



Research Report 1975

**Army Instructors' Use of Mobile Devices in the
Infantry Advanced Leaders Course**

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**United States Army Research Institute
for the Behavioral and Social Sciences**

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**U.S. Army Research Institute
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ARMY INSTRUCTORS' USE OF MOBILE DEVICES IN THE INFANTRY ADVANCED LEADERS COURSE

EXECUTIVE SUMMARY

Research Requirement:

Access to mobile devices has the potential to increase the availability of information and training tools, reduce dead time during training, and allow for a greater range of tools and training approaches. In view of this observation, the current effort investigated the potential utility of supplying not students but instructors with mobile devices to be used in conducting training. That is, can mobile devices and applications (apps) assist instructors in functioning as facilitators? Providing instructors with mobile devices could have many positive effects such as providing access to required materials while assisting individual learners throughout the training site, either in a classroom or in a field location.

This project explored the use of mobile devices to assist instructors as their role moves from that of transmitting knowledge to learners in a lecturing capacity to that of a facilitator of learning in a non-lecturing capacity. In particular, it aimed to address the suitability and usability of current and emerging mobile technologies for Army instructors transitioning to facilitators.

Procedure:

A thorough review of the state of mobile devices and potential mobile apps was conducted. U.S. Army Maneuver Center of Excellence Henry Caro Non-Commissioned Officer Academy (NCOA) Infantry Advanced Leaders Course (ALC) instructors utilized selected mobile tablets during three separate iterations of the course. Instructors were trained prior to utilizing the tablets, which were preloaded with all course files and potentially relevant mobile apps. Instructors were told to utilize the tablets as much or as little as they felt the tablets to be useful, and were asked to submit weekly feedback regarding how often and in what ways the devices were utilized during training. For the first iteration, members of the research team were present to address any potential concerns or difficulties that the instructors may have had. A debriefing session was conducted at the conclusion of each course iteration during which instructors provided feedback regarding ways to improve the experience of using tablets as Army instructors, and advantages and disadvantages of using the device while instructing.

Findings:

Instructors had mixed feedback regarding the potential utility of computer tablets for implementation. Although some instructors indicated many benefits of using the tablets, other instructors did not see any particular advantages over laptop computers and were frustrated by the incompatibility of the tablets with parts of the existing Army classroom technology infrastructure. Overall, instructors saw some promise for the future potential of tablet devices for instructor use, but encountered difficulties utilizing them in the extant Army technological infrastructure. Instructors did recommend issuing students tablets in place of the current Army-issued laptops for ALC students.

Utilization and Dissemination of Findings:

Findings were informally briefed to the NCOA ALC course leaders. Findings from this research will also help guide and inform decision makers about pitfalls and advantages of utilizing mobile devices in the classroom. As classroom technology infrastructure changes, decision makers can incorporate new technology to account for the unique advantages of tablet computers.

ARMY INSTRUCTORS' USE OF MOBILE DEVICES IN THE INFANTRY
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Army Instructors' Use of Mobile Devices in the Infantry Advanced Leaders Course

Introduction

The Army's Training and Doctrine Command (TRADOC) is aggressively pursuing a "Campaign of Learning," encompassing a broad set of initiatives to produce an Army capable of rapidly adapting to defeat unforeseen threats. A central tenet to the Campaign of Learning is rebuilding the Army's conceptual foundations, starting with the Army Capstone Concept (ACC) (U.S. Army Training and Doctrine Command, 2009). The ACC identifies the substantive adaptations the Army must make in leadership, training, learning, and organizing. The document ties specific strategies with important investments and goals.

A counterpart document to the ACC focused specifically on training and learning is the Army Learning Model (ALM, previously denoted as the Army Learning Concept for 2015, ALC 2015) (U.S. Army Training and Doctrine Command, 2011). The ALM describes a learner-centric, technology-enabled learning environment that reflects an understanding of the preferences of digital age learners for relevance, feedback, and collaboration. One of the key themes of the model is to increase "the rigor, relevance, and effectiveness of face-to-face learning experiences in schoolhouses through instructional strategies that maximize the effectiveness of limited resident learning time" (p. ii). ALM prescribes that the focus of Army instruction move from being instructor-centric toward being learner-centric by 2015. Within this move, the function of the instructor is to shift from that of transmitting knowledge in a directive, prescriptive manner to learners to that of facilitating learners' self-paced, self-motivated and active participation in the acquisition of knowledge. To implement such strategies, Army instructional practices must become more responsive to individual student needs and more representative of social learning contexts (U.S. Army Training and Doctrine Command, 2011). Institutional courses must implement training strategies that maximize the training that can be conducted in the available time without compromising standards or reducing skill retention.

One initiative outlined by the ALM is to increase individual Soldier responsibility for learning and to provide training materials to Soldiers at the point-of-need. In doing so, the ALM calls for equipping Soldiers with mobile devices and applications to provide ready access to information and technological tools that foster learning. The intent is to provide Soldiers the ability to access materials, to study, and to increase knowledge when and where desired, especially outside the classroom setting. Access to mobile devices has the potential to increase the availability of information and training tools, reduce dead time during training, and allow for a greater range of tools and training approaches.

Various Army entities have developed applications (apps) for mobile devices, and informal repositories for these apps are available to Soldiers (e.g., "MCoE Mobile Applications," 2013). To date, these apps tend to fall into three categories: individual training, access to reference material, and job aids.

Potential of Mobile Devices to Aid Army Instructors/Facilitators

Although the Army has a growing interest in and has been exploring Soldier use of devices and applications to enhance and distribute the learning environment for individual learners, there has been little to no consideration given to the potential benefits available to instructors. In view of this observation, the current effort evaluated the utility of supplying instructors with mobile devices to be used in conducting training. That is, can mobile devices and applications assist instructors in functioning as facilitators?

