[Lai, C., Yang, J., Chen, F., Ho, C., & Chan, T. (2007).](http://mkoehler.educ.msu.edu/protectedreadings/HybridPhd/lai_et_al_2007.pdf" \t "_blank) Affordances of mobile technologies for experiential learning: the interplay of technology and pedagogical practices. Journal of Computer Assisted Learning, 23(4), 326-337. doi: 10.1111/j.1365-2729.2007.00237.x.

**Theoretical Perspective**

**Critique the author’s conceptual framework:**

Lai, Yang, Chen, Ho, & Chan prime their study with a brief introduction to experiential learning theory. Their introduction covers it's history, from Dewey to modern day application with the G1:1 and M-Learning Project (p. 326). Their study entitled "Affordance of Mobile Technologies for Experiential Learning: The Interplay of Technology and Pedagogical Practices" soon thereafter identifies Kolb's experiential learning theory (ELT) as the main theoretical construct (p. 327). As the authors state, Kolb's theory remains influential and relevant (p. 327). Impressively, the experiment's learning flow stages (p. 328 - 329) seem to follow - loosely - the four adaptive learning stages of ELT. The Sensory Experience stage aligns with the ELT stage of concrete experience. The Question Proposing stage aligns with the ELT stage of abstract conceptualization, as a second example.

The authors acknowledge the limitations to experiential learning. As Lai et al note, McMullen and Cahoon (1979) identified two weaknesses with experiential learning. They are, (1) focusing awareness and (2) abstracting from experience (p. 327). In response, Lai et al "will design a system to eliminate such weaknesses by utilizing mobile technologies and investigate the affordances of such technologies in experiential learning" (p. 327). Considering the thorough review of ELT, their acknowledgement of limitations, and the attempt to address each limitation, the theoretical framework is substantive.

There are many "hypothesis-like" statements well before the hypothesis is properly stated on page 330. Consider the following: "Thus our purpose is to…" (p. 326); "In our study…then the concept of…" (p. 327); "We will...investigate the affordances of" (p. 327); "Therefore, in this study…" (p. 328); "In this study, we develop…" (p. 328); "As the major goal of this study…" (p. 329). These statements overly complicate and fragment the introdution.

**Comment on the need for this study and its importance:**

A reader today will note the dated nature of the study - PDAs are arguably "dated" However, the study is a logical addition to an already proven and relevant theory. If a report/study/experiment is not intuitively relevant or with potential, the reader lacks interest or intrigue. The basic nature of the hypothesis - *can technology increase knowledge creation through experiential learning -* is absolutely relevant (p. 330). While slightly dated today, it was undoubtedly timely in 2007.

 Further, Student acquisition of knowledge is an important aspect of the teaching environment.  Authentic, self-directed learning experiences, although touted by many educators an effective tool for meaningful knowledge acquisition, difficult to structure effectively. These well-intentioned activities often result in confusion or frustration on the part of the student.  Also, students may unintentionally depart from the intended teaching objectives. This study proposes integration of mobile technologies in order to scaffold experiential learning through accessible, real-time, interactive support.The authors do substantiate these points in the section "Support System for Experiential Learning" (p. 329).

**How effectively does the author tie the study to relevant theory and prior research?**

The documentation of relevant theory is substantive. Lai et al sought to address the limitations of their theory with intentional experiment design. They also connect to existing research (Curtis *et al.* 2002; Kynäslahti 2003; Ogata & Yano 2004) stating that utilizing computing power and wireless capability, mobile technologies facilitate more meaningful, useful, accessible and applicable learning experiences.

However, the discussion of theory and prior research seems to only focus on experiential learning. Was there consideration into other theoretical constructs?  They fail to introduce or refute studies that argue against experiential learning as the most pedagogically effective method. In effect, they offer only the research that supports ELT as the most educationally sound instructional delivery method.

