Australian Army
Army Aviation Training Centre

Paper

BQ4787781

BLENDED LEARNING, DIGITAL NATIVES AND THE EFFECTIVE APPLICATION OF LEARNING TECHNOLOGIES IN ARMY (REVISED 30 JUL 19)

INTRODUCTION

1. The inclusion of 'new educational technologies alone does not improve teaching and learning outcomes'[1] [2]. It is the 'effective design of instructional material (that) elicits appropriate cognitive processes in the learner and mediates more successful learning outcomes'[3]. Effective Blended Learning requires the application of the most appropriate instructional design processes, represented by instructional design models and relevant learning strategies, theories, approaches, methods and tools, experienced through the learning content and activities.

2. Defence applies the ADDIE (Analyse, Design, Develop, Implement, and Evaluate) instructional design model, in the Systems Approach to Defence Learning (SADL)[4]. Defence, corporately or by individual Service, delivers training for each of the five (ADDIE) phases of SADL. However, in SADL (Training System suite) courses for Army personnel, there is very little training in the selection or application of relevant learning strategies. As the existing system does not provide an effective foundational knowledge of a range of learning strategies, it may tend to fail if a generation of learners emerge who are different, and who do not follow the predictable patterns of earlier generations.

3. For about two decades, researchers have written about the culture shift accompanying the unfolding tsunami[5] of Generation Z and Digital Natives. Generation Z (Gen Z) are those learners born from the late 1990s to mid-2010s[6]. Computerised technology has always surrounded Digital Natives; 'digital' is a native language[7] for them. Their minds function differently. They are accustomed to rapid task switching—sometimes mislabelled as 'multitasking'[8]; they have shorter attention spans[9] [10]; and subsequently they are at a higher risk of displaying a reduced depth of learning[11]. Digital Natives are the generation who are now just entering the workforce and graduating from university. Digital Natives are a growing proportion of Army's young recruits.

4. **Scope.** This paper discusses how people learn, and the mind of Digital Natives; the Training Systems suite of courses and SADL; keys elements for education and training both analogue-minded learners and Digital Natives; essential behaviours, attitudes, skills and knowledge (BASK) for Army instructors in the 21st Century, in Army's developing Blended Learning environment.

AIM

5. The aim of this paper is to consider in context key factors regarding contemporary learners in Army IOT recommend specific factors in the Blended Learning mix to best support learning for all Army personnel.

BACKGROUND

6. The Chief of Army provided his guidance[12] to ensure that the Australian Army is ready now and future ready. He stirs the commitment to continued learning, initiative, adaptation and simplification of the systematic approach to Army's role in Defence's Joint Force. The Chief of Army acknowledges the central place of Army's people and their development. The development of people necessitates learning, delivered through education and training.

7. The Director General Training and Doctrine (DG TRADOC) published a study of Army's education, training and doctrine needs (the Ryan Review)[13]. He applied Army's Blended Learning philosophy across Forces Command[14]. These strategy documents facilitate the need for additional documents to provide the tactical—and practical—guidance for implementation by Training Establishments (TE). DG TRADOC discusses ADELE (Australian Defence Education Learning Environment) as the adopted Defence-wide Learning Management System. ADELE is Defence's version of MOODLE (Modular Object Oriented Dynamic Learning Environment). There is a plethora of information on both the internet and in ADELE to guide learning content creators (eg Training Designers, Training Developers and Instructors in the SADL context) on how to use MOODLE/ADELE. What is absent in Army is an effective mechanism that ensures those who create learning content do so in a manner which 'elicits appropriate cognitive processes in the learner and mediates more successful learning outcomes'[15], that is, the effective and efficient application of appropriate learning strategies.

HOW PEOPLE LEARN

8. In this paper, the focus is on the changing characteristics of learners. The term 'learner' is used where elements are viewed from the learner's perspective; however, the terms 'teaching' and 'instructing' are used where actions and elements are viewed from the instructor's perspective. This is an important semantic difference—instructors can teach/instruct the way they were taught or they can teach/instruct the way people learn.

9. **Learning theories.** According to Bloom[16], all learning falls into one or more of three domains: psychomotor (skills), cognitive (knowledge) and affective (attitudes/behaviours). Within the domains are learning paradigms. Three main learning paradigms are that provide the philosophical foundation for how a person learns are behaviourism, cognitivism and constructivism[17]. Within the paradigms are learning theories. Effective learning strategies apply appropriate theory IOT elicit success. A succinct overview of learning domains, learning paradigms and selected learning theories is attached in Annex A.

10. Army delivers much of its training through Competency Based Training (CBT). CBT generally applies behaviourism. In CBT, regardless of how the learning was acquired, provided the learners (candidates for assessment) adequately display the required attributes: behaviours, attitudes, skills and knowledge (BASK) they are considered competent. Behaviourism is an effective approach for learning lower order thinking (LOT) skills. Higher order thinking (HOT) skills requires the application of a cognitive development strategy—insignificant in behaviourism.

11. **Thinking skills.** The intent in developing thinking skills (including critical thinking) is to instil in learners the BASK to discern relevance and veracity of potential sources of knowledge and skills. Thinking skills are considered part of the cognitive domain. 'Lower-order thinking (LOT—procedural, declarative) is often characterized by the recall of

information or the application of concepts or knowledge to familiar situations and contexts'[18]. Experts define HOT with different approaches and viewpoints. Annex B lists HOT characteristics. 'In general, higher order thinking (HOT— conceptual, integrated, and decision-making) skills involves solving tasks where an algorithm has not been taught or using known algorithms while working in unfamiliar contexts or situations'[19]. Critical thinking is a dimension of HOT[20].

12. Effectively defining what makes up critical thinking skills is difficult. Definitions vary between writers. 'Lai[21] offers a relevant critical thinking paradigm with three distinct areas: abilities, dispositions and background knowledge. They are:

a. **Abilities:** examine arguments, use inductive and deductive reasoning and problem-solving skills.
b. **Dispositions:** confident, flexible, determined, open-minded, relies on reason and intuition, discerning, curious, creative, seeks knowledge, considers different perspectives, has intellectual integrity and concern for equity.
c. **Background knowledge:** good working knowledge of subject area, evaluate ideas/problems using appropriate criteria, able to explain and apply knowledge'.

13. '(These) categories provide a picture of the essential elements for being a critical thinker who possesses cognitive abilities, a creative disposition and knowledge expertise'[22]. IAW Army's intent to develop its people, all learning strategies across Army courses ought to aim to develop the learner's abilities, dispositions and background knowledge. The effective application of learning technologies in a Blended Learning approach allows this.

14. **Blended Learning.** At its simplest, Blended Learning is the application of a combination of delivery modes and/or methods that meaningfully support the learning process[23]. According to this definition, Army already applies Blended Learning, eg in a course that teaches through an ADELE or Campus course, followed by a central presentation (CP) followed by a syndicate room discussion followed by a CP followed by a tactical exercise without troops or parade ground or weapon handling drill.

15. At one end of the continuum, Blended Learning is not where the learning for the entire qualification is delivered through face-to-face means. At the other end, Blended Learning is not where the learning for the entire qualification is delivered online. Blended Learning is all learning that includes a combination of both face-to-face and online delivery, to varying degrees. Figure 1 graphically represents a Blended Learning concept.

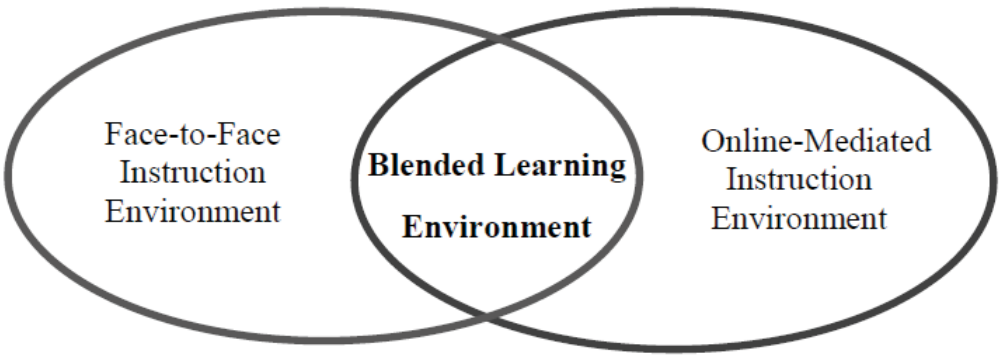

Figure 1: A concept of Blended Learning for entire qualifications[24]

16. Army's intent is to develop a more complex version of Blended Learning such as is identified by the term Complex Adaptive Blended Learning System (CABLS)[25]. CABLS has been used to describe a system where the teacher exercises many roles such as facilitator, counsellor, advisor or e-moderator, and the content is far richer and more dynamic than used previously, and the application of which is adapted to suit contexts and individual learners.

17. Anley[26] writes 'learning is not constrained by the knowledge or initiative of the teacher[27]; learners can access and learn from endless sources, as well as collaborate with each other and construct their own creations and understanding. Blended learning offers authentic opportunities for learners to take control of their own learning at their own pace[28]'. Circumstances necessitates unit COs facilitating genuine opportunities for unit members to participate in (individual or group) learning experiences in their unit battle rhythm.

18. **Cognitive load theory and blended solutions.** 'According to the (cognitive load) theory, during learning information must be held in the working memory until it has been processed sufficiently to transfer into long-term memory. Since the capacity of working memory is limited, when too much information is presented to students at once, it overwhelms them and in consequence much of that information may be quickly forgotten or lost. Cognitive load theory (CLT) thus argues that for individuals to learn effectively, their cognitive architecture and the learning environment created by the instructor must be aligned'[29].

19. Writers propose nine ways[30] to reduce cognitive load. Further detail on these and other aspects of CLT are attached in Annex C. Applying CLT has been found to elicit better retention of integrated knowledge than applying problem-based learning alone[31]. Learning strategies, underpinned by learning theories, such as CLT, supported by relevant technologies applied through Blended Learning, can be expected to better promote effective learning[32].

THE MIND OF DIGITAL NATIVES

20. Some researchers[33] write that the world has fundamentally changed, and the education and training systems have failed to keep up. The current crop of young learners are significantly Digital Natives (DNs). DNs significantly correlate with Gen Z but not exclusively—not every Gen Z person is a DN. Gen Z are those learners born from the late 1990s to mid-2010s[34]. Those from previous generations who seamlessly fit into the digital world are called Digital Immigrants[35]. Key characteristics of a typical DN are listed in Annex D.

21. While the Army learning environment needs to continue to adapt to accommodate DNs effectively, it should also provide a broad range of learning alternatives, not just for older personnel, but also for those young people who for one reason or another were not raised communicating in 'digital'. Many learners already conduct learning outside of the standard 0730 to 1600 work day. Research found that Gen Z's 'verbal skills, expressions, confidence, and other personal skills may falter due to their reliance on technologically-based communication'[36]. Many in Gen Z suffer from FOMO (the fear of missing out)[37] [38] . They feel the need to be always connected, not just via social media, but a DN's first resort for knowledge is the internet [39] [40]. The sense of FOMO can impact a DN's performance and relationship with others. This calls for effective learning strategies to aid DNs' BASK development.

22. As an example of the changes experiences, Gen Z and DNs have a changed focus on sport participation differing from previous generations. They are more goal oriented, with a

less traditional view of 'fun'—'fun' is the sense of achieving goals, not the journey, or experience, itself. In the context of sport participation, the Gen Z expresses 'four common themes regarding coaching preferences: 1) one who does not yell and remains calm, 2) one who is caring and encouraging, 3) one who has knowledge of the sport, and 4) one who involves the team in decision making'[41]. If 'sport participation' is read as 'team activities participation' (think 'Army at work'), and if 'coaching' is read as 'instructor involvement', the research highlights that Gen Z impacts how Army conducts training. It is important to note that Gen Z expects to participate in the decision making process; practical ways to account for this needs to be taught in the Training System suite of courses.

