

Military Writing in Simulations and Operations: Establishing Metrics and Standards

Dan M. Davis & Jennifer H. Nolan
Catholic Polytechnic University
1028 N Lake Ave MC 207
Pasadena, CA 91104
{ddavis & jnolan} @catholicpolytechnic.org

Mark C. Davis
Wood Duck Research, Inc.
129 Wood Duck Loop
Mooresville, NC 28117
davismc@ieee.org

Judith L. Jacobus
Education Counselor/Therapist
1564 Merion Way.
Seal Beach, CA 90740
statelty07@dslextreame.com

Keywords:

Written Communication, Synchronizing Simulation and Operational Standards, Message Drafting, Deep Learning, Natural Language Processing, Metrics

ABSTRACT: *The mundane tasks of drafting and proofing military communications are often eschewed by junior officers, but are frequently the cause of significant loss in operations. Many simulations do not include message drafting and fewer still evaluate the quality of that vital function. This paper addresses the need for an analysis of this over-sight and the potential benefits from remediating inadequate skills in many officers. A brief historical review of the necessity of the cogency and the clarity of the varying forms of writing is presented, including insights from the authors' own professional experience in military, academic and professional contexts. Some informal studies into the amount of time spent drafting written and oral items by varying levels of military leaders is offered to bolster the contention that the time spent on these tasks is higher than anticipated and is in no way reflected in the training time expended on it. The lack of current training efficacy is considered, along with the resultant lack of skill often observed. Both personal and literature support for these observations are presented. Current simulation practice is surveyed, with an emphasis on opportunities to engage and monitor writing skills. Then the authors present a number of emerging technologies that will putatively enable improvements in identifying skill deficits, providing remediation opportunities, quantifying improvements, and confirming implementation impacts in combat and non-combat environments. The authors provide an informal cost/benefit analysis of implementing such an emphasis, including risks that it may be more disruptive than beneficial. Ancillary benefits are suggested that may help compensate for additional costs in time and funding. Dual use issues are covered. The paper concludes with a call for a greater focus on actual engagement of military professionals in their day-to-day activities and the expected outcomes from utilizing the technologies that are available today for such an effort.*

1. Introduction

A major aspect of both military and technical profession is the need for concise, cogent and compelling communications. This paper addresses the need for more precision, explication and quantification of both form and function of this skill. Of particular note will be the lack of any consensus as to a figure of merit or an accepted identification of what is sought. There are two disciplines where the absence of those measures are detrimental to evaluations of and improvements to the defense posture of this nation and her allies dramatically impact this community: identification of communication skill levels in simulations and adoption of quantifiable standards to enable the evaluation of performance. One of the barriers to this effort is the great variance of effective communications; another is the great variety of situations that call into question the appropriate approach to be implemented by the communicator. Several new technologies and methodologies that may offer new and constructive tool are now becoming practicable.

This paper is more of a position paper than a research paper, so much of the analysis will be based on anecdotal experience, informal surveys and research of others. A background review of the importance of excellent communications to the defense effort will be offered, with a discussion of the interrelationship of language and analysis, developing a synergistic effect on both the originator and the consumer of the product. A review of the current situation will be followed by a more focused look at the issues of descriptive methods, quantification, and validation needs. The reader will then find a brief looks at some emerging technologies and techniques that may assist in this quest. The paper will close with a set of suggestions as to "who and how" various groups may participate in this evolution.

1.1 Background

Much of the impressions held by society are based, not on personal experience, but on entertainment and media. This is even more evident when matters under consideration are those for which the typical societal member has very little personal connection. Military operations of various natures fall dramatically into that area. One of the authors (D.M Davis) is fond of asking civilians about the chances of dying on D-Day were for a soldier who hit the beach in Normandy. He has received answers no lower than 25% and as high as 75%! The real loss of life that day was about 2.5%. One gets a similar result if the question is: "What were the chances of dying during a one-year tour in Vietnam?" (Similar range of guesses; actual KIA's: 2% for Army, 5% for Marines).[1] A recent survey may show why the public is so misinformed. As the U.S. Armed Forces have been reduced in size, the number of people who have been in the military, but are now retired or back in civilian life has been reduced significantly, so the number of people who would have common access to a combat veteran would have been accordingly reduced by about a factor of 4. (Figure 1) It would be reasonable to assume that the typical citizen would base their assumptions about death in combat on media performances instead of the experience of unit losses reported by their family members or acquaintances. But, the fact of the matter is, military officers spends very little time in combat or operations. While it is patently more dramatic, therefore more portrayed in the media, it comprises a very small portion of a military member's career.