Secondly, what research on PDAs/tech with ELT existed prior to this study? Lai et al reference the MOBIlearn Conference but barely discuss any research or findings (p. 327). Three other articles claim mobile technologies as being helpful on field-trip-based and outdoor learning (p. 327). However, there was again no clear and specific tie-in to ETL.

**Evaluate the clarity and appropriateness of the research questions or hypotheses:**

What Lai et al claim as the hypothesis is clear and succinct. Further, the hypothesis seems to align with the theoretical construct of the experiment. Two particulars add value - the intentional use of "knowledge creation" signals the type of learning (p. 330) and the comparative nature aligns with the methodology used  - "more than” paper and pencil (p. 330).

Interestingly, the word "affordances" was omitted. While this concept & word are clearly addressed throughout the study, it was not included in the hypothesis (p. 330). I believe this obtuse term was omitted to simplify.

Of note: the learning flow was assessed as part of the experiment but noticeably not included in the hypothesis. We discuss this point further in critiquing the experiment design.

**Research Design and Analysis**

**Critique the appropriateness and adequacy of the study’s design in relation to the research questions or hypotheses.**

The Lai et al study was a weak quasi-natural experiment (as defined by Remler & Van Ryzin, 2011) and can also be classified as a nonequivalent group design. The two classes were similar in gender and size. One class used PDAs whilst the other used paper and pencil - harkening the hypothesis. As a control, the same teacher taught both classes. While inferred, the timing of instruction is not addressed. Did the scaffolding exercise and/or experiential learning activity include both classes simultaneously?  This specificity is needed.

The experiment was a before-after assessment. Accordingly, a pre- and post-test were appropriately administered (p. 330). This test measured the knowledge creation of the two classes. Lai et al explicitly state the use of one-tailed t-test (p. 331).

To measure the affordances with the technology, a 37-point questionnaire was administered. To account for validity, one trick question was included. The questionnaire utilized a 5-point Likert scale, with some open-ended responses.

The experiment and hypothesis only partially reflect one another. The hypothesis addresses two succinct items - knowledge creation and affordances. The experiment does cover these two items, and also assesses the learning flow design of the experiment. While the learning flow is the pedagogical framework of ELT, it is assessed and discussed in equal consideration to the affordances and knowledge creation. The hypothesis could have better reflected this aspect of the experiment.

**Critique the adequacy of the study’s sampling methods (e.g., choice of participants) and their implications for generalizability:**

The study used a convenience sample of two fifth-grade classes comprised of 66 students; 32 boys and 34 girls. This study is therefore generalizable to other students of similar age.  Extrapolation of results to middle or high-school-aged students may be problematic.

There is little discussion or background on these classes. Too many questions are unaddressed. Why these two classes? What are the demographic details? Even the geographic location is unstated. There is reference to Taiwan on page 330. Were these students Taiwanese?

Most notably, two unaddressed questions greatly hinder the validity of the study:

1. How have the classes performed scholastically prior?

2. Could prior academic performance have predicted the results, as observed?

These vital & unaddressed questions nearly preclude comment on the generalizability.

**Critique the adequacy of the study’s procedures and materials (e.g., interventions, interview protocols, data collection procedures).**

The experiment was properly administered. Pre- and post-test assessments, intentional learning flow, and remedial instruction (how to use PDA use) aided in the study’s efficacy. The questionnaire supplemented the knowledge creation data. And, the qualitative comments added depth to the findings.

 The PDAs support interfaces for teachers to design prompts and support materials. This functionality is vital to the process of ETL, but is also limited by the teacher’s ability to design, frame, input and format student support resources.

Of note: Lai et al acknowledge tech problems with the PDAs (p. 333). These were arguably unpredictable or unavoidable. We discuss this further under limitations.

**Critique the appropriateness and quality (e.g., reliability, validity) of the measures used.**

The findings do align with the hypothesis; there exists an argument for the use of mobile technology with experiential learning. The study has face validity and there exists convergent validity when considering the knowledge creation data and attitude/experience data (p. 331 & p. 334, respectively).