Providing instructors with mobile devices could have many positive effects. These devices could provide access to required materials while assisting individual learners throughout the training site, either in a classroom or in a field location. Doing so would strengthen the focus of a learner-centric environment by encouraging students to shoulder greater responsibility for their learning, while simultaneously assisting instructors in their role as facilitators and allowing them to tailor instruction, provide quick feedback, and identify answers to student questions via additional electronic resources. The instructor would need the capability to access instructional materials while away from a central computer location and even while facilitating training in a field location. To implement this capability, the institutional instructor can no longer be tethered to a podium or be behind a desk, but must have the ability to circulate among students while still having ready access to training materials and necessary references. The instructor can exploit the capability for on-the-spot information to assist learners and provide personalized feedback.

This project explored the use of mobile devices to assist instructors as their role moves from that of transmitting knowledge to learners in a lecturing capacity to that of a facilitator of learning in a non-lecturing capacity. In particular, it aimed to address the suitability and usability of current and emerging mobile technologies for Army instructors transitioning to facilitators.

A facilitator must be able to tailor interactions to specific learners' immediate needs rather than to deliver standardized one-size-fits-all training to all learners in a course. In particular, while learning materials and technologies in the formerly instructor-centric environment could be conveniently planned, situated, and choreographed they must now be provided on an as-needed basis in response to the progress and direction that learners may take during the course of a period of learning. Because it is challenging to prepare materials fully accounting for all possible directions learning may take, having access to training materials and information on the fly as the need arises becomes even more important. The untethered facilitator requires on-the-spot capability to conveniently access support materials (references, briefing slides, etc.) to facilitate each learner's acquisition of knowledge and also the capability to provide personalized feedback, all within a blended learning environment. This capability can be greatly enhanced by the use of mobile devices capable of displaying learning materials (e.g., charts, diagrams) and recording and playing back learners' activities (e.g., after action reviews).

Accordingly, this project sought to examine instructor's use of a mobile device as an aid to instruction and student interaction based activities. The instructor participants were a sample of the instructional cadre then assigned to the Henry Caro Non-commissioned Officer Academy MOS 11B Advanced Leaders Course at the Maneuver Center of Excellence, Fort Benning, GA.

The project involved two phases: (1) identifying a mobile device whose technical functionalities and capabilities most closely matched instructor requirements and preferences for conducting classes as facilitators and (2) an implementation phase wherein instructors utilized the mobile device while conducting their courses and provided feedback on how the mobile device and applications were used, difficulties they encountered, and recommendations for enhancing the mobile device capability to better assist them as facilitators.

Method

Identification of Desired Device Capabilities

The project's first phase involved determining the required device capabilities. In order to provide instructors with a mobile device that would fit their needs and desires, researchers interviewed nine instructors (both active duty military and civilian contractors) in small focus groups. These first phase participants included instructors who conduct the ALC course as resident instructors only at Fort Benning, GA, as well as instructors who conduct the course both at Fort Benning and as members of a Mobile Training Team (MTT) at multiple Army installations.

Interview questions covered four major topics addressing existing instructional approach and projections of how mobile devices might be used in the classroom (see Appendix A). The first set of questions addressed how the instructors prepared for and conducted blocks of training, including both classroom training and field environments, such as firing ranges. The questions inquired what blocks of training were particularly difficult, as these areas could require more remedial training or the ability to be responsive as a facilitator to assist students in the learning process.

The second section inquired about instructional materials that are typically available and used such as lesson plans, handouts for practical exercises, and reference documents. The intent was to identify the extent and type of instructional materials instructors needed so that ample storage capacity would be provided on the mobile device to hold these materials, and also ensure that the devices were equipped with appropriate applications to utilize the files.

The third set of questions asked about the instructors' typical computer and mobile device usage, such as word processing, internet browsing, e-mail, games, programming, viewing or creating multimedia, etc., in order to understand their experience and personal preferences including what mobile devices they personally used or would like to use, such as a smart phone or tablet.

Finally, the fourth set of questions asked instructors to identify capabilities and functionality they desired in a mobile device to assist them as instructors/facilitators. The suggested capabilities included areas such as: audio/video capture and playback; communication via phone, walkie-talkie, or e-mail; internet access; networking with other instructors, students, or a local system; desired peripherals (e.g., keyboard, projector); location and motion detection (i.e., global positioning system (GPS) or accelerometer); voice commands; size and weight;

battery life. Instructors were also asked to indicate any applications or software that would be helpful to have loaded on the device.

Exploration of Potential Devices, Applications, and Service Providers

Based upon the outcome of the instructor focus groups, a set of device selection criteria was established (e.g., size, weight, ability to access instructional materials). Device requirements included multiple specified and implied capabilities. Once the overarching capabilities were established, researchers reviewed the technical specifications of devices as they existed at the time,¹ from commercially available vendors.

Two primary concerns driving the selection of the mobile device were suitability of the device and device usability. Suitability pertains to the practicality of the physical characteristics, capabilities and core features available on the devices. Usability addresses the more instructor-specific needs and preferences with the available applications and device's ability to support the training objectives. Cost of required peripherals and network service at the anticipated MTT locations was also considered. Ultimately, the goal was to identify the device that best met the instructors' needs and preferences.

Provisioning the Devices

After selecting the specific device, ten sets of equipment, including multiple adapters and other supplemental items, were acquired and provisioned for use. Appropriate applications, desired software, and instructional materials were loaded on the devices and tested for usability. Researchers developed a brief training session to teach instructors how to use the device's functionality and capabilities for training. This training information was also stored on the device for later reference.

Participants

Fifteen instructors then assigned to ALC were identified to participate in the evaluation. Eleven instructors were active duty Army in the rank of staff sergeant or sergeant first class, while 4 were retired Army noncommissioned officers serving as civilian instructors. The average amount of time served as an ALC instructor was approximately 19 months (range of six to 48 months). Most instructors used computers regularly for work and personal activities and were quite familiar with the functions available. Regarding mobile devices, most participants owned a smartphone and used it to access the internet, check e-mail, manage their events calendar, access social media services, watch videos, and play games. All smartphone users reported using apps on a daily basis. Only a few participants used the smartphone to view documents, and not very often. Participants without a smartphone did have cell phones. Four participants owned a tablet device.