Even service in a combat zone does not assure participation in combat. The Vietnam war involved very fluid "fronts" and significant attacks from irregular/insurgent rear-area assaults, yet only 40% of US Army VietVets qualified for the Combat Infantry Badge. That badge requires "... active ground combat ...", but what constitutes active ground combat is hotly discussed. [3]The 40% number does suggest that, even combat zone service, the actual number of personnel actually involved in combat is low. Another issue to be raised is that of non-combat-zone activities of military personnel. Data here is difficult to find, but anecdotally, one of the authors completed a four year tour (Apr '67 to Apr '71), but fired a weapon in training only on 17 of the 1,467

days or a tenth of one percent. That leads to the implication that the time a member of the armed forces spends in service must largely involve some other activity.

That question was addressed in an informal survey that was suggested by the authors' all having found a reluctance of technical personnel to write. The issue was how much time is spent by the average technical researchers in writing or preparing oral presentations. As many of the personnel who were in the authors' ambit were also military officers (active-duty, reserve or retired), some of the data was similarly generated to give at least a suggestion of how much time a military person does devote to this task.

The survey was a casual and direct one, relying on self-reporting and sought in both oral questioning and eMail exchanges. The question was always framed as: "How much time do (did) you spend while on duty in writing and how much time on preparing oral presentations?". The data included both military personnel with varying military specialties (MOS's, Designators, *etc.*) and response were garnered from all of the services, including the Coast Guard, but excluding the newly constituted Space Force.

The results are shown in the data (Table 1) shown on the left. Even given the low number of respondents and the clearly unscientific methodology employed in the selection of the population surveyed, the large amount of time spent by both the civilians and the military personnel was apparent. An ancillary question was also posed: "How important were your writing skills in the performance of your duties and in your own advancements in your discipline." The answers were uniformly that it was vital in each case and prominent in career advancement. This seemed to hold true equally in the more action-focused disciplines (combat arms) and the more cerebral ones (medical and cryptologic.)

In his seminal book *The Mask of Command*, British military historian John Keegan discusses both the critical importance of battle orders and the significant differences in style employed by various commanders. He particularly compares the erudite, almost poetic, quality of the orders issued by Wellington at Waterloo with the direct no-nonsense of Ulysses Grant during the Civil War.[5] In opposition, the losses suffered in the infamous Charge of the Light Brigade are often blamed on the issuance of unclear orders by ineffective commanders. [6] The criticality of concise, compelling and cogent communications is not restricted to military efforts; a perusal of aircraft accidents shows the appearance of lacking or muddled communications high on the lists of causes issued by the investigating agencies. [7] Here again, these are organizational entities that require and apply rigorous training in all professional activities. Nevertheless, there is evidence that the communications training often does not match the manifest importance of the performance in that area.

1.2 Military Writing

If the reader is not familiar with day-to-day operations in the defense arms of a nation, Table 2 lists some of the written products almost universally required in the military profession.

Table 2 Typical Documents Drafted by Military Personnel

After Action Reviews	Five paragraph orders	Officer Performance Reports
Award citations	Formal proclamations	Operations manuals
Battle orders	Equipment maintenance reports	Procurement orders
Classroom lectures	Intelligence Reports	Staff advisory reports
Correspondence	Letters to unit KIA's families	Standing orders
Ceremonial plans	Lesson plans/lectures	Technical manual revisions
Enlisted Evaluations	Movement orders	Training Plans
Fitness Reports	Officer Evaluation Reports	