23. DNs' minds function differently. They are accustomed to rapid task switching—sometimes mislabelled as 'multitasking'[42]. They have shorter attention spans—seven to ten minutes in the classroom but about eight to ten seconds online[43] [44]. Subsequently they are at a higher risk of displaying a reduced depth of learning[45]. The provision of a proliferation of learning resources, every learner has greater control in how they learn.

THE TRAINING SYSTEMS SUITE OF COURSES AND SADL

24. **SADL.** 'The systems approach to Defence learning (SADL) is designed to ensure that all Defence workforce performance requirements are correctly specified and supported by the most cost-effective learning strategies. Compliance with the SADL ensures that responsibilities and accountabilities are well-defined, that Defence appointments responsible for every process and decision are clear, and their actions and decisions are correctly documented'[46].

25. The table in Annex E contrasts LMPs summative assessment outcomes in the Training System suite of courses with SADL requirements. Defence (or Army) provides training for each (ADDIE) phase of SADL. In the Annex E table, training is not considered as completed until it has been verified by summative assessment—Level 4, suitable for workplace [47] [48]. IAW SADL, learners who are not summative assessed are only trained to Level 3 and are to be supervised by a qualified person until assessed [49]. Therefore, a solution is the development of a structured curriculum/continuum to equip and qualify instructors as implied in the SADL.

26. **LMP learner profile.** An output of the SADL Analyse Phase is the 'target population profile'[50]; from it a training designer can develop a 'learner profile'. Within the SADL template for the 'target population profile' are cells addressing sub-groups, motivations, cultural norms and preferences, and 'other'. If the analysist is unaware of the impact on the learning environment, and the act of learning, imposed by generational change, insufficient information will be recorded to be made available to training designers for developing LMPs. Therefore, operators in the SADL Analyse Phase need to have an understanding of the generational changes in the target population.

27. **Validation.** Validation is a way of confirming, verifying and authenticating the teaching/instructing process. It often focusses on the assessment part of the process as that is where outcomes are measured—as determined in behaviourism. However, it equally applies to every stage—due to the cognitive and affective development aspects. Without effective validation of both assessment and learning content and activities, consistent effective application of learning strategies cannot occur.

28. The SADL assigns 'validation' BASK to the Develop Phase. However, the 214919 *ADF Training Developer* course does not assess validation BASK to Level 4. Therefore,

Training System suite of courses do not effectively train validation. Subsequently, there is no way to consistently apply validation BASK in Army.

29. **Instructor BASK.** Army trains basic instructor BASK in three courses. They are the 202960 *Subject One for Corporal Army* course, the 212682 *ARA Officer Commissioning* course, and the 216149 *Basic Instructor Training* course. As seen in the Annex E table, none of the three Army instructor qualification courses assess (train to Level 4) every BASK of the SADL Implementation Phase. The table shows that the *Certificate IV of Training and Assessment* (2016) achieves most of the SADL Implement Phase requirements. It is also noted that the 212682 *ARA Commissioning* course does not summatively assess (train to Level 4) those SADL Implement Phase BASK incorporated into that course. This conflicts with the requirements to achieve Army Foundational Instructor indicated in ATI 1-2 *Army Instructor Development*.

30. **Pre-learning diagnostic assessment.** The SADL assigns 'conduct pre-learning assessment (diagnostic)' BASK to the Implement Phase. However, none of the three Army instructor qualification courses assess 'diagnostic assessment' BASK (train to Level 4).

31. Not every learner starts at the same point, or even at the exit point of the preceding course in the relevant continuum. The need for more effective and efficient use of resources, and the need to better instil new BASK in learners necessitates a change to the current narrow approach. In summary, effective instruction requires effective diagnostic testing before commencing learning; this is because:

a. The instructor needs to know the (starting) level of expertise of the learners.

b. Instructional design needs to gradually build up the learners' (existing) schema, from basic to complex or part to whole' [51].

32. **The Instructor's Handbook.** The source document for all military instruction in Army is LWP-G 7-1-2 *The Instructor's Handbook* [52]. It covers a broad range of instructor BASK effectively for instructing lower order thinking skills. However, it does not teach learning strategies, learning theories (pedagogy or andragogy) or how people learn other than briefly discussing visual, auditory and kinaesthetic modes. It does not teach validation. It does not provide any guidance for effectively teaching/instructing Digital Natives.

33. **ADELE.** The Australian Defence Education Learning Environment (ADELE) is the adopted Defence-wide Learning Management System. ADELE provides a platform for implementing learning. However, without systematically applying effective learning strategies, ADELE will not perform optimally. It runs the risk of becoming just another repository for information, and not a platform delivering improved behaviours, attitudes, skills and knowledge across a broad range of circumstances.

KEYS ELEMENTS FOR EDUCATION AND TRAINING BOTH ANALOGUE-MINDED LEARNERS AND DIGITAL NATIVES

34. Some writers insist that 'online instructional designers and educators must understand learning theory, content, and the overall educational goals of their learners to provide a quality learning experience in an online environment' [53] [54] [55]. It is posited that this view can be extended to all aspects of Blended Learning—how can an instructional designer (Training Designer, Training Developer or Instructor in the SADL context) effectively design instruction without a effective understanding of learning strategies?

35. In order to provide better guidance for applying Blended Learning and instilling HOT, a future revision of the instructor's handbook should supplement the limited efficacy [56] [57] [58] of the learning styles approach (ie visual, auditory, kinaesthetic modes). A useful addition could be the 'six strategies that work' [59] [60], as noted in Annex F. Changes to or augmentation of the Training Systems suite of courses (including instructor qualification courses) should include training on effective instructional design, and details relevant to the broadening learner demographic.

Incorporating effective instructional design

36. Defence applies the SADL ADDIE instructional design model. 'Every component of the learning process (ie learners, teachers/instructors, materials [content] and learning environment) is crucial for successful learning' [61]. Effective instructional design requires more than simply following a process [62]. It applies pedagogical design/learning strategies. It requires an effective knowledge of learning theories [63].

37. The current Training Systems suite of courses provides only a cursory treatment of pedagogical design/learning strategies and effective knowledge of learning theories as seen in the table in Annex E. The ATI 1-2 *Army Instructor Development* [64] requires TCs/TEs to provide training to instructors on the development of content for ADELE courses. However, the extant Training Systems suite of courses fails to adequately educate and train Training Designers, Training Developers and Instructors to select the most appropriate ways to implement learning (ie the selection of a suitable learning strategies).

38. Its recently dis-established Army Learning Production Centre (ALPC) had provided training for organic instructional designers (ID) IOT exercise their ID BASK effectively. Following the re-structure of the Royal Australian Army Educational Corps (RAAEC) positions across Army, some RAAEC officers are (actually or effectively) posted to ID positions. However, there is insufficient instructional designer qualified personnel to cater for the expanding need across Army.

39. The Army Education Centre (AEC) provides a relevant course, the AEC Blended Learning Instructional Design Program. That course is offered as a professional development course and is hosted on ADELE-U. While of constrained efficacy, that course goes some way towards developing ID BASK for relevant Army personnel.

Aids to learning

40. **Information Technology network.** For Digital Natives (DNs), the first resort for information is the Internet[65] [66]. They are progressively moving from hardwired access to mobile/Wi-Fi internet access[67]. For DNs to seamlessly apply their searching behaviour in Defence, they require the provision of a world class search engine that searches every intranet page, every SharePoint page, and every library linked to either, and then prioritises the results to match their search criteria. The provision of online libraries of briefs and papers covering research and reporting across Army would be commensurate with the intent of the civilian 'internet of things'[68]. A thoroughly extensive solution is not currently available on the DPN. The extant IT system shows signs of struggling to support the current use, as evidenced by lag and video pixilation.

41. **Social networks and social media.** DNs prefer an element of face-to-face learning. They prefer a combination of online communication (eg social media) and face-to-face communication[69]. Social media[70] has a role to play in Blended Learning to provide frank

question and answer forums[71] [72]. Digital Natives are generally more cautious[73] than the previous generation when using social media and prefer higher privacy settings. Social media learning is informal; if using social media to convey learning, the learners need to be specifically informed, and the effective application in learning requires consistent interaction by the instructor[74].

42. Evidence indicates that learning environments which provide individual and social[75] learning processes are likely to be more conducive for learning. ADELE provides the option for course specific forums embedded in the respective courses. In addition, Army learners have access to three forums: the Cove[76], the Forge[77] and ForceNet[78]. A social media presence for learners should be considered for every course; it should be noted that the three existing social media options may need to adapt to better suit the learners.

43. **Gamification.** Games and gamification are not the same. Game-based learning uses a discrete game, with a defined start and end, and game-play in between, to deliver learning content in different settings. Gamification uses selected game elements to aid the learning of content over an extended period[79]. Achieving an adequate balance between entertainment and educational value is one of the main challenges of developing educational games[80]. Games are to be enjoyable (fun) in order to maintain engagement, but they must have effective educational value[81]. Gamification[82] is 'about figuring out ways to create alignment with incentives and motivation. You increase productivity and performance and you can attract a higher-quality employee, next generation of employees or millennials generation who bring with them their increased technology skills'[83] [84]. Thurston[85] recommends that gamification framed using ARCS[86] (attention, relevance, confidence, satisfaction) be used to engage DNs. Gamification has a lot to offer to inspire and sustain the motivation of Army learners.

44. The ADELE plug-in, H5P, has a range of gaming tools to aid the gamification of training. They are found under 'editor' within the 'interactive content'. The ADELE H5P gaming tools are: Arithmetic Quiz, Flashcards, Iframe Embedder, Image Pairing, Memory Game, Personality Quiz, Virtual Tour (360), Course Presentation, and Branching Scenario. The effective and efficient inclusion of these tools necessitates the effective application of appropriate learning theories.

45. **Clip thinking.** DNs have developed what some researchers call 'çlip thinking'[87]. They learn in short clips. Because of this, the mastering of learning elements occurs better in short modules no longer than 15 minutes[88]. An application of this in the extant Army context is to deliver standard 40–45 minute periods in three discrete 15-minute modules. Preferred short-form video clips are generally no more than two to three minutes long[89] [90]. They are useful for providing succinct explanations or displaying actions.

46. **Engagement.** DNs are inclined to spend long hours on their mobile devices. They are inclined to work non-traditional hours. Using mobile technology as part of a sound learning strategy can significantly benefit learning[91]. Mass education is changing to become more personalised. Instructors/teachers need to actively engage and motivate learners. This can be achieved through increasing learner autonomy, goal setting, providing instant feedback (available in ADELE courses), and allowing individual study anywhere and at any time[92]. The four steps of Bandura's cognitive theory—attention, retention, reproduction and motivation[93], and the ARCS model are useful for learner motivation in various contexts. These are further discussed in Annex A.

47. **Micro-credentialing.** Micro-credentialing is a way of recognising the attainment of learning delivered in small discrete modules[94], smaller than traditional qualifications, like

university degrees. By way of example, micro-credential may be conceptualised as being like units-of-competency employed in the Australian Quality Training Framework. Providers issue micro-credentials for a range of purposes including professional development and continued education[95]. These can be used to motivate learners.

48. **Digital badges.** Digital badges[96] are a visible digital symbol linked directly to validation evidence via metadata. They have the potential of being an alternate credentialing system. Digital badges can be a gamification element which signifies accomplishments (goals) in learning. They can influence motivation and competitiveness in and between learners.

49. **Infographics.** 'Good visualization is the key to help untangle complexity: the visualization of information enables (learners) to gain insight and understanding quickly and efficiently … Examples of such visual formats are sketches, diagrams, images, objects, interactive visualizations, information visualization applications, and imaginary visualizations as in stories'[97] These pictorial representation are called infographics. In their online form, they can contain hyperlinks to relevant resources.

50. **Resource proliferation.** The volume of resources at every stage or phase of a course needs to expand in order to meet the diverse learning styles of all learners, including DNs. The learning for a specific BASK attribute needs to be presented in a variety of ways via a variety of media and modes[98] [99]. This provides flexibility. DNs seek to be more autonomous in how, when, where and with what learning content they interact. The outcome is a significant increase in resources, and the resultant burden on any platform hosting the learning, and the TC/TE/designer/developer/instructional staff to maintain the currency of the learning. No matter what learning resource is selected by the learner, the essential BASK is to be effectively adopted by the learner.