Instructors indicated their "level of expertise" with mobile devices from (1) indicating "I don't know anything about them" to (10) indicating "Others ask me to help them," with an average level of 6.6. Instructors also rated the anticipated usefulness of the device in their role as

¹ The device selection was conducted in the fall of 2011 and winter of 2012.

an instructor from (1) indicating “I think they are a waste of money” to (10) indicating “I believe they will be extremely useful,” with an average score of 4.8 (see Appendix B).

Instructor Train-up

Researchers trained Infantry ALC instructors how to operate the mobile devices. Each of three groups of instructors was responsible for conducting a different iteration of the course: two during an MTT (at Forts Campbell and Knox) and one during a resident course (at Fort Benning). Nine of the 15 instructors used the device for a single iteration of the course, while six instructors used it two or more times.

Before each course, instructors participated in a device training session to learn how to use the devices and their capabilities, and also to familiarize instructors on various apps and provided suggestions for particular blocks of training.

The user manual was loaded on the device and included extensive information on how to use the device capabilities. Various instructional videos were also available on the manufacturer’s web site, demonstrating how to perform myriad functions. The service provider’s website also contained instructional material for using the device.

In demonstrating how to use the device capabilities to assist with various blocks of training, the research team identified blocks of training where the device offered a useful capability that instructors did not already have available with their government-provided laptop computers. Using the actual course material, we demonstrated and explained how instructors could use the device to:

- Use the Google Map app to provide directions: MTT instructors had limited access to actual paper maps of the local training location. They could use the Google Map app to capture an image of the training site and use device tools to mark, highlight and indicate where training events would occur or where students were to meet. This image could then be sent to all students via e-mail.
- Use the Google Map app to construct OPORD graphics: Instructors could capture a satellite image of the local field training location and add graphics to this image in order to brief an OPORD as part of training.
- Highlight a doctrinal publication: Throughout training, students are directed to access doctrinal publications, such as field manuals, typically in PDF file format. The app enabling PDF editing/highlighting aided students studying these files.
- Capture photos: The camera could be used to photograph work completed by a student, which could then be projected for all students to see, facilitating discussion and critique.
- Record video: Students are required to present briefings during the course. The device could record the briefing, enhancing the assessment and critique phase.

Device Usage

Device users submitted weekly feedback (see Appendix C) concerning how they used the device, what applications they used, any issues they encountered, and suggestions for enhancing

the device usability. Device users also participated in a discussion session at the conclusion of each course to offer any further observations or suggestions.

Results

Device Selection

From interviews addressing required or desired mobile device features, the following criteria emerged as the key drivers in making a device selection:

- Size and weight – Device must be small and light enough to be easily carried in the Army combat uniform (ACU) pant cargo pocket, yet large enough to allow viewing by 2-3 students.
- Operating system (OS) – The Army-preferred operating system at the time was Android, and to ensure compatibility with Army-developed applications, other OSs were excluded.
- Memory and files storage – Must have sufficient storage for an estimated 16GB of course material.
- Instructional material management – Instructors must have applications to display and/or edit course materials (e.g., Microsoft Office files, Adobe “.pdf”) to include playback of video embedded in existing course material.
- Pictures and video – Instructors must have the ability to capture, display, and playback images and videos captured during training events.
- Connectivity flexibility – Instructors require the capability to use the device in a stand-alone mode and also have capability to connect to external systems to transfer files and to display images (e.g., television, projectors).
- Battery life – Battery life must be at least 8 hours, given limited access to recharging capability in some field training environments.
- Networking – Devices must provide the capability to communicate among instructors, (e.g. via voice, e-mail or chat messaging).

Candidate mobile devices’ features were reviewed by consulting a combination of third party product evaluation websites, manufacturers’ websites, and network service providers’ sales brochures and websites. Additional device clarification, often on product availability and specific capabilities, was conducted by directly contacting device manufacturers and dealer stores in the projected training site areas.

Since size and weight were significant criteria, we first identified major brand devices that satisfied the basic size and weight requirements. From the devices that satisfied size and weight requirements, the research team identified those devices that met the OS and file storage capabilities. For adequate storage capacity, we checked for add-on storage capability in the form of micro Secure Digital (SD) cards.

Battery life and recharging capability were fairly consistent across the devices considered although advertised battery life varied significantly as a function of usage type such as stand-by mode, watching videos, or normal usage. All devices provided at least five hours of operating

time on average, with the preponderance providing seven to nine hours of operations. Therefore, all identified devices met the basic requirements for battery life and recharging capability.

The ability to search the internet for additional information or follow-on relevant content using such common tools as Google or YouTube is in the spirit of the transition to a learner-centric environment, allowing instructors to respond quickly to learner questions during the learning experience (Meister, Kaganer, & Von Feldt, 2011). Although internet connection via Wi-Fi was considered an important capability and was available on the final device, Wi-Fi service was not universally available at the military installation locations where the MTTs occurred. Therefore, in order to ensure internet connectivity during training periods, the device required data access to the internet via a network service provider (e.g., Verizon Wireless, AT&T, T-Mobile, etc.). Therefore, it was important to consider the service coverage maps of candidate providers. As a result of this consideration, the device decision was further shaped by what service providers provided data coverage for all the MTT locations.

Based on the device physical requirements and on service availability for the MTT locations, the Samsung Galaxy Tab 7.7² was selected as the mobile device to be used.

Complementary Components to Support the Device

The selected device is configured with a 30-pin connection interface. The battery charging cord supplied with the devices supplied a 30-pin to USB adapter capability, but special 30-pin to HDMI adapter cables had to be acquired to allow the device to output HDMI. Further, because most of the ALC classroom display systems utilized analog projectors, HDMI to VGA converter modules were also acquired to allow the device displays to be projected on to classroom projection screens.

To provide additional memory to store class materials on the devices, each device was equipped with a 16-gigabyte SD card. Also, instructors were also provided with a stylus for easier input on a touch screen and with a protective hard cover for the device.

Applications and Provisioning the Devices

Although instructors were given the device pre-loaded with an initial set of applications (apps), as the project progressed, instructors requested additional device capabilities or expressed the desire for specific apps. The following sections identify and address the variety of apps explored and used during the project, organized by general functionality.