There is one issue that is obvious: What training do the commissioned officers get? Again, there is scant data in the literature about how much writing is taught in the Service Academies, the ROTC programs, and the Officer Training/Candidate Schools. A quick check with commissioned officers from each group found no one who thought they had any adequate training in military writing. The civilian training in K-12 levels has also been found wanting [8 MacEnerney, U Chicago].. In 2011, Major (now an Assistant Professor) Trent Lythgoe suggested that Army verbal communication was a problem in the Army and had been for decades. [9] In part, he based this on the 1975 work by Major John Bergen, who wrote a Master's Thesis on the topic at the Naval Postgraduate School. His studies had shown that Army officers are "average writers." [10]. Maj. Bergen continued to report that a selected population of Army officers 18.5% had scored below national standards. Maj. Bergen confirmed the authors' of this paper's finding that the services do not manifest an interest in good writing skills. Maj. Lythgoe observed that the Army had not issued a new writing manual since 1987 and that the Army was in the process of adapting to emails and slide presentations. [11] The authors of this paper take exception to his contention in the first paragraph of his essay that the preparation of slides hampers, rather than augments the formulation of effective analyses.

It is well-known that by the time an officer candidate gets to one of the Academies, the ROTC classes or OCS/OTS's, they have had at least 16 years of education in verbal communication, mostly written. As part of research for this paper, the authors interviewed a high-ranking member of the faculty at one of the California State University System schools. He had been educated all the way from infancy through to his Bachelors in an elite university in an English-Speaking country. He very vigorously presented an alarm-inducing case of the lack of literacy among U.S. high school graduates, for whom he had to provide years of remedial training to make them capable of a modicum of success at the tertiary educational level. His major bone of contention was finding so many of his remedial students, especially from certain school districts, were functionally illiterate, yet had been awarded ".. straight 'A's.' in English" from their teachers. [12].

On the other hand, Larry MacEnerney from the University of Chicago identified a problem with a different genesis within a different group: the lack cogency that he reported was rampant within the tenure-track faculty and senior university administration officers [6]. It was a problem that he noted was created by the lack of useful instruction in K-12 and in college. His stated opinion was that the writing, as now implemented, was not designed to produce a communication of new ideas or to advocate a change of attitude or activity. It was devoted entirely to repeating what the teacher had identified as being important, in a way that would permit the student to pass on into another level and eventually receive the "Wizard of Oz's" ceremonious degree. Even the *de rigueur* Technical Writing courses in the engineering schools seemed to most of the interviewees as more focused on form rather than communication. Everyone the authors interviewed within the research community had high praise for their technical writing course, but when asked: "When did you last publish a paper?", the responses were disappointing, *e.g.* one PhD researcher at a government supported laboratory had not published anything at all since leaving graduate school some two decades before nor had he participated in any proposal drafting or other professional writing.

Two higher-order issues remain largely unresolved:

- What are the goals of written and oral communications?
- What are the metrics for assessing progress and achievement thereof?

As with virtually every aspect of military duty, the stakes are much higher than many human activities: societal survival and life itself are awarded the victor; mission failures and deaths are imposed on the vanquished. Optimization is not just a management shibboleth; it is a vital element in ultimate contest. Yet both the goals and the methodologies for achieving those goals are sufficiently subjective so as to cause the researcher to pause. But, like other subjective issues, there is a wide-spread consensus about what is exceptional or just prosaic or dangerously substandard. Nevertheless, current writing improvement efforts of which the authors are aware

seem to focus on format, precision and conformance, not conciseness, cogency and compellingness. As for metrics, again the need to justify a particular assessment tends to drive the assessor to the more measurable former trilogy, than the latter more purposeful trilogy. The authors contend that the establishment of goals should be a major priority, with an organized research and promulgation effort to identify and distribute the salient goals of various types of military communications. These goals would ideally also be self-reinforcing, so as to encourage both the proper use and the increased inclination to document activities. The same effort should initiate a consideration of metrics for assessing progress toward the goals.

