artifact counts (information typically added later, in the field camp lab) and information pertinent to botanical flotation samples, both of which were added to the digital form while we were in Belize, based on priorities identified as excavations continued. Taking advantage of this malleable element of the database was made possible by ongoing collaboration with Motz, who came to the field with us; we found that our conversations with him prompted subtle but critical clarifications of the conceptual structure behind the data. Contrary to what Jackson and Brown might have imagined at the outset of this collaboration, the process is ideally not one in which an imagined product is described to a digital specialist, built, and then returned as a finished piece.

While our emphasis in this article is on digital shifts in the field, we also note that our digital database has eased our workflow back in the United States. The paper versions of all forms required by the Belize Institute of Archaeology were easily generated with the click of a button, with the additional benefit that descriptions entered by excavators were standardized and legible (Figure 6). The database is now hosted online through the Department of Classics at the University of Cincinnati, which has allowed ongoing collaboration between the project co-directors and staff who live in different parts of the country; we are also able to grant read-only access to students and scholars interested in accessing or learning from our data.

These elements are—we believe—convincing ones in terms of the positive impacts of "going paperless." However, our emphasis in this article is on a "grander challenge" (per Huggett 2015b): to explore the shifts possible through digital technology in how we perceive sites and materials while in the field. We turn to observations on these shifts now, illustrated with specific examples from our season but framed in terms of broader observations relevant to archaeologists working in other contexts.

Shifts in Perception

One of our focuses in this first season of using our digital recording system was on shifting perspectives and experiences *in the field*. We want to emphasize that the shifts in doing archaeology that we discuss below—in seeing the site and artifacts through multiple material frameworks—are rooted in the field and are not results that could just as easily be accomplished as post-season afterthoughts. Rather, the use of our database changed how we observed and documented data in the field in structured ways. Part of our daily archaeological practice became regular movement between culturally informed views of the materials that passed through our hands and that we described, photographed, and drew.

Some of these shifts involved not the Maya view, but rather the in-field integration of data types that characterizes the database, which can force archaeologists to look carefully in the field and potentially clarify what they see and how they are interpreting it. For instance, Jackson took a photo of a complex set of layered floors and related architectural elements internal to a structure in Group C; in writing her caption while looking at the photo she had just taken, she realized that the image she had captured did not convincingly support the interpretation she was providing in the caption. As a result, she was able to stop and reexamine the floor sequence and subsequently modify her understanding of the architectural elements. The database prompted a re-evaluation, a process of second looking, while in the field.

Beyond such processes of looking carefully, our goal was to shift our ways of seeing in more profound ways, by decentering the ways of archaeological looking that are so familiar to us. Significantly, the recording process—especially in the Maya view page of the database—acted as a structured guide, instructing project members in how to see and yielding standardized ways of collecting multiple, diverse datasets. The act of following the "instructions" of the database bent our observational powers in particular directions. This process was powerful as a way of teaching novice archaeology students and also productively challenging expert project staff members to make documentation of multiple material perspectives regular and systematic.

The database helped us to see artifacts differently by providing alternate ways of characterizing and contextualizing them. The qualities on the Maya view page gave us language for describing and categorizing objects in different ways (e.g., volcanic glass blades as "obsidian" on the standard page, or, in the Maya view, as objects that are "black" and "bright-shiny-wet"; standing stone architecture as "masonry" versus "woody" and "airy"). These different material lenses suggest that reorganizing information can challenge us to understand it differently. For example, this mode of documentation offers the ability to compare excavated structures in terms of the artifact qualities present within each building and also differential combinations or juxtapositions of artifact qualities represented. While these qualities could be added to a database after the conclusion of the field season, awareness of artifact distributions in the field—as seen through Maya categories—can impact in-field decision-making, such as the locations of test units to explore spaces not otherwise apparent. While still nascent, a clear next step for our digital documentation will involve the integration of spatial analysis with Maya view data. For instance, we anticipate that in-the-field plotting of the distribution of artifacts according to Maya characterizations will allow us to see otherwise unseen activity areas and spaces (see Huggett's [2015a:91] related critique of the Western perspective encoded in GIS spatial models). Working together with our spatial analyst, Dr. Joshua Wright (University of Aberdeen), we plan to automate these representations in future seasons so that they can be created in near real-time in the field, and not just as a result of separate spatial analysis or visualization; this would allow the technological abilities of the digital system to provide evolving differential visions of the site as excavations unfold.

We also observed that elements of our Maya view pages primed students and staff to react differently to particular materials. Within a likely ritual structure in Group C, we discovered two

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large metates (grinding stones), left overturned on the final phase floor within two rooms. These objects clearly fall within commonly recognized "termination deposits" in Maya contexts (see, e.g., Mock 1998, Newman 2015), part of the ritual and social "closing" or decommissioning of a space. Questions in the Maya view of our database, however, prompted us to recognize these metates as likely candidates for object-personhood, based on their distinctive end-of-life contextual treatment. This identification caused us to see the entire structure (which until that point had seemed to be a primarily residential multi-room space) in a different light: we were ready to approach prosaic ceramic sherds subsequently encountered on the floor in another area of the structure with extra caution and attention. Indeed, as indicated by further excavation, these sherds appear to be parts of smashed vessels deposited as offerings above a sub-floor intrusive burial, additional elements of the apparent ritual focus of the building (see Jackson and Brown 2016).