In case instructors found a need for apps beyond those in the initial set, they were provided a pre-paid credit card for purchasing additional apps. These cards were provided to encourage users to explore additional apps and possibly enhance tablet functionality. Over the more than four months instructors used the devices, only a small minority of them reported exploring other apps and none used the credit card to make app purchases.

² This selection was based on the state of mobile device technology and carrier service areas as of early 2012.

MS Office apps. The need for an app that was compatible with a variety of MS Office documents was recognized. Instructors needed to open and/or edit MS Office documents (e.g., Word, PowerPoint, and Excel) and PDF files. The default app pre-loaded on the device, Quick Office Pro HD, provided the best overall compatibility with the majority of the ALC instructors' course files (e.g., lesson outlines, PowerPoint slide shows, reference documents). However, this app was not completely compatible with all MS Office features, causing some anomalies such as PowerPoint presentation formatting errors. In light of the anomalies, instructors were advised to use Quick Office Pro HD as the primary app when accessing course files, but were encouraged to explore other apps to determine the overall best suitability and functionality for their needs in respect to opening and editing ALC course files.

File and device management apps. The device provided the ability to flexibly manipulate settings and apps. However, the provided file management app was unwieldy for the instructors trying to access course files, so a more usable file management app was installed prior to distributing the devices.

Audio, video, photo and screen capture apps. After a number of popular video apps were investigated, the device's default player emerged as best suited to provide the compatibility and reliability of use for the file formats (WMV, MPG, and AVI) that the instructors used. The device was equipped with front and rear facing camera/video cameras. The camera function could be used in conjunction with other features and apps on the device as a screen capture capability. Pictures could be edited using existing apps or add-on apps. The device also possessed an audio recording application that allowed instructors to record briefings and student presentations.

Productivity apps. Productivity apps for e-mail, scheduling, and navigation were pre-loaded and provided the instructor with easily accessed features. Other productivity tools were added by the research team, such as a virtual personal assistant app that allowed the user to interact with the device through voice commands. At instructor request, an app was installed to allow basic editing of PDF files.

Military-related apps. Several basic military apps were found in the Army Marketplace and other Army-developed venues. The Army Marketplace has basic military apps focusing primarily on common tasks such as first aid, land navigation, vehicle maintenance, rifle marksmanship, after action reviews and the Army Physical Fitness Test (APFT), but other apps include training content such as the BCT Smart card, tactical reports, vehicle search techniques, escalation of force, detainee operations, tactical casualty care, improvised explosive devices, weapon clearing, interaction with the media, and heat and cold injuries. In addition to those apps developed by Army personnel and through Army-sanctioned methods, other apps with military functionality were found publicly available. For example, one app provides the map location on the device using the military grid reference system rather than the standard civilian system, while another displays contour lines and other navigation features not regularly available in standard device navigation apps. Both of these features were requested by instructors to assist in training students on a block of land navigation training during ALC.

Feedback from Instructors

A critical part of the device assessment was obtaining regular feedback from the device users. Instructors were asked to complete and return a form each week that classes were conducted and also participated in a group focused interview session after each course iteration to provide additional feedback.

Summary of survey feedback. Despite attempts to ease the weekly feedback process, the initial feedback response rate of 76% dropped to an 11% response rate by the final iteration. This drop was likely a result of several factors, including fewer researcher visits to the course once initial technical difficulties were resolved, instructors' deeming it unnecessarily redundant to submit the same data every week, and persistence of initial negative attitudes of some instructors towards the devices.

The weekly feedback asked instructors how they used the devices. A variety of uses was indicated, including: prepare for class by accessing and reviewing instructional material, answer student questions, assist small groups, and allow access to class material while away from the primary classroom computer terminal. Some instructors, while away at the MTT, used the device to present classes (e.g., to project PowerPoint slides) and to show videos.

Some limited photo or video recording to critique student performance, sending e-mails, and tracking student information during the course was also reported. A number of instructors recommended issuing the devices to students because of the relative compact size and lower cost when compared to the government-issued laptops issued to students. However, very few instructors allowed the students to use the devices. When interviewed, a number of instructors expressed concern about losing or damaging the tablet and a reluctance to take the device to field training because of these reasons.

Some potential uses of the device were not reported as having been utilized. Even though government-issued laptop computers did not allow this capability, instructors did not use the device to contact other instructors on apps such as Skype, or to transfer files or data using external media storage devices. There was also very limited internet access reported with the device. Underutilization of this capability may have been impacted because of radio signal reception problems inside classrooms.

Several apps that the research team anticipated would be used were not, including Office Pro, Google Maps, Search Browser, Video Player, Google Search, Calendar, Pen, T-Memo, Gallery, and Photo Editor. However, it is possible that instructors may have been unfamiliar with app names, and therefore, did not identify specific apps despite their use. For example, the Gallery app must be used in order to view images, but not a single instructor indicated using the Gallery app even though they did report accessing images on the device to use as part of class presentations.

The weekly feedback responses also asked instructors for their general observations and comments concerning the devices. This feedback included comments that the device was unnecessary because the students and instructors already had a laptop with the necessary

instructional material. In some cases, resident course instructors were hesitant to interfere with the existing classroom wiring to connect the tablets, while other instructors felt that the existing computer and projector configuration met their needs. In contrast, MTT instructors encountered a plethora of unique classroom configurations that in some cases required creative wiring configurations to connect instructor and student laptops, devices, and projectors. These challenges, in some cases, may have created an atmosphere that further encouraged instructors to use the equipment that they were familiar with (i.e. laptop) and underutilize the tablet device in a fast-paced NCOES environment.

Moreover, wireless connectivity was frequently limited, which impeded instructors' ability to use the device to download information or access certain applications. Additionally, some course files were not able to be viewed on the device, despite attempts to ensure file/app compatibility. Instructional material was generally created in MS Office software, but some material could not be accessed due to software/app incompatibility. Also, especially with PowerPoint files, there was a need for multiple viewing apps, because no one app could be used to reliably open all PowerPoint files. Despite the portability of the device, instructors were still tethered to a fixed location when presenting a class with the device connected to a projector; they not have the mobility to move around the classroom. All in all, there were some perceptions that the device was redundant with the issued laptops without providing any additional benefit.