2. Descriptive Methods, Quantification and Validation

The authors assert that the role of the simulation standards community in the evolution of a more effective assessment, education, and improvement of communication skills in military personnel is significant. While the liberal arts communities are advocating a return to classical education [13] in an effort to recapture the eloquence and elegance of times past, the work-a-day realities of the current demands of defense personnel would be better served with a serious reconsideration of what is most effective, especially in the high-stress environments of combat operations. One analogous environment may be the cockpit of commercial aircraft. There, both intra-cockpit, captain/first officer, oral communications and aircraft/air-traffic controller radio communications are strictly formatted during times of maximum stress. [14]. But these communications are virtually entirely oral and may be more constrained in their extent than are the wide-ranging communication needs expressed in the list of military documents above in Table 2.

Attempts such as Keegan's cited above [5], seem to be entirely qualitative, so are largely difficult to quantify. The author's innumerable hours of grading written compositions at all levels of education, K-Postgraduate, have found they do not often ascertain the qualities identified as germane by MacEnerney above [8]. The question now arises: "Can the qualities that are necessary be identified and articulated and quantified?". The authors assert that they can be studied with significant probability of successfully achieving an articulable description.

Having articulated such characteristics of excellent written and oral communications, the next task would be to quantify the value of those characteristics. This process will stretch even the most finely honed analysis of linguists and behavioral scientists. Outcomes are so variable and the final resolution of many combat encounters approaches randomness, as is posited by both operation researchers and novelists [15]

The next issue will be validation. How can one assess the likelihood that any particular constructive advice will have a salutary impact on mission success and loss reduction? From D-Day's Normandy beaches to Desert Storms Iraq, mission success and loss estimates have been disturbingly incorrect. One important feature is, in the authors' opinion, face validity. To achieve commitment to training and practice, the personnel targeted must have a sense that what they are doing is useful. Further than that, the leadership must be able to access a quantifiable result that the investment in training time and expense will be justified by the results. So, the interaction between the careful establishment of goals and the subsequent accurate measurement of these goals will be paramount. Here again, the simulation standards community is one that can be a major contributor to such an effort, based on their approaching and standardizing similar factors in the simulation discipline.

3. Emerging Technologies that May Enable New Capabilities

3.1 Natural Language Processing

While there are many forms of communication involving all five of the senses, language is the most rich and most universally employed. Natural Language Processing (NLP) is one of the more common forms of artificial

intelligence. It allows computers to interact with human language, whether it be written or oral. It is in the oral speech of human interaction with the machine language of computers that NLP has produced the most dramatic impacts. A concomitant development was the ability of the computer to recognize human oral speech. This was not an easy task. One of the authors was working on an early version of computer recognition of typed English methods in 1971. Several decades elapsed before oral speech recognition by computers was practicable. For many, a day never passes when one does not "converse" with a computer via an voice channel, *e.g.* Siri, Lexa, Google, *etc.* As computational devices and services become increasingly more intertwined with our daily lives and world, so too does the impact that NLP has on ensuring a seamless and effective human-computer experience for communication purposes. [16]

But, more than just convenience, this bi-lateral interchange of data with computers generates a potentially rich body of data that was heretofore not captured. It is now feasible to capture every word spoken by a lecturer and every question posed by a student. Using NLP-developed techniques, this data can be sorted, evaluated and stored. The design and evaluation of these processes could potentially be enhanced by the experience of the simulation standards community. There will be a potential for collaboration that will be lost, if the ways in which this is accomplished vary in format and standards between each researcher.

3.2 Deep Learning

Deep Learning is an artificial intelligence method that enables computational devices to accomplish recognition the correlations between entries in massive data sets, recognize patterns of interest. Deep learning is a one of the enabling technologies that facilitate autonomous vehicles, making it possible for them to recognize traffic conditions, road markings, and to distinguish a other moving vehicles from parked cars. It is the driver behind voice control in consumer devices. Deep learning is one of the most significant advances of the 21st Century in the opinion of many writers. It's achieving results that were not possible before. In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound. Deep learning models can achieve state-of-the-art accuracy, sometimes exceeding human-level performance, *e.g.* Deep Learning programs have been shown to be more accurate in recognizing lung cancers from X-Rays than live radiologists. Models are trained by using a large set of labeled and Quantified data and neural network training architectures that contain many layers. [17] The use of a clearly evaluated figure of merit is required to generate effective insight.