51. **Flipped classroom.** A 'flipped' classroom is one where the learners peruse material and prepare for the lesson beforehand to allow for a relevant specific learning activity once in class. The key benefit of this approach is that it allows the learner to better prepare by playing a video or online element several times[100] to reinforce the learning content before individually exercising the BASK attributes in class.

52. **Analogue immigrants.** The definition of Digital Natives (DNs) is given above. The term digital migrant is applied by some to those who are not born in the Gen Z era, but who are at home with digital technology. Three quarters[101] of DNs consider that they cannot learn without digital technology. The availability of technology cannot be guaranteed in the Army workplace. Therefore, DNs need to learn the BASK necessary to operate without contemporary technology for when circumstances force them to resort to pre-twenty-first century technology. This should be a deliberate and carefully considered instead of it occurring as an accidental coincidence as it currently does. DNs need to deliberately learn to be analogue migrants.

53. **Digital Natives as part of the solution.** The inclusion of DNs in exploring and applying learning technologies across Army is a necessary part of the way forward. Providing them with a commensurate degree of freedom of movement when engaging DNs as instructors will produce solutions which may not be imagined by those of preceding generations. Other armies, too, are wrestling with the implications of generational change[102].

ESSENTIAL BEHAVIOURS, ATTITUDES, SKILLS AND KNOWLEDGE FOR ARMY INSTRUCTORS IN THE 21ST CENTURY

54. The twenty-first century Army Training Establishment (TE) instructor needs to better understand their diverse learners. They need to meet them where they are and to lead them to where they need to be in order to support Army's capability. The generational changes, combined with adoption of technological changes, impose the necessity for TE instructors to develop broader BASK in order to complete their tasks with increased efficiency and effectiveness. A list of relevant BASK, drawn from SADL, suggested for Training Establishment instructors is attached in Annex G.

55. Due to the changing nature of learners and the learning environment due to technological advances, leaders at every level in Army need to continue the development of a culture of excellence in education and training. One aspect is the provision of shift-working instructors IOT to provide rapid feedback to learners, using the upgraded learning technologies, including on evenings and weekends. Another aspect is the inculcation of learning design BASK in operators in the Analyse, Design, Develop and Implement phases of SADL IOT select the most appropriate approach, methods and tools for BASK development.

56. The contrast between Army's existing instructor training and the requirements of SADL (as noted in Annex E) indicates that the Certificate IV in Training and Assessment (2016) better aligns with SADL requirements than extant Army training. However, the intention of the observation here is that Army should learn from broad industry experience and develop a contextualised Army specific course broadly (but not necessarily closely) aligned to what civilian industry requires of effective, efficient and professional instructors.

RECOMMENDATIONS

57. It is recommended that:

a. operators in the Analyse Phase be knowledgeable of the impacts of generational changes IOT produce more accurate 'target population profiles' to support the development of subsequent LMPs

b. advanced (eg TE) instructor training be developed which aligns with all SADL Implement Phase requirements, similar to but not duplicating the Certificate IV in Training and Assessment (2016) IOT ensure effective, efficient and professional instructors

c. formal training be developed which installs rudimentary BASK of effective instructional design IOT qualify every TC/TE Training Designer, Training Developer and Instructor to create worthwhile learning content and experiences

d. all LMPs (and non-LMP courses) be reviewed IOT ensure the effective application of relevant learning strategies in the light of the learner characteristics of the changing demographics of Army learners

e. the Instructor's Handbook be supplemented with additional material to account for the different learning characteristics of all learners including Digital Natives, with the early issue of an interim supplement IOT ensure all Training Designers, Training Developers and Instructors have access to relevant guidelines

f. validation BASK are to be acquired, and systematically applied, by key pers in Training Establishments IOT ensure that every stage of the learning process is as effective and efficient as possible.

CONCLUSION

58. This paper observes that while Army is developing a Complex Adaptive Blended Learning System it is not yet adequately prepared to equip the unfolding tsunami of learners known as Digital Natives, the generation of young people who are now enlisting as soldiers and officers. The brains of Digital Natives' are wired differently to previous generations—they think differently. The system needs to continue adapting to accommodate the learning styles of Digital Natives, and it needs to meet Digital Natives where they are IOT broaden their capabilities to work in a greater range of environments.

59. Changing Army's learning environment by adopting improved technologies alone will not guarantee improved learning outcomes. Army needs to continue upgrading training IOT better equip TE instructors to better use the new technologies.

60. The current Training Systems suite of courses are inadequate to educate and train operators in the SADL Analyse, Design, Develop and Implement phases to select the most appropriate ways to implement learning—through adopting appropriate approaches, methods and tools. Rudimentary effective instructional design BASK should be inculcated into Training Designer, Training Developer and Instructor courses, more so than the cursory treatment currently given. The current Training Systems suite of courses fails to adequately impart validation BASK—a necessity to ensure that training design, development and implementation indeed achieves its intended outcomes, in Training Establishments.

61. Effective application of improved technologies imposes a liability on the IT network and TC/TE staff. The 21st Century learning environment requires access to a massive increase in learning resources, the delivery of it on demand, and the maintenance of its currency. The current IT network often struggles to play the occasional instructional video without lag or pixilation. The current DPN fails to provide a worlds-best-practice search engine, which searches every intranet webpage, SharePoint page and connected library to quickly provide learners with access to the collected knowledge and wisdom of the ADF. Many learners already conduct learning outside of the standard 0730 to 1600 work day. The culture of Army's leaders, at every level, needs to continue developing a culture of excellence, as exampled by providing motivated instructors who interact with learners in different ways and contexts to those currently experienced.

62. Digital Natives significantly correlate with Gen Z but not exclusively—not every Gen Z person is a Digital Native. While the Army learning environment needs to change to accommodate Digital Natives effectively, it should also provide a broad range of learning alternatives, not just for older personnel, but also for those young people who for one reason or another were not raised communicating in 'digital'.

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30 Jul 19

Annexes
A. Overview of learning domains, paradigms and select theories
B. Key points for developing thinking skills
C. Applying cognitive load theory
D. Characteristics of Digital Natives that influence how they learn
E. Comparison of Training System suite courses with SADL
F. Six strategies that promote learning
G. Key BASK for Training Establishment Instructors

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[1] Jonas-Dwyer, D & Pospisil, R 2004, 'The Millennial effect: Implications for academic development, *Research and Development in Higher Education: Transforming Knowledge into Wisdom*, vol. 27, pp.194–206, cited in Swanzen 2018.

[2] Swanzen, R 2018, 'Facing the generation chasm: the parenting and teaching of Generations Y and Z', *International Journal of Child, Youth and Family Studies*, vol. 9, no. 2, 2018, pp. 125–150, viewed 16 May 2019, https://journals.uvic.ca/index.php/ijcyfs/article/view/18216.

[3] Khalil, MK & Elkhider, IA 2016, 'Applying learning theories and instructional design models for effective instruction', *Advanced Psychological Education*, vol. 40, pp. 147–156, 2016, p.147, viewed 16 May 19, https://www.physiology.org/doi/pdf/10.1152/advan.00138.2015.

[4] Department of Defence, 2019, *The Systems Approach to Defence Learning (SADL)*, viewed 16 May 2019, http://drnet.defence.gov.au/JCG/ADC/LCD/SADL/Pages/SADL%20Home.aspx.

[5] Rothman, D 2016, 'A tsunami of learners called Generation Z', *Maryland Police and Correctional Training Commissions Journal*, viewed 11 May 2019, https://mdle.net/Journal/A_Tsunami_of_Learners_Called_Generation_Z.pdf

[6] Carter, T 2018, 'Preparing Generation Z for the teaching profession', *SRATE Journal*, vol. 27, no. 1, Winter 2018, viewed 11 May 2019, https://files.eric.ed.gov/fulltext/EJ1166694.pdf.

[7] Prensky, M 2001, 'Digital Natives, Digital Immigrants Part 1', *On the Horizon*, vol. 9, no. 5, pp.1–6, https://doi.org/10.1108/10748120110424816, cited in Berk, 2009.

[8] Rothman, D 2016, 'A tsunami of learners called Generation Z', *Maryland Police and Correctional Training Commissions Journal*, viewed 11 May 2019, https://mdle.net/Journal/A_Tsunami_of_Learners_Called_Generation_Z.pdf

[9] Ibid.

[10] Patch, H 2018, 'Which factors influence Generation Z's content selection in OTT TV? A Case Study', *Degree project in computer science and engineering*, Second cycle, Stockholm, Sweden 2018, viewed 11 May 2019, http://www.diva-portal.org/smash/get/diva2:1232633/FULLTEXT01.pdf.

[11] Carr, N 2011, 'The shallows: What the internet is doing to our brains', New York, WW Norton and Company, cited in Kirschner, 2017.

[12] Burr, R 2019, *Army is Motion: Chief of Army's Strategic Guidance 2019*, Department of Defence.

[13] Ryan, M 2016, *The Ryan Review: A study of Army's education, training and doctrine needs for the future*, Department of Defence.

[14] Ryan M 2017, *The application of Blended Learning technologies across FORCOMD* (X6872605)

[15] Khalil, MK & Elkhider IA 2016, 'Applying learning theories and instructional design models for effective instruction', *Advanced Psychological Education*, vol. 40, pp. 147–156, 2016, p.147, viewed 16 May 19, https://www.physiology.org/doi/pdf/10.1152/advan.00138.2015.

[16] Bloom, BS (Ed.) 1956, *Taxonomy of educational objectives: The classification of educational goals*, New York, McKay, cited in Bolin, Khramtsova & Saarnio, 2005.

[17] Khalil MK & Elkhider IA 2016, 'Applying learning theories and instructional design models for effective instruction', *Advanced Psychological Education*, vol. 40, pp. 147–156, 2016, p.147, viewed 16 May 19, https://www.physiology.org/doi/pdf/10.1152/advan.00138.2015.

[18] Thompson, T 2008, 'Mathematics Teachers' Interpretation Of Higher-Order Thinking In Bloom's Taxonomy', *International Electronic Journal of Mathematics Education*, vol. 3, no. 2, July 2008, p.97, viewed 26 May 2019, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.153.1356&rep=rep1&type=pdf

[19] Ibid.

[20] Yen, TS & Halili, SH 2015, 'Effective Teaching of Higher-Order Thinking (HOT) In Education', *The Online Journal of Distance Education and e-Learning*, April 2015, vol. 3, no. 2, pp. 41–47, viewed 26 May 2019, http://www.tojdel.net/journals/tojdel/articles/v03i02/v03i02-04.pdf

[21] Lai, ER 2011, *Critical thinking: A literature review*, Pearson research report, available: http://www.pearsonassessments.com/hai/images/tmrs/criticalthinkingreviewfinal.pdf, cited in Muirhead, DeNigris and Perlman 2016.

[22] Muirhead, B, DeNigris, J & Perlman, JR 2016, 'Effective Critical Thinking Technology Pedagogy', *International Journal of Instructional Technology and Distance Learning*, October 2016, vol. 13, no. 10, viewed 11 May 2019, https://www.researchgate.net/profile/Bennie_Prince/publication/310325826_Viewing_Quality_Matters_from_Boyer's_Scholarship_Paradigm_Prince_BF_Snyder_JL_Kanekar_A_and_Lipscomb_SR/links/582b6f7208ae004f74afb658.pdf#page=52.

[23] Singh, H 2003, 'Building effective blended learning programs', *Educational Technology*, vol. 43, no. 6, pp. 51–54, available http://doi.org/10.1021/es2033229, cited in Yeop, Wong & Noh 2016.

[24] Yeop, MA, Wong, KT & Noh, NM 2016, 'Blended learning in selected journals: a content analysis using the Complex Adaptive Blended Learning Systems', *International Journal of Instructional Technology and Distance Learning*, October 2016, vol. 13, no. 10, pp 47–58, viewed 11 May 2019, https://www.researchgate.net/profile/Bennie_Prince/publication/310325826_Viewing_Quality_Matters_from_Boyer's_Scholarship_Paradigm_Prince_BF_Snyder_JL_Kanekar_A_and_Lipscomb_SR/links/582b6f7208ae004f74afb658.pdf#page=52

[25] Wang, Y, Han, X & Yang, J 2015, 'Revisiting the Blended Learning Literature: Using a Complex Adaptive Systems Framework', *Educational Technology & Society*, vol. 18, no. 2, pp. 380–393, cited in Yeop, Wong & Noh, 2016.