There were conflicting messages regarding the feasibility and value of tablets. Some instructors stated that possibilities for using devices are "endless" while others felt that instructors will typically stick with the style and assets (i.e.. the government-provided laptops) they have been accustomed to using. While some believed it was handy to have instructional material immediately available when outside the classroom, others believed instructors and students should learn material prior to leaving the classroom for field training and should not need access to instructional material outside the classroom (in a field setting). Opinions varied drastically among the instructors, but of those who believed the devices could be valuable, the following discussion reflects the specific ways the instructors believed the devices could be useful.

Hardware and software capabilities. Processing speed, storage capacity, and available apps were one area of consideration. Generally, there was an overall satisfaction with the device hardware. The device provided adequate processor speed and internal/external storage capacity, and battery life met instructor needs (the devices were able to last a full day without recharging). However, the device battery could not be charged through a computer USB port or other similar device; AC power was required, which limited recharge options. Moreover, when attached to an external monitor or projector, the device needed to be plugged into an AC outlet, greatly reducing portability. In addition, picture quality was degraded when recording or viewing video in bright light conditions, such as during outdoor training events.

As mentioned earlier, files or documents created in the same software could respond differently when accessed or opened in different apps. Therefore, multiple apps needed to be available to ensure all necessary files could be properly accessed. While multiple apps were available to provide similar functions, this became a distraction. Most instructors would like relatively few apps to perform the necessary functions and to have the apps configured on the

“home screen” for easier access. Most also agreed that it would be nice to have a single app to open MS Office files with full office functionality such as playing imbedded videos in PowerPoint presentations. Some apps were unreliable, at times, and would unexpectedly crash.

The “Army Marketplace” is relatively new and has a very limited number of training apps. Currently available apps are for basic military skills and are not applicable to ALC students. In time, more apps may be developed that are directly applicable to ALC and other specific Army topics. As this develops, the instructors indicated a need for a functionality that could search the multiple marketplaces for possible new apps. New apps continue to be developed in open source marketplaces like Google, and many offer military functionality (e.g., an app that allows the user to input a location using MGRS [military grid reference system] for use with military maps, in lieu of a street address or latitude and longitude, thus allowing the device to function as an unsecure military style GPS).

Connecting to peripherals and ease of use. Since instructors used the devices in a classroom setting, they commented about being able to connect the tablet device to peripheral equipment and accessories such as a printer, projector, external storage capability, or other devices. While a host of peripheral devices are compatible with tablets (e.g., keyboard, mouse) a tablet usually requires separate adapters or converter boxes to connect to other devices. In addition, a tablet is usually restricted to a single output (to display on a television, projector, speakers, etc.) while laptops typically have multiple USB outputs in addition to a VGA and/or HDMI port. This somewhat inhibited the ability to connect the device to multiple items: with multiple ports, the device could easily move from device to another without changing the physical connection setup, whereas the existing single port required changing the set up each time a different device was needed. The device had limited printing capability (i.e., Samsung printer only). Instructors desired the ability to connect the device to a range of printers (as no standard printer exists across Army training locations), with a wireless connection preferred. External speakers were necessary when playing video presentations due to the small internal speakers and low volume.

This device, like others, had unique connectivity issues (e.g., VGA versus HDMI) that should be thoroughly explored before selecting a device. Some instructors believed that the device required too many cords and adapters when connecting it to the converter box or to an existing projector or monitor. In some cases, extension cords were required because the device and peripheral cords were not long enough to reach existing AC outlets or projectors (e.g., table or ceiling mounted peripherals), further increasing the effort required to utilize the tablet devices. Especially in established pre-wired classroom settings, instructors were apprehensive to disconnect existing computers, projectors, and other devices to connect tablets and converter boxes. It was easier to use the existing set-up than trying to re-configure the connections. Although the solution may not always have been ideal, the ability to successfully operate the device in a classroom could be resolved in most cases with a converter box, extension cord, or different connectors and adapters. Determining viable solutions required some knowledge of these components and created additional demand on the user. Instructors preferred a wireless connection for all peripheral connections, if possible, in order to preserve the device’s portability and to limit the number of wires and connections to the device.

In addition to minimizing the number of power and connector cords, instructors wanted a device that was easy to use. The device in this research functioned much like a smartphone in terms of the icons, buttons, and overall operations. Therefore, with limited familiarization training and practice, instructors found the device relatively simple to understand and operate, given that most had experience with smartphones. However, due to the relatively small size of the tablet, some instructors were frustrated with the onscreen keypad when trying to type documents or compose e-mails. After the first iteration of the course using this device, instructors were also provided a stylus along with each device to facilitate interacting with the touchscreen and entering information when very specific touches on the touchscreen were required. The use of a stylus facilitated the detailed and specific manipulation of the touchscreen by enhancing the accuracy of the touch point to a much smaller surface area than a finger usually allows.

Network Connectivity. While a stand-alone device containing instructional material is beneficial, instructors noted the additional benefit and perceived necessity for a network connection. This connection could be wired or wireless, each presenting unique advantages. Regardless of the connection type, having a reliable high-speed connection is key to accessing networks and various applications that require large data files. Related, these reliable connections must include easy access to military networks, even when traveling to MTT sites. Level of cellular service (e.g., 3G, 4G) varies greatly between geographical locations and service providers. The selected service provider must be available in the area where the device is to be used. Although the research team attempted to ensure adequate coverage was available for this research effort, exploring service provider maps did not allow for adequate prediction of reliable cellular network access. Several instructors reported some portions of the ALC course are conducted in field sites which typically have limited or no connectivity. Also, users must consider the impact of heavily constructed buildings, such as large brick buildings and older military facilities, which can attenuate 3G/4G signal strength. When network access is inhibited, so too is the usefulness of the mobile device. Therefore, if cellular service is limited and network connectivity will be dependent on Wi-Fi, consider implementing means to boost or extend wireless signals for improved connectivity.