Given the anticipated exponential growth of data, much of it pre-sorted by the aforementioned NLP, it is clear that analysis by human reviewers is surely impractical and unlikely to recognize all of the important relationships between the data units. Again, due to the disparate nature of these data sets from around the globe, the lack of standards in methodology terminologies and interface definitions will hamper, if not entirely preclude, the optimal benefit of these technological advances.

Another *caveat* is the need for an inconceivable abundance of computational power. The data storage volumes that are envisioned are several orders of magnitude larger than what we now have. While now sampling the large sets would be possible, earlier work in high performance parallel computers has shown that such "work-arounds" invariably result in less valid results. [18]

3.3 Quantum Computing

In the late 20th Century, Caltech's Richard Feynman proposed the concept of Quantum Computers. [19]A quantum computer is a built on a way to use certain ideas from quantum mechanics to perform operations on data. The basic principle is that quantum properties can be used to represent data in varying ways simultaneously and hitherto abilities to perform otherwise incalculable operations on it. A theoretical model is the quantum Turing machine, also known as the universal quantum computer. The idea of quantum computing is still very

new. Experiments have been done. In these, a very small number of operations were done on qubits (quantum bit). Both practical (meaning in the real world) and theoretical (meaning just thinking) research continues with interest, and many national government and military funding agencies support quantum computing research to develop quantum computers for both civilian and military purposes, such as cryptanalysis, or breaking codes.

Today's computers, called "classical" computers, store information in binary; each bit is either on or off. Quantum computation use qubits, which, in addition to being possibly on or off, can be both on and off, which is a way of describing superposition, until a measurement is made. The state of a piece of data on a normal computer is known with certainty, but quantum computation uses probabilities. Only very simple quantum computers have been built, although larger designs have been invented. Quantum computation uses a special type of physics, quantum physics.

If large-scale quantum computers can be built, they will be able to solve some problems much more quickly than any computer that exists today. Quantum computers are different from other computers such as DNA computers and traditional computers based on transistors. Some computing architectures such as optical computers may use classical superposition of electromagnetic waves. Without quantum mechanical resources such as entanglement, people think that an exponential advantage over classical computers is not possible. Quantum computers should be able to perform functions that are not theoretically computable by classical computers, but they are, by definition thought to be capable of incredibly massive probabilistic computations, ideal for simulation and for large-scale analytic searches for patterns. The processor shown in Figure 2 is quite small, but this type of processor requires a cooling facility the size of a trailer to cool it down to about 10 milliKelvin. To make use to the quantum effect, the processor has to be as close to absolute zero as possible. They are anticipated to be able to do many things much more quickly and efficiently, but that great power is still in the offing as of 2023.[20]

Work on this capability has great promise for future advances in simulations in general, as presented in earlier papers at the SISO-SIW meetings. [21] As differences from classical digital computing abound, the careful scrutiny of these issues by this community is warranted and suggested.

3.4 Learning Analytics

This is a new use of "big data", improved sensors and artificial intelligence. Still evolving in definition and implementation, Learning Analytics offers new opportunities to enrich various practices in formal and informal education, but little is understood about the ways different it can enhance optimizing practices for educators and students. A number of authors have surveyed its place in education [22]. Some common features of Learning Analytic programs center on four major questions about its systems impact on users:

What (types of data)? How (analytic methods)? Why (objectives)? Benefits (for users)?

Learning analytics is a type of evaluating learning that has emerged from on-line education over the last decade or so. It provides a new way to assess technological, educational and social factors that have impacted the implementation of analytics in educational settings. This has all flowed from the development of data-driven analytics, the rise of learning-focused perspectives and the influence of previous educational constraints. There are a number of mutually enhancing relationships between learning analytics, educational data mining and academic analytics.

These advances suggest significant opportunities to quantify and develop analytical tools for the modeling and simulation communities, thereby making them a target for the simulation standards community as well. A significant interplay between adoption and adaption of Learning Analytics to the development of better tools and

enhanced skill in the area of military communications is anticipated. This would, in the authors' opinion, benefit both efforts.