[26] Anley, C 2015, *Learner Perceptions of the Motivating Role of Learning Technology in Education*, Master of Education in Educational Psychology, viewed 11 May 2019, http://scholar.sun.ac.za/handle/10019.1/96801.

[27] Lai, E & Xue, Y 2012, 'On the Influence of online education on teacher-student relationship', in Luo, J. (Ed.) 2012, *Soft Computing in Information Communication Technology*, vol. 161, pp. 49–55, Berlin, Germany, Springer, cited in Anley, 2015.

[28] Tavenner C 2012. Moving beyond blended learning to optimized schools, 2012, September 6 [Web log post]. Retrieved December 10, 2013, from http://goo.gl/CBtSrp. Cited in Anley 2015.

[29] Hultberg, P, Calonge, DS & Lee, E 2018, 'Promoting Long-Lasting Learning through Instructional Design', *Journal of the Scholarship of Teaching and Learning*, vol. 18, no. 3, September 2018, viewed 25 May 2019, https://files.eric.ed.gov/fulltext/EJ1192953.pdf.

[30] Mayer, RE & Moreno, R 2003, 'Nine Ways to Reduce Cognitive Load in Multimedia Learning', *Educational Psychologist*, vol. 38, no. 1, pp. 43–52, viewed 28 May 2019, http://www.uky.edu/~gmswan3/544/9_ways_to_reduce_CL.pdf.

[31] Vogel-Walcutt, JJ, Gebrim, JB, Bowers, C, Carper, TM & Nicholson, D 2011, 'Cognitive load theory vs. constructivist approaches: which best leads to efficient, deep learning?' *Journal of Computer Assisted Learning*, vol. 27, pp.133–145, 2011, p.142, viewed 26 May 2019, http://www.etc.edu.cn/lc/koPage/ko3228/1/133-145%20Cognitive%20load%20theory%20vs.%20constructivist%20approaches%20which%20best%20leads%20to%20efficient,%20deep%20learning.pdf.

[32] O'Connor, C 2015, 'A Practice-Led Approach to Aligning Learning Theories with Learning and Teaching Strategies in Third Level Chemistry Education,' *Irish Journal of Academic Practice*, vol. 4, no. 1, article 7, doi:10.21427/D7B42F available at: https://arrow.dit.ie/ijap/vol4/iss1/7, viewed 24 May 2019, https://arrow.dit.ie/cgi/viewcontent.cgi?article=1040&context=ijap

[33] Kelly, FS, McCain, T & Jukes, I 2009, *Teaching the digital generation: No more cookie-cutter high schools*, Melbourne, Vic, Hawker Brownlow Education, cited in Kivunja ,2014.

[34] Carter, T 2018, 'Preparing Generation Z for the teaching profession', *SRATE Journal*, vol. 27, no. 1, Winter 2018, viewed 11 May 2019, https://files.eric.ed.gov/fulltext/EJ1166694.pdf.

[35] Kirschner, PA 2017, 'The myths of the Digital Native and the multitasker', *Teaching and teacher education*, vol. 67 pp.135–142, Elsevier 2017, viewed 16 May 2019, https://www.gwern.net/docs/psychology/2017-kirschner.pdf.

[36] Jones, V, Jo, J & Martin, P 2007, *Future schools and how technology can be used to support Millennial and Generation-Z students*, ICUT 2007 (Proceedings B, pp. 886–891), 1st International Conference of Ubiquitous Information Technology, Dubai, February 2007, pp. 12–14, cited in Parker et alc 2012, p.7.

[37] Peterson, H 2014, *Millennials Are Old News – Here's Everything You Should Know About Generation Z* [online], UK, Business Insider, available from: http://www.businessinsider.com/generation-z-spending-habits-2014-6?IR=T [Accessed 24 April 2016], cited in Dunkley, 2017.

[38] Twenge, JM 2017, *iGen: Why today's supper-connected kids are growing up less rebellious, more tolerant, less happy and completely unprepared for adulthood*, New York, Atria Books, cited in Trevino, 2018.

[39] Dede, C 2005, 'Planning for Neomillennial Learning Styles', *Educause Quarterly*, vol. 1, cited in Jagger et al 2015.

[40] Jagger, S, Siala, H & Sloan, D 2015, 'It's All in the Game: A 3D Learning Model for Business Ethics', *Journal of Business Ethics*, vol. 1, no. 21, viewed 03 June 2019, https://philarchive.org/archive/JAGIAI.

[41] Parker, K, Czech, D, Burdette, T, Stewart, J, Biber, D, Easton, L, Pecinovsky, C, Carson, S, & McDaniel T 2012, 'The Preferred Coaching Styles of Generation Z Athletes: A Qualitative Study', *Journal of Coaching Education*, vol. 5, no. 2, Fall 2012 p. 5, National Association for Sport and Physical Education, p. 16, viewed 11 May 2019, https://journals.humankinetics.com/doi/pdf/10.1123/jce.5.2.5.

[42] Rothman, D 2016, 'A tsunami of learners called Generation Z', *Maryland Police and Correctional Training Commissions Journal*, viewed 11 May 2019, https://mdle.net/Journal/A_Tsunami_of_Learners_Called_Generation_Z.pdf

[43] Ibid.

[44] Patch, H 2018, 'Which factors influence Generation Z's content selection in OTT TV? A Case Study', *Degree project in computer science and engineering*, Second cycle, Stockholm, Sweden 2018, viewed 11 May 2019, http://www.diva-portal.org/smash/get/diva2:1232633/FULLTEXT01.pdf.

[45] Carr, N 2011, *The shallows: What the internet is doing to our brains*. New York, WW Norton and Company, cited in Kirschner, 2017.

[46] Department of Defence 2013. *Defence Learning Manual*, Commonwealth of Australia. Para 2.20, viewed 24 May 2019, http://intranet.defence.gov.au/home/documents/data/DEFPUBS/DEPTMAN/DLM/Part1/DLMPART1.pdf.

[47] Department of Defence, 2017, ATI 1-3 *The Management of Army Training*, X6347841.

[48] Department of Defence nd, *Learning Outcome Levels*, Systems Approach to Defence Learning, AB30752463

[49] Department of Defence, 2017, ATI 1-3 *The Management of Army Training*, X6347841.

[50] Department of Defence, nd, *AP5 Target Population Profile* v.2.0 (template), Commonwealth of Australia, AB28409730.

[51] Hultberg, P, Calonge, DS & Lee, E 2018, 'Promoting Long-Lasting Learning through Instructional Design', *Journal of the Scholarship of Teaching and Learning*, vol. 18, no. 3, September 2018, viewed 25 May 2019, https://files.eric.ed.gov/fulltext/EJ1192953.pdf.

[52] Department of Defence, 2017, ATI 1-2 *Army Instructor Development*, Commonwealth of Australia, X7124196.

[53] Craig, K 2018, *Motivation in Instructional Design*, Doctorate in Education, viewed 25 May 2019, https://digitalcommons.csp.edu/cgi/viewcontent.cgi?article=1002&context=edd.

[54] Bradford, G 2011, 'A relationship study of student satisfaction with learning online and cognitive load', *Internet and Higher Education*, vol. 14, pp. 217–226, cited in Craig, 2018.

[55] Meyer, KA & Murrell, VS 2014, 'A national study of training content and activities for faculty development for online teaching', *Journal of Asynchronous Learning Networks*, vol. 18, no. 1, cited in Craig, 2018.

[56] Pashler, H, McDaniel, M, Rohrer, D & Bjork, R 2008, 'Learning Styles: Concepts and Evidence', *Psychological Science in the Public Interest*, vol. 9, no. 3, December 2008, pp. 105–119, Sage Publications, viewed 22 May 2019, https://pdfs.semanticscholar.org/6275/2ca4c446ca7328f8c284f5385f1af1c4212e.pdf.

[57] Cuevas, J 2015, 'Is learning styles-based instruction effective? A comprehensive analysis of recent research on learning styles', *Theory and Research in Education*, vol. 1, no. 26, viewed 22 May 2019, https://s3.amazonaws.com/academia.edu.documents/45118709/Theory_and_Research_in_Education-2015-Cuevas-1477878515606621.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1558519246&Signature=L%2FKNEqOo3BlFHcBjt6oYu1HFmWQ%3D&response-content-disposition=inline%3B%20filename%3DIs_learning_styles-based_instruction_eff.pdf.

[58] Willingham, DT, Hughes, EM, & Dobolyi, DG 2015, 'The Scientific Status of Learning Styles Theories', *Teaching of Psychology*, 2015, vol. 42, no. 3, pp. 266–271, viewed 22 May 2019, https://career.ucsf.edu/sites/career.ucsf.edu/files/Article%20UCSF%20SEJC%20January%202017.pdf.

[59] Pashler, H, Bain, P, Bottge, B, Graesser, A, Koedinger, K, McDaniel, M, & Metcalfe, J 2007, *Organizing Instruction and Study to Improve Student Learning* (NCER 2007-2004). Washington, National Center for Education Research, Institute of Education Sciences, U.S. Department of Education, viewed 22 May 2019, https://files.eric.ed.gov/fulltext/ED498555.pdf.

[60] Pomerance, L, Greenberg, J & Walsh, K 2016, *Learning About Learning: What every new teacher needs to know*, January 2016, National Council on Teacher Quality, viewed 22 May 2019, https://files.eric.ed.gov/fulltext/ED570861.pdf.

[61] Dick, W & Carey, L 1996, *The Systematic Design of Instruction*, Fourth Edition, Harper Collins College Publishers, New York, cited in Isman, 2011.

[62] Schwier, RA & Wilson, JR 2010, 'Unconventional Roles and Activities Identified by Instructional Designers', *Contemporary Educational Technology*, vol. 1, no. 2, pp. 134–147. 2010, viewed 19 May 2019, https://dergipark.org.tr/download/article-file/252126.

[63] Ritzhaupt, AD & Kumar, S 2015, 'Knowledge and Skills Needed by Instructional Designers in Higher Education', *Performance Improvement Quarterly*, vol. 28, no. 3, pp.51–69, International Society for Performance Improvement, viewed 19 May 2019, http://www.aritzhaupt.com/eprofessional/papers/2015/RitzhauptKumar.pdf.

[64] Department of Defence, 2017, ATI 1-2 *Army Instructor Development*, Commonwealth of Australia, X7124196.

[65] Dede, C 2005, 'Planning for Neomillennial Learning Styles', *Educause Quarterly*, vol. 1, cited in Jagger et al 2015.

[66] Jagger, S, Siala, H & Sloan, D 2015, 'It's All in the Game: A 3D Learning Model for Business Ethics', *Journal of Business Ethics*, vol. 1, no. 21, viewed 11 May 2019, https://philarchive.org/archive/JAGIAI.

[67] Carter, T 2018, 'Preparing Generation Z for the Teaching Profession', *SRATE Journal*, vol. 27, no. 1, Winter 2018, viewed 11 May 2019, https://files.eric.ed.gov/fulltext/EJ1166694.pdf.

[68] Morgan, J 2014, *A simple explanation of 'The Internet of Things'*, Forbes Media, 13 May 2014, viewed 18 July 2019, https://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/#3788308d1d09

[69] Rothman, D 2016, 'A tsunami of learners called Generation Z', *Maryland Police and Correctional Training Commissions Journal*, viewed 11 May 2019, https://mdle.net/Journal/A_Tsunami_of_Learners_Called_Generation_Z.pdf.

[70] Ashley-Roberts, C 2012, *The social network, Chemistry World*, retrieved 04 November 2013, http://www.rsc.org/chemistryworld/2012/07/social-network, cited in O'Connor, 2015.