Durability and reliability. Given the range of harsh environments in which ALC courses are conducted, instructors report mobile devices must be durable. For this research effort, each device was placed in a protective cover to increase durability when using the device outside the classroom. Likewise, in order to be fully incorporated into a training environment, the devices must be reliable to ensure the device can be used when it is needed. The device used for this project proved to be very durable and reliable. Of the 10 devices, over all usage periods, by multiple users, there was only one incident of a faulty device (i.e., the screen would not auto-rotate). Even with multiple users in varying conditions, there was no noticeable damage to any of the devices during the project. This could be due to the fact that most instructors reported using the device only for classroom instructions and intentionally avoided or limited use of the device during field location training. Some instructors were reluctant to use the device because they believed the tablets were too fragile in a field setting and were concerned that they would be financially responsible for damaged or lost equipment.

Portability. To enhance device portability, instructors suggested that certain device features would be beneficial although some trade-offs are necessary to ensure the optimum mix of capabilities. Most instructors liked the relative portability of the device when compared to a laptop. However, as stated earlier, instructor's mobility in the classroom was restricted when delivering classroom presentations from the device, because, to drive a projector, the device had to connect to both its power supply and to the projector. The vast majority of instructors suggested a device that interfaced in an entirely wireless capacity with a monitor or projector via a remote control, allowing freedom to move about the classroom.

Regarding the device's size, some participants thought that the device was awkwardly sized. Although the device was relatively small compared to laptops and other tablet devices, unlike a cell phone, it could require two hands to operate: one hand to manipulate the screen and one to hold the device if a table or similar surface was not available upon which to rest the device while using it. To partially address this issue, some instructors suggested that a hand attachment device, small handle, or elastic strap attaching the device to the user would make it easier to use when moving around in the classroom or in field training locations. This would provide the instructor a better way of securing the device without the concern of misplacing or dropping it. Although there were drawbacks to the size, the instructors did see advantages of providing students the tablets in lieu of laptops, and most instructors suggested that the smaller and lighter device would satisfy student needs and would be easier for instructors to transport to MTT sites. Related, some instructors suggested that the instructor device should have the ability to connect and interface with student devices. This would allow the instructor to "synchronize" all students to a "specific or the same page and keep them on-track with the class presentation."

Compatibility. Instructors typically have an Army-issued laptop computer that is used for presenting classes and accessing networks during classroom training. Any device intended to supplement or replace these laptops (i.e., a mobile device or tablet) must be compatible with Army-issued computers, Army networks, and the software programs that instructors must use. Unfortunately, the device in this project did not provide the full capability of the Army laptop. Users could not access the Army network to check official Army e-mail or Army Knowledge Online. There was no "common access card (CAC)" reader available on the device, making some websites inaccessible on the device and some software programs used for Army forms (e.g., NCOERs, Pure Edge, Form Flow) were not available on the device or in mobile form. These restrictions inhibited the ability of instructors to fully replace the laptops with the tablet devices. When browsing the internet, some websites can detect the screen size of the device being used, and will automatically route the user to a specific version of the website intended for mobile devices, usually with reduced functionality. Some instructors were unfamiliar with these different formats and preferred that the web sites be viewed in standard version, regardless of how it was accessed.

Beyond web browsing, users also experienced incompatibilities with other apps and components, from the very problematic such as causing the device to reboot or close out of material unexpectedly to the less problematic but still frustrating situation of lost functionality in MS Office, complicating the use of many highly needed materials for ALC training.

Relevance. As a general rule, people acquire and use devices and technologies that provide them additional capabilities, reduce time or costs, or enhance their lifestyle. For instructors, the devices must provide them some benefit or capability that enhances their ability as an instructor or they will be less likely to use them. Instructors who recognized the device capabilities identified a variety of uses for the device. For example, some said that using photo, video, and internet imagery for training could be helpful, and other instructors used the device to quickly access information in order to answer student questions or to direct students to particular sections of reference material (e.g., highlight portions of a field manual). Others compiled and maintained student rosters on the device for hip-pocket access both in and out of the classroom. Another recommendation was to load the required local documentation, such as local range procedures and regulations, on the device for access during field training and eliminating the requirement to carry a large paper-based notebook.

Although some instructors saw promise and potential in the devices, some instructors did not believe the device provided additional or essential capabilities. They concluded the device was a “handy tool, but not necessary.” These instructors did not take the device to field training because they were concerned about breaking or losing the device or believed that field training is almost entirely hands-on and students should already possess the technical knowledge by that time, therefore making additional training in the field not worthwhile. Some instructors concluded that because students already had laptops containing the course material, there was no need to carry material around the classroom on a mobile device. For example, one instructor expressed, “I have to carry a laptop anyhow to access government networks and forms, why should [I] carry something extra.”

Discussion and Conclusion

This research was intended as a preliminary effort to investigate the feasibility of integrating mobile devices into Army training, in particular as support for Army instructors. With the expectation that mobile devices may have wider reaching benefit when utilized by an instructor who can utilize their capabilities and resources to positively affect the training environment for Soldiers, instructors reported back varied opinions of the practical and pedagogical benefits and constraints of utilizing these mobile devices.

While not unanimous in their opinions, there was strong consensus among instructors of what device capabilities and features would be most beneficial to instructors. Instructors valued portability to ensure the ability to move around with the device while still interacting with peripherals (e.g., monitor, projector, and printer) without requiring myriad converters and adapters. Wireless remote capability would be ideal. The device should store sufficient power to operate through a complete training day. The device should be able to access and display instructional material with a single app without loss of features from the file software. Being able to access government networks for checking e-mail and using required forms would also make the device more beneficial.

In some cases, instructors found utility in the device and were able to use the enhanced capabilities of the device both in the classroom and while in the field. Despite some compatibility issues, ALC training documents and presentations were accessed and used

frequently by instructors with few problems, once they became familiar with the device. Other creative uses were found for imagery applications to enhance student learning. In contrast, instructors who did not feel comfortable with the device or believed that it failed to provide additional benefits beyond the laptops they were already required to use simply saw the device as an unnecessary burden and continued to train students as they had before. For some instructors, the uncertainty about the technology and operating outside of their “comfort zone” partially led to instructors using the device for very little or not all. Potential embarrassment from using the device also inhibited device usage with one instructor explaining, “My bumbling attempt to start using the device in front of students did not help me in gaining confidence.”