4. Mobilization of an Effort to Enhance Military Communication Skills

One of the most persistent skill detriments in the military is the often noted lack of writing skills, a sub-set of the more general set of communication skills. Many claim, with little quantifiable justification, that those skills have degraded even more quickly with the advent of a virtually ubiquitous computer capability. The substitution of eMails for written letters, the avoidance of face-to-face contact in favor of text exchanges and the use of "spelling and grammar checkers" for thoughtful proof-reading is also offered as one of the reasons for the degradation of literate discourse.

Due to the subjective nature of communication efficacy, little can be done to productively identify, assess and remediate that problem. However, with the advent of new technologies and more sophisticated techniques, it now may be possible to generate enough data to establish trends, correlations and causalities between certain relationships and outcomes. Several of these new capabilities have been introduced and outlined above. Many, such as Deep Learning and Learning Analytics may depend on each other, as may the adoption of Quantum Computing to enable both of the former.

Always being mindful of the "academic siloing" that keeps cross disciplinary collaborations from being as productive as they should be, it may be propitious for the various communities to increase their inter-disciplinary communications. It also may be appropriate for the simulation standards community to act as a sort of agora where the communities can meet, ensure that they are understanding each other and are providing standard communication interfaces and using standard language to facilitate understanding.

5. Discussion

The end of the Vietnam War and the cancelation of the Selective Service Duty requirement brought about a dramatic drop in the size of the active duty military (to about a 1/3 from 1971's levels to 2023's [23]). There was, perforce, an anticipated decline of veterans, as shown in Table 1 above, as the VietVets are rapidly approaching the end of their projected life-spans [24]. The increasing power of the US Armed Forces with reduced personnel leads one to the assumption that each individual service member has a duty to be more precise in his communication duties and each veteran has a higher level of duty to inform the public about service life and combat ethical issues. From those conclusions, it would not be inappropriate to assert a higher duty to ensure both training and selection improvements need to be made certain so that no untoward events are caused by a failure to communicate.

Assuming a credible effort will have been expended by the cognizant and capable authorities to establish goals that are rational, reachable and reinforcing, using the emerging technologies above should be able to generate analyses that which have previously been seen as hopelessly subjective. The unimaginably vast troves of data already stored electronically could be used for AI training, looking for hitherto unrecognized markers of good communications. For instance, the written products generated by officers could be assessed and rated based on the evaluations of their skills on periodic fitness reports. Another method may be more controlled and would entail a research team specifically looking at communication quality of simulation participants or exercise trainees and then converting that to a digital format that could be subjected to NLP-like analyses.

It is generally accepted that formal education has two goals: improving the competent and culling out the incompetent. The degree to which personnel are able to inculcate the positive aspects of the above described research could then manifest itself as improved training and thereby produce consistently concise, cogent and compelling communications. This then could legitimately be a major factor in personnel evaluation and advancement. At some point, a demonstrable and immutable failure to master adequate communications' techniques, a change in career-choice might be justified. The failures of communication so many times in the past were costly, *e.g.* the confusion of General Lew Wallace at Shiloh [25], and these new approaches may reduce the future catastrophes.

It is also technically feasible that a system for monitoring on-going communications for proper format and for optimal communication parameters identified by the AI approaches set forth above could both be a constant reinforcement of good practices and a way to recognize dangerously sub-standard tendencies.

All of these actions would require careful establishment of standards and metrics. These are the very skills that are the core of the simulation standards community *raison d'être* and expertise. The service branches would be well-advised to make use of this body of knowledge and this group of experts.

6. Conclusions

There is a significant recognition that one of the poorest skills in the military is the ability to write with concisely, cogently and compellingly. In this setting, especially in combat, the possession of that skill is not only a desirable mark of erudition and hallmark of a competent leader, is very well may be the major hurdle to success or the major reason for mission failure and death. For the first time in history, new technologies are providing a way to identify, analyze, quantify and validate these issues. These technologies can enable and validate a set of criteria for excellence and a limit for incompetence. A standing and automatic evaluation program could be implemented that would give continuous feedback to the engaged personnel and data to their reporting senior for evaluation and mentoring. The simulation standards professionals have vital role to play in these processes.