[71] Cole, ML, Hibbert, DB & Kehoe, EJ 2013, 'Students' perceptions of using Twitter to interact with the course instructor during lectures for a large enrolment chemistry course', *Journal of Chemical Education*, vol. 90, no. 5, pp. 671–672, cited in O'Connor, 2015.

[72] O'Connor, C 2015, 'A Practice-Led Approach to Aligning Learning Theories with Learning and Teaching Strategies in Third Level Chemistry Education,' *Irish Journal of Academic Practice*, vol. 4, no. 1, Article 7, doi:10.21427/D7B42F, available https://arrow.dit.ie/ijap/vol4/iss1/7, viewed 24 May 2019, https://arrow.dit.ie/cgi/viewcontent.cgi?article=1040&context=ijap

[73] Carter, T 2018, 'Preparing Generation Z for the Teaching Profession', *SRATE Journal*, vol. 27, no. 1, Winter 2018, viewed 11 May 2019, https://files.eric.ed.gov/fulltext/EJ1166694.pdf.

[74] Mao, J 2014, 'Social media for learning: A mixed methods study on high school students' technology affordances and perspectives', *Computers in human behaviour*, vol. 33, April 2014, pp.213–223, Abstract viewed 28 May 2019, https://www.sciencedirect.com/science/article/pii/S0747563214000077.

[75] Berk, RA 2009, 'Teaching Strategies for the Net Generation', *Transformative Dialogues: Teaching & Learning Journal*, vol. 3 issue 2, November 2009, p. 11, viewed 11 May 2019, http://www.kpu.ca/sites/default/files/Teaching%20and%20Learning/TD.3.2_Berk_Teaching_Strategies_for_Net_Generation.pdf.

[76] Department of Defence, The Cove, viewed 04 July 2019, https://cove.army.gov.au/.

[77] Department of Defence, The Forge, viewed 04 July 2019, https://theforge.defence.gov.au/.

[78] Department of Defence, ForceNet, viewed 04 July 2019, https://www.forcenet.gov.au/.

[79] Kapp, K 2014, 'Gamification: Separating fact from fiction', *Chief Learning Officer*, March 2014., viewed 27 May 2019, http://ww.w.cedma-europe.org/newsletter%20articles/Clomedia/Gamification%20-%20Separating%20Fact%20from%20Fiction%20(Mar%2014).pdf.

[80] Torrente, J, del Blanco, A, Marchiori, EJ, Moreno-Ger, P & Fernández-Manjón, B 2010, 'eAdventure: Introducing Educational Games in the Learning Process', *IEEE Educon Education Engineering 2010 – The future of global learning Engineering Education*, pp.1121–1126, p.1122., viewed 27 May 2019, https://www.researchgate.net/profile/Javier_Torrente/publication/224148958_e-Adventure_Introducing_educational_games_in_the_learning_process/links/0fcfd5108260dbdf4e000000/e-Adventure-Introducing-educational-games-in-the-learning-process.pdf.

[81] Prensky, M 2001, *Digital Game Based Learning*, New York, McGraw-Hill, cited in Torrente et al 2010.

[82] Dey, S & Eden, R 2016, 'Gamification: An emerging trend', *Pacific Asia Conference on Information Systems* (PACIS 2016) Taiwan, viewed 28 May 2019, http://eprints.qut.edu.au/98342/1/PACIS%20Final%202.pdf.

[83] Hein, R. 2013, 'How to Use Gamification to Engage Employees', *CIO: CXO Media Inc*., cited in Dey and Eden, 2016.

[84] Zichermann, G & Cunningham, C 2011, 'Gamification by Design: Implementing Game Mechanics *Web and Mobile Apps*, O'Reilly Media, Sebastopol, CA, cited in Dey and Eden, 2016.

[85] Thurston, TN 2018, 'Design Case: Implementing Gamification with ARCS to Engage Digital Natives', *Journal on Empowering Teaching Excellence*, vol. 2, no. 1, Spring 2018, Article 5, p.25, viewed 11 May 2019, https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1024&context=jete.

[86] Li, K & Keller, JM 2018, 'Use of the ARCS model in education: A literature review', *Computers & Education* vol. 122, 2018, pp.54–62, viewed 20 May 2019, http://www.scipaper.ir/Archive/www.sciencedirect.com/scipaper.ir-use-of-the-arcs-model-in-education-a-literature-review-2018.pdf

[87] Gudilina, S 2016, 'Media and information literacy is lifelong education component', *SHS Web of Conferences*, 2016, viewed 29 May 2019, https://www.shs-conferences.org/articles/shsconf/pdf/2016/07/shsconf_eeia2016_01025.pdf.

[88] Dostovalova, EV, Lomasko, PS, Maschanov, AA, Nazarenko, EM, Simonova, AL 2018, 'Teaching in a Continuously and Dynamically Changing Digital Information and Learning Environment of a Modern University', *The New Educational Review*, November 2018, viewed 11 May 2019, https://www.researchgate.net/profile/Maria_Agueero4/publication/328811516_Foreign_Language_Teachers'_Feedback_Practices_a_Comparative_Study/links/5be46dbea6fdcc3a8dc77eaf/Foreign-Language-Teachers-Feedback-Practices-a-Comparative-Study.pdf#page=126.

[89] Hajhashemi, K, Caltabiano, NJ & Anderson, N 2018, 'Lecturers' perceptions and experience of integrating online videos in higher education', *Australian Educational Computing*, vol. 33, no. 1, 2018, viewed 11 May 2019, https://researchonline.jcu.edu.au/56552/1/164-Article%20Text-648-2-10-20180816.pdf

[90] Williams, J 2017, 'Finding Generation Z: What platforms do they use most?', *Awlogy*, 2017, https://awlogy.com/articles/finding-generation-z-whatplatforms-do-they-use-most, cited in Patch, 2018.

[91] Docherty, M 2018, 'Teaching the next generation: engaging and empowering the learners of tomorrow', *Proceedings of INTED2018 Conference* 5th-7th March 2018, Valencia, Spain, pp.1030–1039, viewed 11 May 2019, https://www.researchgate.net/profile/Mat_Docherty/publication/323899722_TEACHING_THE_NEXT_GENERATION_ENGAGING_AND_EMPOWERING_THE_LEARNERS_OF_T

OMORROW/links/5b02d589aca2720ba098e378/TEACHING-THE-NEXT-GENERATION-ENGAGING-AND-EMPOWERING-THE-LEARNERS-OF-TOMORROW.pdf.

[92] Docherty, M 2018, 'Teaching Generation Z: Engaging Tomorrow's Learners', *Inverted Classroom and Beyond 2018 Conference,* 20–21 February 2018, pp.77–85, viewed 11 May 2019, http://c3.icvl.eu/papers2016/icvl/documente/pdf/section1/section1_paper12.pdf.

[93] Bandura, A 2001, 'Social Cognitive Theory of Mass Communication', *Mediapsychology*, vol. 3, pp. 265–299, 2001, viewed 20 May 2019, https://vulms.vu.edu.pk/Courses/MCM511/Downloads/Social%20Cognitive%20Theory%20OF%20MASS%20COMMUNICATION.pdf.

[94] Elliott, R, Clayton, J, & Iwata, J 2014, 'Exploring the use of micro-credentialing and digital badges in learning environments to encourage motivation to learn and achieve', in Hegarty, B, McDonald, J & Loke, SK (Eds.), *Rhetoric and Reality: Critical perspectives on educational technology*, Proceedings ascilite Dunedin 2014, pp. 703–707, viewed 29 May 2019, http://researcharchive.wintec.ac.nz/3546/1/276-Elliott.pdf

[95] Milligan, S & Kennedy, G 2017, 'To what degree? Alternative micro-credentialing in a digital age', in *Visions for Australian tertiary education*, Melbourne Centre for the Study of Higher Education, The University of Melbourne, pp. 41–53., viewed 29 May 2019, https://www.wellsadvisory.com.au/wordy/wp-content/uploads/2018/01/MCSHE-Visions-for-Australian-Tertiary-Education.pdf#page=49

[96] Gibson, D, Ostashewski, N, Flintoff, K, Grant, S, Knight, E, 2015, 'Digital badges in education', *Education and Information Technologies*; New York vol. 20, Iss. 2, June 2015, pp. 403–410, viewed 03 July 2019, https://search.proquest.com/docview/1664982352?pq-origsite=gscholar

[97] Bertagni, B & Salvetti, S 2015, 'Dealing with complexity in a simple way: How visualization boosts understanding in learning process; The Z Generation case, *Sociologia Del Lavoro*, vol. 137, 2015. pp. 202–215, pp.202–203, viewed 11 May 2019, https://www.researchgate.net/profile/Fernando_Salvetti/publication/286092516_Employability_Knowledge_in_the_Glocal_World/links/56660bf708ae15e74634c4da/Employability-Knowledge-in-the-Glocal-World.pdf#page=205

[98] Kaur, M 2013, 'Blended learning - its challenges and future', *Procedia - Social and Behavioral Sciences*, vol. 93, 2013, pp. 612–617, p.616, viewed 28 May 2019, https://pdf.sciencedirectassets.com/.

[99] Ozdamlia, F & Cavusb, N 2011, 'Basic elements and characteristics of mobile learning', *Procedia - Social and Behavioral Sciences*, vol. 28, 2011, pp. 937–942, p.940, viewed 28 May 2019, https://pdf.sciencedirectassets.com/.

[100] Seedoyal-Seereekissoon, D 2018, 'Flipped classroom teaching in higher education: an assumption or an inevitable tool', *PEOPLE: International Journal of Social Sciences*, vol. 4, no. 1, pp.494–506, p.502, viewed 11 May 2019, https://grdspublishing.org/index.php/people/article/ viewFile/1272/1106.

[101] Afshar, MA, Jafari, A, Heshmati, F, Movahedzadeh, F & Cherif, AH 2019, 'Instructional Strategies for Motivating and Engraining Generation Z Students in Their Own Learning Process', *Journal of Education and Practice*, vol. 10, no. 3, 2019, p.4, viewed 11 May 2019,

https://www.researchgate.net/profile/Abour_Cherif/publication/330774868_Instructional_Strategies_for_Motivating_and_Engraining_Generation_Z_Students_in_Their_Own_Learning_Process/links/5c53adae92851c22a39f60a4/Instructional-Strategies-for-Motivating-and-Engraining-Generation-Z-Students-in-Their-Own-Learning-Process.pdf.

[102] Trent, K 2019, Motivating and Educating Millennials, *Journal of Military Learning*, April 2019, vol. 3, no. 1, Army University Press, viewed 10 May 2019, https://www.armyupress.army.mil/Portals/7/journal-of-military-learning/Archives/April-2019/JML-A19-whole-book.pdf

Bibliography

Afshar, MA, Jafari, A, Heshmati, F, Movahedzadeh, F & Cherif, AH 2019, 'Instructional Strategies for Motivating and Engraining Generation Z Students in Their Own Learning Process', *Journal of Education and Practice*, vol. 10, no. 3, 2019, p.4, viewed 11 May 2019, https://www.researchgate.net/profile/Abour_Cherif/publication/330774868_Instructional_Strategies_for_Motivating_and_Engraining_Generation_Z_Students_in_Their_Own_Learning_Process/links/5c53adae92851c22a39f60a4/Instructional-Strategies-for-Motivating-and-Engraining-Generation-Z-Students-in-Their-Own-Learning-Process.pdf.

Anley, C 2015, *Learner Perceptions of the Motivating Role of Learning Technology in Education*, Master of Education in Educational Psychology, viewed 11 May 2019, http://scholar.sun.ac.za/handle/10019.1/96801.

Ashley-Roberts, C 2012, 'The social network', *Chemistry World*, viewed 04 November 2013, http://www.rsc.org/chemistryworld/2012/07/social-network, cited in O'Connor, 2015.

Bandura, A 2001, 'Social Cognitive Theory of Mass Communication', *Mediapsychology*, vol. 3, pp. 265–299, 2001, viewed 20 May 2019, https://vulms.vu.edu.pk/Courses/MCM511/Downloads/Social%20Cognitive%20Theory%20OF%20MASS%20COMMUNICATION.pdf.