A major challenge to overcome is instructor attitude. As evidenced, some instructors are already using devices and recognize the benefits. Others are accustomed to the way they have conducted training to this point. Getting instructors to change training styles and incorporate capabilities offered by devices will require some overt action and mandates from leaders. Merely training instructors in how to use the device is not sufficient. They must have time to learn and become comfortable with the new technology. They must also be convinced of the additional benefits to them and the students or devices may not be used to full effect.

This research effort indicated that mobile devices could indeed be utilized in an Army institutional setting, with certain limitations in mind. One of the largest hindrances to adoption is the perception that the devices’ added capabilities compared to laptop computers do not adequately compensate for the additional effort of incorporating devices that may not be compatible with existing network infrastructure and software. This particular obstacle to incorporating these devices will likely vary based upon the particular course material being covered, the specific teaching style of the instructors, and the capabilities of the specific technology being employed. As technology develops, additional capabilities will be created, and with time, these capabilities will become widespread and affordable. However, unless and until technology develops certain specific capabilities, various training material may not be feasibly addressed with mobile devices. For example, even with a protective case, these fragile devices may still be damaged by certain weather conditions, and could be easily damaged in certain training environments. Likewise, some training content may never be properly represented through electronic training mediums—be it desktop, mobile device, or full scale simulator.

The capabilities of technology and the feasibility of incorporating the increasingly powerful handheld mobile devices into training is also restricted by instructor style and capabilities. To some extent, inhibitions and negative perceptions of mobile devices will almost certainly diminish in time as these devices become more commonplace, familiarity increases, and their capabilities and benefits are more thoroughly demonstrated. However, ultimately, the incorporation of these devices into Army training relies on instructors’ instructional approach. As the Army shifts to a facilitator role, that change that instructors must make in adopting this new role will be aided by incorporating these devices. From the safety of a well-rehearsed, one-size fits all lecture, instructors have little need for these devices. However, as instructors increasingly transition to serve as a facilitator, guide-on-the-side capacity, the ability to respond quickly, answer questions, present information in multiple unique ways, provide tailored feedback to individual learners, and encourage collaboration amongst students, these mobile devices and their successors will be increasingly important in Army training.

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Appendix A
ALC Instructor Interview Questions

Instructional Preparation and Execution

1. How do you prepare yourself for classes in these training environments?
 - Classroom (Lecture and Discussion), i.e. Tactical Questioning, Offensive Operations, etc.
 - Classroom (Practical Exercise), i.e. Patrolling, Combat Orders, etc.
 - Simulation/Computer Based, i.e. FO Procedures, FBCB2
 - Range Operations, i.e. Demolitions, Machine Gun live fire, etc.
 - Field/Gym, i.e. Physical Fitness, Combatives.
2. When instructing:
 - What blocks of training do you typically have the most difficulty with?
 - i. What causes the difficulty?
 - ii. Do you have any suggestions of how best to overcome this difficulty?
 - What blocks of training do other instructors typically have the most difficulty with?
 - i. What causes the difficulty?
 - ii. Do you have any suggestions of how best to overcome this difficulty?
 - What instructional capability or support is lacking when you are training:
 - i. In a classroom (at Benning)?
 - ii. At a field location (at Benning)?
 - iii. In a classroom at MTT?
 - iv. At a field location at MTT site?
3. What blocks of training do students typically have the most difficulty with?
 - i. What causes the difficulty?
 - ii. Do you have any suggestions of how best to overcome this difficulty?
4. What blocks or training or subject areas seem to generate the most questions from students?
5. When you respond to a student question during PEs, one-on-one times, or breaks what do you use to assist in promoting student understanding? (e.g., demonstration, sketch, show example, show quote)
6. How do you prepare for the exam modules?
 - FO Procedures
 - Machine Gun Employment
 - Demolitions
 - Tactics 1 and 2
 - Land Navigation
 - APFT
7. When a student, or a group of students, requires remedial training what do you do differently to promote understanding?

Instructional Materials

8. During preparation what instructional materials do you access?
 - Lesson plans?
 - Practical exercise materials?
 - Handouts, references, etc.?
 - Other materials? Describe materials and references.
 - How often do you access each of these items?
9. What instructional materials do you NOT have regular access to that you would like to have immediately available? In what form?
10. What instructional materials would you like to have that you currently do not have?
11. When instructing:
 - What do you refer to the most?
 - What references do you currently carry with you to facilitate training?

Instructor Technical Habits

12. Do you have access to a computer at the office? What capabilities do you use? (e.g., word processing, net surfing, e-mail, games, programming, multimedia view or create, etc.)
13. What desktop/laptop do you use personally? What capabilities do you use? (e.g., word processing, net surfing, e-mail, games, programming, multimedia view or create, etc.)
14. What mobile devices do you currently have/use? How do you use them? (e.g., phone [iPhone, Android based phone, Blackberry based phone], tablet [iPad. Other], computer)
15. If any personal devices are WiFi or able to connect to the internet, what service provider do you use? Do you like the connectivity? Why or why not?
16. Is there connectivity for mobile devices in the most common training areas on Fort Benning? Do you have 2G, 3G, or 4G connectivity? Do you have the same connectivity at the other installations where MTTs are usually conducted? Are there dead areas?
17. What mobile device(s) would you like to have for personal use? Why, what would you do with it? Do you plan to purchase this device within the next year?