The question on the Maya view page about wholeness versus brokenness similarly caused us to perceive our excavations differently, prompting excavators to pay attention to the position of materials in their object life trajectories (i.e., acknowledging them as changing versus static), observations which make space for known Maya valences associated with different states of objects (see, for example, Deal and Hagstrum 1995, Houston 2014, Hutson and Stanton 2007, Just 2005, O'Neil 2012). These questions allowed us to identify a related series of broken materials within several different structures in Group C of our site: multiple fragmented pots that were laid as offerings on the final phase floor of a structure (mentioned above), multiple sitting benches and floors that had been broken through and then subsequently repaired in order to deposit burials, and a bundle burial which involved the disarticulation of a body. Viewing these diverse materials and contexts as a related group—of broken stuffs—redirected our thinking about the function of structures in the site and sharpened the functional contrasts we had hypothesized between groups of structures in the different patio groups we were investigating (e.g., Group A versus Group C).

We also observed changes in our view of the landscape outside of active excavations and how it was incorporated into our understanding of the site. Certainly, archaeologists are accustomed to surveying the landscape and routinely document contexts outside of their units. However, due to the questions asked about landscape on the Maya view page of each lot form, this awareness was more systematic, with project members consistently asking questions and recording information about space and environment outside of the plaza groups we were excavating and discussing environmental factors like the persistent pleasant breeze at our hilltop location (echoing anthropological engagement with phenomenological awareness of local constructions of place [e.g., per Merleau-Ponty 1989]). We were prompted to rethink what we included in the cultural landscape as we mapped the site and, as a result, focused ongoing mapping not only on architecture, but also on caves, prominent outcrops, and hilltops in the vicinity. In these ways, prompts such as the queries in the database served to direct and increase awareness in the field, shifting resulting conversations and related questions. Significantly, this shifted awareness impacts the data types and content that were recorded by excavators—information that cannot simply be added later, during post-season activities.

As a result of daily interaction with the digital recording system and its structured requirements of seeing (and recording) materials through multiple lenses, project members were more actively aware of their relative position—as individuals and as members of a particular group (modern, Western archaeologists), trained in particular ways of seeing. Our digital emphasis on specific Maya material qualities led to greater attention to our own perceived qualities of artifacts (including multiple types of focused sensory engagement with individual artifacts—how do they feel; how do they look in different lights?) and greater awareness of the archaeological engagement with multiple life stages of artifacts (including conversations about treatment of artifacts in the field and longer-term housing decisions). While more abstract, a conceptual type of collaboration permeated unit-side conversations this season, in which staff and students alike were notably aware of and curious about Maya perspectives on the materials and spaces being uncovered. Discussion of both ancient inhabitants and also modern descendant communities created a sense of connection and partnership with the culture we were studying and sparked nuanced conversations about the ethics of artifact storage and display, complexities of local looting in developing nations, and issues of archaeological training and privilege.

FINAL THOUGHTS

At the opening of this article, we noted that paperwork works in powerful ways to articulate, and even shape, our assumptions. Making changes in archaeological recording practices, then, offers a key opportunity to shift or modify these ingrained professional practices and ways of seeing. While we can use digital tools to make our field life more comfortable through numerous technical advantages, we can also use them to productively make ourselves less comfortable in our perceptions of sites and artifacts. In using the database, we found that the Maya view was powerful in decentering Western assumptions and allowing us to see alternative perspectives. Significantly, using the ability of a digital recording system to seamlessly and flexibly switch between views makes the incorporation of non-Western views integral and gives equal footing to professional archaeological ways of understanding the archaeological record and indigenous visions of this material.

This making of space is an important move in committing to multivocality and inclusivity of indigenous concepts in our archaeological interpretations**.** As archaeologists are increasingly challenged to make our work relevant to diverse populations, we need tools with the ability to create openings for the multiple voices inherent in understanding the past. Relational digital databases can be employed as an active tool in collaborative and indigenous approaches focused on "epistemologies of inclusiveness" (McAnany and Rowe 2015:2) in diverse contexts; these issues are currently at the forefront of many scholarly conversations in archaeology (see discussions in Atalay 2006; Lippert 2006; McAnany and Rowe 2015; Nicholas 2010; Watkins and Nicholas 2014). We envisage that archaeologists working in various regions may adapt the real time linking of very different ways of seeing the archaeological record for their own research purposes.

https://doi.org/10.7183/2326-3768.4.2.176 Published online by Cambridge University Press

Acknowledgments

The research discussed in this article was generously funded through grants made to Jackson by the Wenner-Gren Foundation (Post Ph.D. Research Grant—Grant 9001), the National Geographic Society/Waitt Grants Program (Grant W377-14), and the Taft Research Center at the University of Cincinnati; we are grateful for all of their support. We also acknowledge important assistance from the Department of Anthropology and the Department of Classics at the University of Cincinnati. The fieldwork carried out in Belize was made possible by Dr. Fred Valdez, the Programme for Belize Archaeological Project (PfBAP), and the Belize Institute of Archaeology (IoA), under a permit granted to Dr. Valdez, Director of PfBAP, by the IoA (permit number: IA/H/2/1/15 (11), valid through December 2015); we are very grateful for the opportunity to conduct archaeological research in Belize. The archaeological work described was conducted according to all conditions of the permit. Thanks for support with specific elements of the project go to Dr. Joshua Wright, John Wallrodt, and Miriam Rothenberg, as well as the staff and students of the Say Kah Archaeological Project, who enthusiastically embraced our recording system. We are also grateful for the assistance of Dr. Leila Rodriguez, who edited the Spanish abstract. The arguments and observations in this article have been significantly improved through the thoughtful feedback of four anonymous reviewers; we appreciate their comments and suggestions.

Data Availability Statement

Our database, described in this article, and the complete data from the 2015 Say Kah field season, are hosted on a server in the Department of Classics at the University of Cincinnati. Read-only access to a demo version of the online database can be granted to interested parties.

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https://doi.org/10.7183/2326-3768.4.2.176 Published online by Cambridge University Press