Berk, RA 2009, 'Teaching Strategies for the Net Generation', *Transformative Dialogues: Teaching & Learning Journal*, vol. 3 issue 2, November 2009, p. 11, viewed 11 May 2019, http://www.kpu.ca/sites/default/files/Teaching%20and%20Learning/TD.3.2_Berk_Teaching_Strategies_for_Net_Generation.pdf.

Bertagni, B & Salvetti, S 2015, 'Dealing with complexity in a simple way: How visualization boosts understanding in learning process. The Z Generation case', *Sociologia Del Lavoro*, vol. 137, 2015. pp. 202–215, pp.202–203, viewed 11 May 2019, https://www.researchgate.net/profile/Fernando_Salvetti/publication/286092516_Employability_Knowledge_in_the_Glocal_World/links/56660bf708ae15e74634c4da/Employability-Knowledge-in-the-Glocal-World.pdf#page=205.

Bloom, BS (Ed.) 1956, *Taxonomy of educational objectives: The classification of educational goals*, New York, McKay, cited in Bolin, Khramtsova and Saarnio, 2005.

Bolin, AU, Khramtsova, I & Saarnio, D 2005, 'Using Student Journals to Stimulate Authentic Learning: Balancing Bloom's Cognitive and Affective Domains', *Teaching of Psychology*, vol. 32, no. 3, 2005, pp154–159, viewed 26 May 2019,

https://www.researchgate.net/profile/Irina_Khramtsova/publication/228636895_Using_Student_Journals_to_Stimulate_Authentic_Learning_Balancing_Bloom%27s_Cognitive_and_Affective_Domains/links/5585a7fe08ae7bc2f44be2e4.pdf.

Bradford, G 2011, 'A relationship study of student satisfaction with learning online and cognitive load', *Internet and Higher Education*, vol. 14, pp. 217–226, cited in Craig, 2018.

Brame, CJ 2016, 'Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content', *CBE Life Sciences Education*, vol. 15, no. 4, viewed 24 May 2019, https://www.lifescied.org/doi/10.1187/cbe.16-03-0125.

Burr, R 2019, *Army is Motion: Chief of Army's Strategic Guidance 2019*, Department of Defence.

Bybee, RW, Taylor, JA, Gardner, A, Van Scotter, P, Powell, JC, Westbrook, A & Landes, N 2006, *The BSCS 5E instructional model: Origins, effectiveness, and applications*, Colorado Springs BSCS, accessed 31 December 2013 online at http://www.bscs.org/curriculumdevelopment/features/bscs5es.html, cited in Kivunja, 2014.

Carr, N 2011, 'The shallows: What the internet is doing to our brains', New York, WW Norton and Company, cited in Kirschner, 2017.

Carter, T 2018, 'Preparing Generation Z for the teaching profession', *SRATE Journal*, vol. 27, no. 1, Winter 2018, viewed 11 May 2019, https://files.eric.ed.gov/fulltext/EJ1166694.pdf.

Cole, ML, Hibbert, DB & Kehoe, EJ 2013, 'Students' perceptions of using Twitter to interact with the course instructor during lectures for a large enrolment chemistry course', *Journal of Chemical Education,* vol. 90, no. 5, pp. 671–672, cited in O'Connor, 2015.

College of Nursing Technology Support 2015, *The other two learning domains*, The Ohio State University, viewed 20 May 2019, http://u.osu.edu/contech/2015/11/12/the-other-two-learning-domains.

Craig, K 2018, *Motivation in Instructional Design*, 2018, Doctorate in Education, viewed 25 May 2019, https://digitalcommons.csp.edu/cgi/viewcontent.cgi?article=1002&context=edd

Cuevas, J 2015, 'Is learning styles-based instruction effective? A comprehensive analysis of recent research on learning styles', *Theory and Research in Education*, vol. 1, no. 26, viewed 22 May 2019, https://s3.amazonaws.com/academia.edu.documents/45118709/Theory_and_Research_in_Education-2015-Cuevas-1477878515606621.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1558519246&Signature=L%2FKNEqOo3BlFHcBjt6oYu1HFmWQ%3D&response-content-disposition=inline%3B%20filename%3DIs_learning_styles-based_instruction_eff.pdf.

Dede, C 2005, 'Planning for Neomillennial Learning Styles', *Educause Quarterly*, vol. 1, cited in Jagger et al 2015.

Delprato, DJ & Midgley, BD 1992, 'Some fundamentals of BF Skinner's behaviourism', *American Psychologist*, vol. 47, no. 11, pp. 1507–1520, 1992, American Psychological Association, viewed 20 May 2019, https://psycnet.apa.org/fulltext/1993-11901-001.pdf.

Department of Defence 2013. *Defence Learning Manual*, Commonwealth of Australia, Para 2.20, viewed 24 May 2019, http://intranet.defence.gov.au/home/documents/data/DEFPUBS/DEPTMAN/DLM/Part1/DLMPART1.pdf.

Department of Defence, 2017, ATI 1-2 *Army Instructor Development*, Commonwealth of Australia, X7124196.

Department of Defence, 2017, ATI 1-3 *The Management of Army Training*, Commonwealth of Australia, X6347841.

Department of Defence, 2019, *The Systems Approach to Defence Learning (SADL)*, Commonwealth of Australia, viewed 16 May 2019, http://drnet.defence.gov.au/JCG/ADC/LCD/SADL/Pages/SADL%20Home.aspx.

Department of Defence, nd, *AP5 Target Population Profile* v.2.0 (template), Commonwealth of Australia, AB28409730.

Department of Defence nd, *Learning Outcome Levels*, Systems Approach to Defence Learning, Commonwealth of Australia, AB30752463

Dey, S & Eden, R 2016, 'Gamification: An emerging trend', *Pacific Asia Conference on Information Systems* (PACIS 2016) Taiwan, viewed 28 May 2019, http://eprints.qut.edu.au/98342/1/PACIS%20Final%202.pdf

Dick, W & Carey, L 1996, *The Systematic Design of Instruction*, Fourth Edition, Harper Collins College Publishers, New York, USA, cited in Isman, 2011.
Dostovalova, EV, Lomasko, PS, Maschanov, AA, Nazarenko, EM, Simonova, AL 2018, 'Teaching in a Continuously and Dynamically Changing Digital Information and Learning Environment of a Modern University', *The New Educational Review*, November 2018, viewed 11 May 2019, https://www.researchgate.net/profile/Maria_Agueero4/publication/328811516_Foreign_Language_Teachers'_Feedback_Practices_a_Comparative_Study/links/5be46dbea6fdcc3a8dc77eaf/Foreign-Language-Teachers-Feedback-Practices-a-Comparative-Study.pdf#page=126.

Docherty, M 2018, 'Teaching Generation Z: Engaging Tomorrow's Learners', *Inverted Classroom and Beyond 2018* Conference 20–21 February 2018, pp.77–85, viewed 11 May 2019, http://c3.icvl.eu/papers2016/icvl/documente/pdf/section1/section1_paper12.pdf.

Docherty, M 2018, 'Teaching the next generation: engaging and empowering the learners of tomorrow', *Proceedings of INTED2018 Conference*, 5th-7th March 2018, Valencia, Spain, pp.1030–1039, viewed 11 May 2019, https://www.researchgate.net/profile/Mat_Docherty/publication/323899722_TEACHING_THE_NEXT_GENERATION_ENGAGING_AND_EMPOWERING_THE_LEARNERS_OF_TOMORROW/links/5b02d589aca2720ba098e378/TEACHING-THE-NEXT-GENERATION-ENGAGING-AND-EMPOWERING-THE-LEARNERS-OF-TOMORROW.pdf.

Dunkley, L 2017, 'Reaching Generation Z: Harnessing the Power of Digital Influencers in Film Publicity', *Journal of Promotional Communications*, vol. 5, no. 1, pp. 31–39, viewed 29 May 2019, http://www.promotionalcommunications.org/index.php/pc/article/viewFile/85/108.

Elliott, R, Clayton, J, & Iwata, J 2014, 'Exploring the use of micro-credentialing and digital badges in learning environments to encourage motivation to learn and achieve', in Hegarty, B, McDonald, J & Loke, SK (Eds.), *Rhetoric and Reality: Critical perspectives on educational technology*, Proceedings Ascilite, Dunedin, 2014, pp. 703–707, viewed 29 May 2019, http://researcharchive.wintec.ac.nz/3546/1/276-Elliott.pdf.

Gagne, RM 1977, *The conditions of learning*, New York, Holt, Rinehart and Winston, cited in Kivunja, 2014.

Gibson, D, Ostashewski, N, Flintoff, K, Grant, S, Knight, E, 2015, 'Digital badges in education', *Education and Information Technologies*; New York vol. 20, no. 2, June 2015, pp. 403–410, viewed 03 July 2019, https://search.proquest.com/docview/1664982352?pq-origsite=gscholar.

Gudilina S 2016, *Media and information literacy is lifelong education component*, SHS Web of Conferences 9, 01025, 2016, viewed 29 May 2019, https://www.shs-conferences.org/articles/shsconf/pdf/2016/07/shsconf_eeia2016_01025.pdf.

Hajhashemi. K, Caltabiano. NJ & Anderson. N 2018. 'Lecturers' perceptions and experience of integrating online videos in higher education', *Australian Educational Computing*, vol. 33, no. 1, 2018, viewed 11 May 2019, https://researchonline.jcu.edu.au/56552/1/164-Article%20Text-648-2-10-20180816.pdf.

Harris, KR & Graham, S 1999, *Making the writing process work*, New York, Brookline Books, cited in Kivunja, 2014.

Harrow, A 1972, *A Taxonomy of Psychomotor Domain: A Guide for Developing Behavioral Objectives*, New York, David McKay, cited in Wilson, 2019.

Hein, R 2013, 'How to Use Gamification to Engage Employees', *CIO: CXO Media Inc*, cited in Dey & Eden, 2016.

Hultberg, P, Calonge, DS & Lee, E 2018, 'Promoting Long-Lasting Learning through Instructional Design', *Journal of the Scholarship of Teaching and Learning*, vol. 18, no. 3, September 2018, viewed 25 May 2019, https://files.eric.ed.gov/fulltext/EJ1192953.pdf.

İsman, A 2011, 'Instructional Design In Education: New Model', *The Turkish Online Journal of Educational Technology*, January 2011, vol. 10, no. 1, viewed 21 May 2019, https://files.eric.ed.gov/fulltext/EJ926562.pdf.

Jagger, S, Siala, H & Sloan, D 2015, 'It's All in the Game: A 3D Learning Model for Business Ethics', *Journal of Business Ethics*, vol. 1, no. 21, viewed 11 May 2019, https://philarchive.org/archive/JAGIAI.

Jonas-Dwyer, D & Pospisil, R 2004, 'The Millennial effect: Implications for academic development, *Research and Development in Higher Education: Transforming Knowledge into Wisdom*, vol. 27, pp.194–206, cited in Swanzen 2018.

Jones, V, Jo J, & Martin, P 2007, *Future schools and how technology can be used to support Millennial and Generation-Z students*. ICUT 2007 (Proceedings B, pp. 886-891), 1st International Conference of Ubiquitous Information Technology, Dubai, February 12-14, 2007, cited in Parker et al 2012.

Kapp, K 2014, 'Gamification: Separating fact from fiction', *Chief Learning Officer*, March 2014, viewed on 27 May 2019 at http://ww.w.cedma-europe.org/newsletter%20articles/Clomedia/Gamification%20-%20Separating%20Fact%20from%20Fiction%20(Mar%2014).pdf.

Kaylor SK 2014. Preventing Information Overload: Cognitive Load Theory as an Instructional Framework for Teaching Pharmacology. *Journal of Nursing Education*, 53:2, 2014. Viewed on 21 May 2019 at https://search.proquest.com/docview/1494065020/fulltextPDF/EF13D2709EC74797PQ/1?accountid=10479.

Kaur, M 2013, 'Blended learning - its challenges and future', *Procedia - Social and Behavioral Sciences*, vol. 93, pp. 612–617, 2013, p.616, viewed 28 May 2019, https://pdf.sciencedirectassets.com/.