Technology Assisted Instruction

18. How do you use any personal devices to assist you with your duties as an instructor?
19. What applications do you currently personally use that could be applied as an instructor?
20. How would you use a mobile device in a classroom setting (resident and MTT)?
21. How would you use a mobile device in a field or range setting (resident and MTT)?
22. What capabilities would you require/desire of the mobile device?
 - Audio / Video capture and playback
 - Communication (e.g., voice, phone/walkie-talkie, e-mail)

- Internet access (e.g., AKO, Web browsing)
- Networked (e.g., other instructors, ALC operations, local network)
- Peripherals (e.g., keyboard, projector)
- GPS
- Voice Commands
- Accelerometer (small motion sensors inside the tablet PC that detect the orientation of the device, i.e. portrait to landscape changes, tipping the tablet PC in a certain direction moves game character in that direction, compass orientation, etc.)
- Size (overall size, screen size, etc.)
- Weight
- Battery life (recharge time, number of batteries, accessibility to prime power, etc)

23. What applications/software/documents would be of value to you in your role as an instructor/facilitator?

<u>Navigation</u>	<u>Situational Awareness</u>	<u>Productivity</u>	<u>References</u>	<u>Planning</u>	<u>Simulations</u>
Lat Long	Weather updates	Cloud computing	Graphical Training Aids	Google maps	Crucible of Command
MGRS Road	Breaking News Latitude™ (location sharing)	Mobile office	ePublications eForms		Follow Me Take Charge
			POI documents AAR		VBS2

24. What applications would you like to see developed for use as an instructor/facilitator?

25. What information do you have about how Soldiers are using mobile devices (e.g., phones, tablets) in an operational environment that might be of assistance to you as an instructor?

Appendix B

UMDAI Background Information

Last Name	First Name	Rank/Grade

Time in Service (TIS)	Time in Grade (TIG)	Time as ALC Instructor

Civilian Education Level (select Highest)								
Non HSG	GED	HS Diploma	Some College (no degree)	Associate Degree	Bachelor Degree	Graduate Work	Master Degree	Higher

**Please complete the table for each mobile device that you have/use.
Indicate frequency of use for each:**

D = Daily W = Weekly M = Monthly

Device	Model/Make	Internet	Talk/Chat	Email	Calendar	Social Media	View Video	E-Reader	Games	Produce documents	View documents	Camera	Apps	other
Laptop														
Tablet														
Smart Phone														
Cell Phone														
Blackberry														
Kindle														
Other														

Other Device Use Comments

Please indicate your level of expertise with mobile devices

I don't know anything about them

I can figure out basic stuff

I can use it for most stuff

Others ask me to help them

1	2	3	4	5	6	7	8	9	10

Please provide your current impression about how useful you believe devices will be to you as an ALC instructor

I think they are a waste of money

I probably won't use it much

No opinion

I plan to try it as much as possible

I believe they will be extremely useful

1	2	3	4	5	6	7	8	9	10

UMDAI Weekly Survey

Last Name	First Name	Rank/Grade

Training Week	Week 1	Week 2	Week 3

Please complete the table concerning blocks of training (classes) you instructed or assisted with this past week.

How Device Was Used	Land Navigation	FO Procedures	Futures	Roles of PLT SGT	DA Form 6	Property Accountability	NCOER/Effective Communication	Risk Management	Army Uniforms	UCMJ	Army/Infantry History
Prep for class											
Used in lieu of laptop to present class											
Accessed file to answer student questions											
Show video (thru HDMI)											
Assist student (1-on-1)											
Internet search for info											
Allow student to use											
Contact Benning											
Contact another instructor											
Assist small groups											
Transfer files or data to/from students											
Captured photos or video for AAR											
Class data collection (test scores, etc.)											

How Device Was Used	Urban Breaching	Employ Machine Guns	Range Operations	Machine Gun Leader Training	Combatives	Intro to Army Operations	Offensive Operations	Defensive Operations	Operation Terms/Symbols	Troop leading Procedures	Combat Orders
Prep for class											
Used in lieu of laptop to present class											
Accessed file to answer student questions											
Show video (thru HDMI)											
Assist student (1-on-1)											
Internet search for info											
Allow student to use											
Contact Benning											
Contact another instructor											
Assist small groups											
Transfer files or data to/from students											
Captured photos or video for AAR											
Class data collection (test scores, etc.)											

How Device Was Used	Counterinsurgency (COIN)	Patrolling	Sniper Defeat	Convoy Operations	FBCB2	Integrate CREW Systems	Vehicle Recovery	IED Prep prior to movement	Resilience Training for Leaders	Counseling	Army/Infantry History
Prep for class											
Used in lieu of laptop to present class											
Accessed file to answer student questions											
Show video (thru HDMI)											
Assist student (1-on-1)											
Internet search for info											
Allow student to use											
Contact Benning											
Contact another instructor											
Assist small groups											
Transfer files or data to/from students											
Captured photos or video for AAR											
Class data collection (test scores, etc.)											

Other Responses for Device Usage in Classes

Please provide some specific details of how you used the pre-loaded device applications and the impact it had.

Pre-loaded Apps	Capture/View Images	PPT Slides	Graphics/Illustrations	Online Browsing	View Video	Capture Video	E-Reader	Edit Documents	Produce documents	View documents	Other
Quick Office Pro											
Google Maps											
Camera											
T-Memo											
Video Player											
Browser											
Pen Memo											
Gallery											
Video Maker											
Photo Editor											
Google Search											
Pen Memo											
Calendar											

Based on your experience this week, please indicate your feelings toward the device.

Rate the Statement	Not very Useful	Ok, but....	Useful	Very Useful
Ability to review materials and prepare for class.				
Accessing and surfing the internet for additional training support material and information.				
Ability to display materials and information to small groups of individual students.				
Flexibility to have needed information immediately available while away from lecture platform or classroom.				
Ability to respond to student questions, "on-the-spot."				

Please indicate your level of training effectiveness now, with the device, compared to similar, past instruction without the device.

Rate the Statement		Not effective	Helped a little	OK	Effective	Extremely Effective
When students had a question, I could assist small groups in better understanding the material.	Prior week					
	Now					
During practical exercises, I could circulate among students and assist them with materials.	Prior week					
	Now					
During training in a field location, I could remind students of needed material and information.	Prior week					
	Now					
I had access to additional (useful) training materials that were not available on the issued laptop.	Prior week					
	Now					
I had access to functionality that was not available on the issued laptop.	Prior week					
	Now					

1. What difficulties did you experience with the device and how did you resolve them?

2. How did the device help your Soldiers learn? What could have been done to make it better?

3. Looking back, were there some activities this week where you could have used the device but did not? Why? What “lessons learned” did you experience that would be helpful for future usage?

4. Based on your usage this week, what were the most useful features of the device?

5. Based on your usage this week, what were your LEAST favorite features of the device? Why? How would you like it changed?