7. Acknowledgements

We should also note that much of the work cited was supported by grants from the Office of Naval Research's STEM Program (ONR N00014-16-1-2820) and by research assistants supported by the National Science Foundation Research Experience for Undergraduates program (NSF 1560426). Nevertheless, the positions taken in the paper are the authors' own and do not represent in any way the views of the Department of Defense or the US Government.

8. References

- [1] National Archives (2022). Vietnam War U.S. Military Fatal Casualty Statistics. Retrieved from the internet on 07Dec22 using URL: <https://www.archives.gov/research/military/vietnam-war/casualty-statistics>.
- [2] Statista, (2022). Percentage of U.S. population who are veterans in 2021, by age and gender. Retrieved from the internet on 27Dec22: <https://www.statista.com/statistics/250366/percentage-of-us-population-who-are-veterans/>.
- [3] Army Regulations 600-8-22, (2022). Personnel General: Military Awards. Head Quarters Department of the Army, Washington DC, US.
- [4] Davis, D.M. (2022). Time Spent Writing of Preparing Presentations: An Informal Survey, conducted up to 2022 among colleagues in Southern California.

- [5] Keegan, J. (2011). *The Mask of Command: A study of generalship*. Random House. New York, NY, USA.
- [6] Adkin, M. (2017). *The charge: The real reason why the Light Brigade was lost*. Casemate Publishers.
- [7] Archer, S. K. (2015). Gender, Communication, and Aviation Incidents/accidents. *Journal of Media Critiques*, 1(2), 11-21.
- [8] MacEnerney, L. (2022). *The Craft of Writing Effectively*, Lecture format, via live (2015) video clip. Retrieved from internet on 17Dec22 from URL: <https://www.youtube.com/watch?v=vtIzMaLkCaM>
- [9] Lythgoe, T. J. (2011). *Flight Simulation for the Brain: Why Army Officers Must Write*. Army Command and General Staff College, Ft. Leavenworth, Kansas
- [10] John D. Bergen, *The Causes of Writing Problems in the Army*, (master's thesis, Command and General Staff College, 1975), IV, <http://cgsc.contentdm.oclc.org/utis/getfile/collection/p4013coll2/id/2256/filename/2307.pdf>.
- [11] *Ibid.* pp-3.
- [12] Davis, D.M., (2022). Private Conversation with a California State University Official (the official requested that he not be cited by name), California, USA.
- [13] Littlejohn, R., & Evans, C. T. (2006). *Wisdom and eloquence: A Christian paradigm for classical learning*. Crossway. Wheaton, Illinois, US
- [14] Cushing, S. (1994). *Fatal words: Communication clashes and aircraft crashes*. University of Chicago Press. Chicago, Illinois, USA.
- [15] Tolstoy, L. (1993). *War and peace* (L. Maude & A. Maude, Trans.). Wordsworth Editions.
- [16] Nadkarni, P. M., Ohno-Machado, L., & Chapman, W. W. (2011). Natural language processing: an introduction. *Journal of the American Medical Informatics Association*, 18(5), 544-551.
- [17] LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. *Nature*, 521(7553), 436-444. London, UK.
- [18] Brunett, S., Davis, D., Gottschalk, T., Messina, P., & Kesselman, C. (1998, March). Implementing distributed synthetic forces simulations in metacomputing environments. In *Proceedings Seventh Heterogeneous Computing Workshop (HCW'98)* (pp. 29-42). IEEE.
- [19] Feynman, R. P., Hey, T., & Allen, R. W. (2018). *Feynman Lectures on Computation*. CRC Press, Boca Raton, Florida, US.
- [20] Hidary, J. D. (2021). *Quantum Computing: an Applied Approach* (Vol. 1). Springer. Berlin, Germany
- [21] Yao, K-T., Davis, D. M., Liu, J. J., & Kaimakis, N. J. (2018). New Technologies to Enhance Computer Generated Interactive Virtual Humans. In the *Proceedings of the SISO Fall Simulation Innovation Workshop*. Orlando, Florida: SISO
- [22] Ferguson, R. (2012). *The State Of Learning Analytics in 2012: A Review and Future Challenges*. Technical Report KMI-12-01, Knowledge Media Institute, The Open University, UK. Retrieved from the internet on 18Dec22 from URL: <http://kmi.open.ac.uk/publications/techreport/kmi-12-01>
- [23] Secretary of Defense (2022). *U.S. Military Personnel 1954-2014*. Defense Manpower Data Center, Washington, D.C., USA.
- [24] Social Security Administration (2022). *Actuarial Life Table*. Social Security Administration, Washington, D.C., USA.
- [25] Getchell, K. (2013). *Scapegoat of Shiloh: The Distortion of Lew Wallace's Record by US Grant*. McFarland. Jefferson, North Carolina, USA.