Kelly, FS, McCain, T & Jukes, I 2009, *Teaching the digital generation: No more cookie-cutter high schools*, Melbourne, Vic, Hawker Brownlow Education, cited in Kivunja, 2014.

Khalil, MK & Elkhider, IA 2016, 'Applying learning theories and instructional design models for effective instruction', *Advanced Psychological Education*, vol. 40, pp. 147–156, 2016, p.147, viewed 16 May 19, https://www.physiology.org/doi/pdf/10.1152/advan.00138.2015.

Kirschner, PA 2017, 'The myths of the Digital Native and the multitasker', *Teaching and teacher education*, vol. 67 pp.135–142, Elsevier 2017, viewed 16 May 2019, https://www.gwern.net/docs/psychology/2017-kirschner.pdf.

Kivunja, C 2014, 'Theoretical Perspectives of How Digital Natives Learn', *International Journal of Higher Education*, vol. 3, no. 1, pp. 94–109, 2014, viewed 28 May 2019, https://files.eric.ed.gov/fulltext/EJ1067467.pdf.

Krathwohl, DR 2002, 'A Revision of Bloom's Taxonomy: An Overview', *Theory Into Practice*, vol. 41, no. 4, Autumn 2002, College of Education, The Ohio State University, viewed 26 May 2019, https://teaching.yale-nus.edu.sg/wp-content/uploads/sites/25/2016/02/A-Revision-of-Blooms-Taxonomy_An-Overview.pdf.

Krathwohl, DR, Bloom BS & Masia, BB 1964. *Taxonomy of educational objectives, Book II. Affective domain.* New York, David McKay Company, Inc. cited in Wilson, 2019.

Lai, ER 2011, *Critical thinking: A literature review*, Pearson research report. Available: http://www.pearsonassessments.com/hai/images/tmrs/criticalthinkingreviewfinal.pdf, cited in Muirhead, DeNigris & Perlman, 2016.

Lai, E & Xue, Y 2012, On the Influence of online education on teacher-student relationship. In Luo, J. (Ed.), *Soft Computing in Information Communication Technology*, vol. 161, pp. 49–55, Berlin, Germany, Springer, cited in Anley, 2015.

Li, K & Keller, JM 2018, 'Use of the ARCS model in education: A literature review', *Computers & Education* vol. 122, 2018, pp.54–62, viewed 20 May 2019, http://www.scipaper.ir/Archive/www.sciencedirect.com/scipaper.ir-use-of-the-arcs-model-in-education-a-literature-review-2018.pdf

Lieto, A, Chellac, A and Frixione, M 2017, *Conceptual Spaces for Cognitive Architectures: A Lingua Franca for Different Levels of Representation* (paper), viewed 24 May 2019, https://arxiv.org/pdf/1701.00464v1.pdf.

Liu, CC 2010, 'Evolution of Constructivism', *Contemporary Issues in Education Research*, vol. 3, no. 4, April 2010, pp.63–66, viewed 26 May 2019, https://files.eric.ed.gov/fulltext/EJ1072608.pdf.

Mao, J 2014, 'Social media for learning: A mixed methods study on high school students' technology affordances and perspectives', *Computers in human behaviour*, vol. 33, pp.213–223, April 2014, Abstract viewed 28 May 2019, https://www.sciencedirect.com/science/article/pii/S0747563214000077.

Mayer, RE & Moreno, R 2003, 'Nine Ways to Reduce Cognitive Load in Multimedia Learning', *Educational Psychologist*, vol. 38, no. 1, pp. 43–52, viewed 25 May 2019, http://www.theurbanclimatologist.com/uploads/4/4/2/5/44250401/mayermoreno2003reducing cognitiveoverload.pdf.

Meyer, KA & Murrell, VS 2014, 'A national study of training content and activities for faculty development for online teaching', *Journal of Asynchronous Learning Networks*, vol. 18, no. 1, cited in Craig, 2018.

Milligan, S & Kennedy, G 2017, 'To what degree? Alternative micro-credentialing in a digital age', *Visions for Australian tertiary education*, Melbourne Centre for the Study of Higher Education, The University of Melbourne, pp. 41–53, viewed 29 May 2019, https://www.wellsadvisory.com.au/wordy/wp-content/uploads/2018/01/MCSHE-Visions-for-Australian-Tertiary-Education.pdf#page=49.

Morgan, J 2014, *A simple explanation of 'The Internet of Things'*, Forbes Media, 13 May 2014, viewed 18 July 2019, https://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/#3788308d1d09

Muirhead, B, DeNigris, J & Perlman, JR 2016, 'Effective Critical Thinking Technology Pedagogy', *International Journal of Instructional Technology and Distance Learning*, vol. 13, no. 10, October 2016, viewed 11 May 2019, https://www.researchgate.net/profile/Bennie_Prince/publication/310325826_Viewing_Quality_Matters_from_Boyer's_Scholarship_Paradigm_Prince_BF_Snyder_JL_Kanekar_A_and_Lipscomb_SR/links/582b6f7208ae004f74afb658.pdf#page=52.

O'Connor, C 2015, 'A Practice-Led Approach to Aligning Learning Theories with Learning and Teaching Strategies in Third Level Chemistry Education', *Irish Journal of Academic Practice*, vol. 4, no. 1, article 7, viewed 24 May 2019, https://arrow.dit.ie/cgi/viewcontent.cgi?article=1040&context=ijap.

Ozdamlia, F & Cavusb, N 2011, 'Basic elements and characteristics of mobile learning', *Procedia - Social and Behavioral Sciences*, vol. 28, pp. 937–942, 2011, p.940, viewed on 28 May 2019 at https://pdf.sciencedirectassets.com/.

Pappas, C 2014, *Cognitive load theory and instructional design*, viewed 25 May 2019, https://elearningindustry.com/cognitive-load-theory-and-instructional-design.

Parker, K, Czech, D, Burdette, T, Stewart,, J, Biber D, Easton,, L, Pecinovsky C, Carson, S, & McDaniel, T 2012, 'The Preferred Coaching Styles of Generation Z Athletes: A Qualitative Study', *Journal of Coaching Education*, vol. 5, no. 2, Fall 2012 pp.5–23, p.16, National Association for Sport and Physical Education, viewed 11 May 2019, https://journals.humankinetics.com/doi/pdf/10.1123/jce.5.2.5.

Pashler, H, Bain, P, Bottge, B, Graesse,r A, Koedinger, K, McDaniel, M, & Metcalfe, J 2007, *Organizing Instruction and Study to Improve Student Learning* (NCER 2007-2004). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education, viewed 22 May 2019, https://files.eric.ed.gov/fulltext/ED498555.pdf.

Pashler, H, McDaniel, M, Rohrer, D & Bjork, R 2008, 'Learning Styles: Concepts and Evidence', *Psychological Science in the Public Interest*, vol. 9, no. 3 December 2008, pp. 105–119 Sage Publications, viewed 22 May 2019, https://pdfs.semanticscholar.org/6275/2ca4c446ca7328f8c284f5385f1af1c4212e.pdf.

Patch, H 2018, 'Which factors influence Generation Z's content selection in OTT TV? A Case Study', *Degree project in computer science and engineering*, Second cycle, Stockholm, Sweden 2018, viewed 11 May 2019, http://www.diva-portal.org/smash/get/diva2:1232633/FULLTEXT01.pdf.

Peterson, H 2014, *Millennials Are Old News — Here's Everything You Should Know About Generation Z* [online], UK, Business Insider. Available from: http://www.businessinsider.com/generation-z-spending-habits-2014-6?IR=T [Accessed 24 April 2016], cited in Dunkley, 2017.

Pomerance, L, Greenberg, J & Walsh K 2016, *Learning About Learning: What every new teacher needs to know*, January 2016, National Council on Teacher Quality, viewed 22 May 2019 https://files.eric.ed.gov/fulltext/ED570861.pdf.

Prensky, M 2001, *Digital Game Based Learning*, New York, McGraw-Hill, cited in Torrente et al 2010.

Prensky, M 2001, 'Digital Natives, Digital Immigrants Part 1', *On the Horizon*, vol. 9, no. 5, pp.1–6, https://doi.org/10.1108/10748120110424816, cited in Berk, 2009.

Ritzhaupt, AD & Kumar, S 2015, 'Knowledge and Skills Needed by Instructional Designers in Higher Education', *Performance Improvement Quarterly*, vol. 28, no. 3, pp.51–69, International Society for Performance Improvement, viewed 19 May 2019, http://www.aritzhaupt.com/eprofessional/papers/2015/RitzhauptKumar.pdf.

Rothman, D 2016, 'A tsunami of learners called Generation Z', *Maryland Police and Correctional Training Commissions Journal*, viewed 11 May 2019, https://mdle.net/Journal/A_Tsunami_of_Learners_Called_Generation_Z.pdf.

Ryan, M 2016, *The Ryan Review: A study of Army's education, training and doctrine needs for the future*, Department of Defence.

Ryan, M 2017, *The application of Blended Learning technologies across FORCOMD*. Department of Defence (X6872605)

Schwier, RA & Wilson, JR 2010, 'Unconventional Roles and Activities Identified by Instructional Designers', *Contemporary Educational Technology*, vol. 1, no. 2, 2010, pp. 134-147, viewed 19 May 2019, https://dergipark.org.tr/download/article-file/252126.

Seedoyal-Seereekissoon, D 2018, 'Flipped classroom teaching in higher education: an assumption or an inevitable tool', *PEOPLE: International Journal of Social Sciences*, vol. 4, no. 1, pp.494–506, p.502, viewed 11 May 2019, https://grdspublishing.org/index.php/people/article/viewFile/1272/1106.

Singh, H 2003, 'Building effective blended learning programs', *Educational Technology*, vol. 43, no. 6, pp. 51–54, http://doi.org/10.1021/es2033229, cited in Yeop, Wong & Noh, 2016.

Swanzen, R 2018, 'Facing the generation chasm: the parenting and teaching of Generations Y and Z', *International Journal of Child, Youth and Family Studies*, 2018, vol. 9, no. 2, pp. 125–150, viewed 16 May 2019, https://journals.uvic.ca/index.php/ijcyfs/article/view/18216.

Tapscott, D 2009, *Grown up digital: How the net generation is changing your world*, New York, McGraw-Hill, cited in Kivunja, 2014.

Tavenner, C 2012, *Moving beyond blended learning to optimized schools*, 2012, September 6 [Web log post], retrieved December 10, 2013, from http://goo.gl/CBtSrp, cited in Anley 2015.

The University of Sydney School of Education and Social Work 2018, *Constructivism*, viewed on 26 May 2019 at http://sydney.edu.au/education_social_work/learning_teaching/ict/theory/constructivism.shtml

Thompson, T 2008, 'Mathematics Teachers' Interpretation Of Higher-Order Thinking In Bloom's Taxonomy', *International Electronic Journal of Mathematics Education*, vol. 3, no. 2, July 2008, p.97, viewed 26 May 2019, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.153.1356&rep=rep1&type=pdf.

Thurston, TN 2018, 'Design Case: Implementing Gamification with ARCS to Engage Digital Natives', *Journal on Empowering Teaching Excellence*, vol. 2, no. 1, Spring 2018, Article 5, p.25, viewed 11 May 2019, https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1024&context=jete.

Torrente J, del Blanco A, Marchiori EJ, Moreno-Ger P, and Fernández-Manjón B 2010, 'eAdventure: Introducing Educational Games in the Learning Process', *IEEE Educon Education Engineering 2010 – The future of global learning Engineering Education*, pp.1121–1126, p.1122, viewed 27 May 2019, https://www.researchgate.net/profile/Javier_Torrente/publication/224148958_e-Adventure_Introducing_educational_games_in_the_learning_process/links/0fcfd5108260dbdf4e000000/e-Adventure-Introducing-educational-games-in-the-learning-process.pdf.