However, two issues greatly hinder the validity. Had prior performance of the classes been discussed, the content validity would be been substantiated. Secondly, a predictive validity quotient would project similar findings if a second experiment had been performed - with the classes "switched". If the findings were valid, the previous "without PDA" class would perform as the "with PDA" class had originally.

The validity of student responses was determined using a “trick” question. A single question may be insufficient to properly assess truly reflective responses. Further, 11 of 66 student questionnaires were deemed invalid because they failed the single "trick" question (pg 332). This effectively eliminates data from one-sixth of student participants.

**Critique the adequacy of the study’s data analyses. For example: Have important statistical assumptions been met? Are the analyses appropriate for the study’s design? Are the analyses appropriate for the data collected?**

The analysis prose is delineated by each measure: knowledge creation, mobile technology, learning flow, etc. Each section reviews quantifiable and qualitative data. The qualitative feedback concretely shows the creation of knowledge - italicized in the student responses (p. 332).

Each section reviews the statistically significant findings whilst acknowledging those that were not significant (p. 333). The author’s analysis is supported by simple, seemingly accurate tables. Each table clearly notes the test applied – Table 3 notes the use of a one-tailed Mann-Whitney U-Test (p. 333). As a critique, the aggregate data is undocumented and no discussion of an outlier exists.

**Interpretation and Implications of Results**

**Critique the author’s discussion of the methodological and/or conceptual limitations of the results:**

Lai et al state, "as far as knowledge creation is concerned, students with PDA outperformed the students without PDA" (p. 335). This assessment links well to the hypothesis. Was mobile technology "better than" paper/pen in terms of knowledge creation? Yes – based on their data alone. The discussion that follows reviews their broad findings while also addressing some surprising findings, such as the lack of motivation during the observation stage (p. 335). Specifically, many of the “with PDA” students lost interest once the picture-taking stage was completed, while the “without PDA” students demonstrated more sustained attention and engagement in the process.

The authors do not state any limitations to the study. They should have stated the issues with voice recording, exterior noise, and “user-friendliness” of the technology interface (p. 335). Also, comparisons between students’ photos and sketches were made rather than utilizing standard library photos, possible decreasing accuracy

**How consistent and comprehensive are the author’s conclusions with the reported results?**

As stated earlier, the aggregate data is not provided by Lai et al. Numerous qualitative comments in the analysis section are critical of the technological affordances (p. 333 & 335).

Although the authors consistently addressed the reported results, no specific commentary spoke to standard deviation on the t-test compared. The standard deviation on table 2 (t-test) seemed somewhat high in comparison to the means shown.

**How well did the author relate the results to the study’s theoretical base?**

Lai et al do relate their discussion/analysis to the base.  The authors concluded that the students with PDA created more knowledge than did the students without PDA (p. 335). Furthermore, the authors address the two limitations associated with ELT and proclaim that technological affordances do complement the pedagogical considerations (p. 335).

**In your view, what is the significance of the study, and what are its primary implications for theory, future research, and practice?**

In my opinion, this is a small, if almost insignificant, addition to the research on technology use with experiential learning. Teachers are struggling to stay abreast of new technologies and integrate them into their teaching and learning as efficiently as possible. This study supports the educational theory that technology integration, when combined with experiential learning, has the potential to foster creation of knowledge more effectively than conventional instructional methods.

 Lai, C.-H., Yang, J.-C., Chen, F.-C., Ho, C.-W., & Chan, T.-W. (2007). Affordances of mobile technologies for experiential learning: the interplay of technology and pedagogical practices. *Journal of Computer Assisted Learning*, *23*(4), 326-337.

Remler, D. & Van Ryzin, G. (2011). *Research Methods in Practice: Strategies for Description and Causation.* Thousand Oaks, California. Sage Publications.