Author Biographies

DAN M. DAVIS is a Research Associate Professor at Catholic Polytechnic University (CPU) and is also active as a consultant at the Institute for Creative Technologies, University of Southern California (USC). He is currently focusing on large-scale DoD simulations and virtual human implementations. Prior to retirement, he was the Director of the JESPP project at USC for more than a decade. As the Assistant Director of Advanced Computing Research at Caltech, he ran Synthetic Forces Express, bringing HPC to DoD simulations. He has also served as a Director at the Maui High Performance Computing Center and in computer research roles at the Jet Propulsion Laboratory and Martin Marietta. He was the Chairman of the Coalition of Academic Supercomputing Centers and has taught at the undergraduate and graduate levels. As early as 1971, Dan was writing programs in FORTRAN on one of Seymour Cray's CDC 6500's. While in the Marine Corps, he saw duty in Vietnam as a Cryptologist and retired in 2002 as a Commander, U.S.N. He received B.A. and J.D. degrees from the University of Colorado in Boulder.

JENNIFER H. NOLAN, PH.D. is the President of Catholic Polytechnic University and Professor of Psychology in their College of Arts and Sciences. Her earlier work specialized in memory, dementias, stroke and insulin resistance. She is a brain plasticity specialist and certified Cogmed provider. Previously, she was the C.O.O. and co-founder of a stroke and brain injury rehabilitation center. Dr. Nolan has taught university courses at the University of California Irvine, Loyola Marymount University, and Glendale Community College. She has conducted local and nationwide clinical trials, and published in both scientific journals and popular magazines. She received a BA in Psychology from Loyola Marymount University, Los Angeles and a Ph.D. in Psychology from the Dept. of Cognitive Science at the University of California, Irvine.

MARK C. DAVIS, PH.D. is the Chief Technical Officer at Wood Duck Research, Inc, and is semi retired after careers in the US Navy and as a computer design engineer for both IBM and Lenovo. Rising to the level of Distinguished Engineer at Lenovo, he was responsible for the design of laptop computer cross-disciplinary technology, including PC architecture, embedded systems, open source and virtualization. Previous work was with IBM in the areas of software development and architecture involving security, storage and virtualization. Dr. Davis has been granted well over fifty patents that were filed during his service at both companies. He is a graduate of the Duke University NROTC program and was commissioned as an Ensign, attended nuclear power school, and served as a Submarine Officer for twelve years, including one duty tour as a classroom instructor. He left the active duty as a Lieutenant Commander to pursue a PhD. Mark holds a BSEE degree from Duke University and a PhD in Computer Science from the University of North Carolina, Chapel Hill, where his advisor was Professor Fredrick P. Books.

JUDITH L. JACOBUS is retired from conducting speech therapy as a Speech and Language Specialist for more than two decades. Her experiences were in public schools settings in Orange County, California. She also previously taught for 12 years as a classroom teacher in multi-cultural communities there. Judith currently volunteers her professional skills for a local police department, so has extensive experience with dysfunctional adults and children in a variety of both every-day and traumatic situations. Her participation in amateur theatrics has more fully familiarized her with the characteristics of human behavior as they are projected via verbal, facial and body-language cues. This experience has also exposed her to the skill and art of the selection of appropriate persons for specific on-screen roles. Judith holds a lifetime Special Education Credential in Speech and Hearing Therapy, K-12 from the State of California. She earned a B. A. Degree in Speech Communications from the California State University Long Beach and an M. A. Degree in Teaching and Teacher Leadership from the Grand Canyon University in Glendale, Arizona.