Trent, K 2019, Motivating and Educating Millennials, *Journal of Military Learning*, April 2019, vol. 3, no. 1, Army University Press, viewed 10 May 2019, https://www.armyupress.army.mil/Portals/7/journal-of-military-learning/Archives/April-2019/JML-A19-whole-book.pdf

Trevino, N 2018, 'The Arrival of Generation Z on College Campuses', *Theses & Dissertations*, vol. 332, viewed 29 May 2019, https://athenaeum.uiw.edu/cgi/viewcontent.cgi?article=1337&context=uiw_etds.

Twenge, JM 2017, *iGen: Why today's supper-connected kids are growing up less rebellious, more tolerant, less happy and completely unprepared for adulthood*. New York, Atria Books, cited in Trevino, 2018.

van Gog, T, Paas, F & Sweller, J 2010, 'Cognitive Load Theory: Advances in Research on Worked Examples, Animations, and Cognitive Load Measurement', *Education Psychology Review*, vol. 22, 2010, pp. 375–378, viewed 22 May 19, https://link.springer.com/content/pdf/10.1007%2Fs10648-010-9145-4.pdf.

Vogel-Walcutt, JJ, Gebrim, JB, Bowers, C, Carper, TM & Nicholson, D 2011, 'Cognitive load theory vs. constructivist approaches: which best leads to efficient, deep learning?' *Journal of Computer Assisted Learning*, vol. 27, 2011, pp.133–145, p.142, viewed 26 May 2019, http://www.etc.edu.cn/lc/koPage/ko3228/1/133-145%20Cognitive%20load%20theory%20vs.%20constructivist%20approaches%20which%20best%20leads%20to%20efficient,%20deep%20learning.pdf.

Wang, Y, Han, X & Yang, J 2015, 'Revisiting the Blended Learning Literature: Using a Complex Adaptive Systems Framework', *Educational Technology & Society*, vol. 18, no. 2, pp. 380–393, cited in Yeop, Wong & Noh, 2016.

Willingham, DT, Hughes, EM, & Dobolyi, DG 2015, 'The Scientific Status of Learning Styles Theories', *Teaching of Psychology*, vol. 42, no. 3, 2015, pp. 266–271, viewed 22 May 2019, https://career.ucsf.edu/sites/career.ucsf.edu/files/Article%20UCSF%20SEJC%20January%202017.pdf.

Williams, J 2017, 'Finding Generation Z: What platforms do they use most?' *Awlogy*, 2017. https://awlogy.com/articles/finding-generation-z-whatplatforms-do-they-use-most, cited in Patch, 2018.

Wilson, LO 2019, *Three Domains of Learning – Cognitive, Affective, Psychomotor*, viewed 20 May 2019, https://thesecondprinciple.com/instructional-design/threedomainsoflearning/

Yen, TS & Halili, SH 2015, 'Effective Teaching of Higher-Order Thinking (Hot) In Education', *The Online Journal of Distance Education and e-Learning*, April 2015, vol. 3, no. 2, pp. 41–47, viewed 26 May 2019, http://www.tojdel.net/journals/tojdel/articles/v03i02/v03i02-04.pdf.

Yeop, MA, Wong, KT & Noh NM 2016, 'Blended learning in selected journals: a content analysis using the Complex Adaptive Blended Learning Systems', *International Journal of Instructional Technology and Distance Learning*, October 2016, vol. 13, no. 10, pp 47–58, viewed 11 May 2019, https://www.researchgate.net/profile/Bennie_Prince/publication/310325826_Viewing_Quality_Matters_from_Boyer's_Scholarship_Paradigm_Prince_BF_Snyder_JL_Kanekar_A_and_Lipscomb_SR/links/582b6f7208ae004f74afb658.pdf#page=52.

Zichermann, G & Cunningham, C 2011, ‘Gamification by Design: Implementing Game Mechanics’, *Web and Mobile Apps*,(O'Reilly Media: Sebastopol, CA, cited in Dey & Eden 2016.

ANNEX A TO
BLENDED LEARNING PAPER – BQ4787781
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OVERVIEW OF LEARNING DOMAINS, PARADIGMS AND SELECT THEORIES

1. **Learning domains.** According to Bloom[1], all learning falls into one or more of three domains: psychomotor, cognitive and affective. Each of the three learning domains correspond with skills, knowledge or attitudes/behaviours, as shown in Figure 1. Within the learning domains are learning paradigms. A paradigm is a framework of preconceptions and governing ideas[2]. Three main learning paradigms are behaviourism, cognitivism and constructivism[3].

Psychomotor			**Cognitive** [A]		**Affective**	
(Skills)			(Knowledge)		(Attitudes/behaviour)	
Physical			Intellectual		Emotional	
What can you do? [B]			What do you know? [B]		What do you feel? [B]	
6	Non-discursive communication [C]		6	Create	5	Characterisation
5	Skilled movement		5	Evaluate		
4	Physical abilities		4	Analyse	4	Organising
3	Perceptual abilities		3	Apply	3	Valuing
2	Fundamental movement		2	Understand	2	Responding
1	Reflex movements		1	Remember	1	Receiving

Figure 1: Three learning domains compared (after Wilson, 2019[4]). **Notes:** A: (Anderson and) Krathwohl 2002[5]; B: College of Nursing Technology Support, 2015[6]; C: Harrow, 1972[7].

2. **Behaviourism.** Behaviourism falls in the psychomotor domain. It has three phases: the stimulus, the thinking (cognitive) and the response. Two key behaviour theorists were Ivan Pavlov (1849–1936) and BF Skinner (1904–1990). Early behaviourists conducted much of their research on animals (eg Pavlov's dogs). The behaviourist's focus was on eliciting the response. Skinner[8] considered little of the cognitive aspects. Behaviourism is often only considered as stimulus and response.

3. Army delivers much of its training through Competency Based Training (CBT). CBT generally applies behaviourism. In CBT, regardless of how the learning was acquired, provided the learners (candidates for assessment) adequately display the required skills, knowledge, attitudes and behaviours (SKAB) they are considered competent. Behaviourism is an effective approach for learning lower order thinking skills (LOT). For behaviourism, Gagne[9] provides nine steps to scaffold learning:

a. Gaining attention
b. Expectancy: Informing the learner of the objective
c. Memory retrieval: Stimulating recall of prerequisite learning
d. Presenting stimulus materials
e. Providing learning guidance
f. Eliciting performance
g. Providing feedback
h. Assessing performance
i. Enhancing retention and transfer to the job.

4. **Cognitivism.** Cognitivism falls in the cognitive domain. Although the concepts preceded him, cognitivism is aligned to BS Bloom (1913–1999) and Bloom's taxonomy (1956). The revised version of that taxonomy was later published by Anderson and Krathwohl's (2001). The Anderson and Krathwohl (revised Bloom's) taxonomy has six levels. Each level requires an increase in the cognitive ability. The six levels are: remember, understand, apply, analyse, evaluate and create.

5. Albert Bandura (1925–) developed his social cognitive theory (1977) base on earlier work by others. Social cognitive theory falls into both the cognitive and affective domains. Social cognitive theory has four steps: attention, retention, reproduction and motivation. Bandura posited that learning can occur through observation[10]. For cognitivism, Harris and Graham[11] provide six stages of learning:

a. Develop and activate background knowledge, including skills and knowledge
b. Discuss the strategy, to promote active involvement and ownership of the strategy
c. Model the strategy, to demonstrate how to learn and illustrate the thought process of a skilled learner
d. Memorize the strategy, so that students know and understand what is involved with each step in the process
e. Support the strategy, using scaffolding to promote a transfer of strategy performance from teacher to student
f. Observe independent performance, to demonstrate use of the strategy for improved academic performance.

6. **Constructivism.** Constructivism falls into the cognitive domain. Constructivist 'theory suggests that humans construct knowledge and meaning from their experiences'[12]. There are four primary theorists for constructivism: Bruner, Piaget, Dewey and Vygotsky. The 'two major different strands of the constructivist perspectives, social constructivism, and cognitive constructivism'[13]. A degree of Army training applies a constructivist approach, the learners start with small bites of basic information and they build upon that. For constructivism, Bybee et al[14] provide five elements for learning:

a. Engage
b. Explore
c. Explain
d. Elaborate
e. Evaluate.

7. Connectivism has been proposed as a contemporary theory for learning in the digital age[15]. It has incorporated characteristics of both cognitivism and constructivism[16]. Connectivism has not been widely accepted as a learning paradigm. The reader can conduct their own reading on the benefits of Connectivism in providing a context for discussing learning in the digital age.

8. **Engagement strategies.** Learner motivation is key to learning success. There are several engagement strategies. These are not learning theories, as such. ARCS (ie attention, relevance, confidence, satisfaction) is used both for instructional design and motivation. Research into ARCS showed that learners spent more time on tasks which were framed using the ARCS approach[17]. Keller (1938–) recommended the ARCS model be integrated into the instructional design process[18].

[1] Bloom BS (Ed.) 1956. Taxonomy of educational objectives: The classification of educational goals. New York: McKay. Cited in Bolin, Khramtsova and Saarnio 2005.

[2] Macquarie Dictionary 2019 (online)

[3] Khalil MK and Elkhider IA 2016. Applying learning theories and instructional design models for effective instruction. *Advanced Psychological Education*. 40: 147–156, 2016. p.147. Viewed on 16 May at https://www.physiology.org/doi/pdf/10.1152/advan.00138.2015; 16 May 2019.

[4] Wilson LO 2019. *Three Domains of Learning – Cognitive, Affective, Psychomotor*. Viewed on 20 May 2019 at https://thesecondprinciple.com/instructional-design/threedomainsoflearning/

[5] Krathwohl DR 2002. A Revision of Bloom's Taxonomy: An Overview, Theory Into Practice, 41:4, Autumn 2002, College of Education, The Ohio State University. Viewed on 26 May 2019 at https://teaching.yale-nus.edu.sg/wp-content/uploads/sites/25/2016/02/A-Revision-of-Blooms-Taxonomy_An-Overview.pdf

[6] College of Nursing Technology Support 2015. *The other two learning domains*. The Ohio State University. Viewed on 20 May 2019 at http://u.osu.edu/contech/2015/11/12/the-other-two-learning-domains/

[7] Harrow A 1972. *A Taxonomy of Psychomotor Domain: A Guide for Developing Behavioral Objectives*. New York: David McKay. Cited in Wilson 2019.

[8] Delprato DJ and Midgley BD 1992. Some fundamentals of BF Skinner's behaviourism. *American Psychologist*. 1992 47:11, 1507–1520. American Psychological Association. Viewed on 20 May 2019 at https://psycnet.apa.org/fulltext/1993-11901-001.pdf.

[9] Gagne, R. M. (1977). The conditions of learning. New York: Holt, Rinehart and Winston. Cited in Kivunja 2014.

[10] Bandura A 2001. Social Cognitive Theory of Mass Communication. *Mediapsychology*, 3, 265–299. 2001, viewed on 20 May 2019 at https://vulms.vu.edu.pk/Courses/MCM511/Downloads/Social%20Cognitive%20Theory%20OF%20MASS%20COMMUNICATION.pdf

[11] Harris, K. R. & Graham, S. (1999). Making the writing process work. New York: Brookline Books. Cited in Kivunja 2014.

[12] The University of Sydney School of Education and Social Work 2018. Constructivism. Viewed on 26 May 2019 at http://sydney.edu.au/education_social_work/learning_teaching/ict/theory/constructivism.shtml

[13] Liu CC 2010. Evolution of Constructivism, Contemporary Issues in Education Research, April 2010 3:4, pp.63–66. Viewed on 26 May 2019 https://files.eric.ed.gov/fulltext/EJ1072608.pdf

[14] Bybee, R.W., Taylor, J.A., Gardner, A., Van Scotter, P., Powell, J.C., Westbrook, A.& Landes, N. (2006). The BSCS 5E instructional model: Origins, effectiveness, and applications. Colorado Springs BSCS, Accessed on 31 December 2013 online at http://www.bscs.org/curriculumdevelopment/features/bscs5es.html. Cited in Kivunja 2014.

[15] Siemens, G 2005, 'Connectivism: A learning theory for the digital age', *International Journal of Instructional Technology & Distance Learning*, January 2005, viewed 12 July 2019, http://www.itdl.org/Journal/Jan_05/article01.htm.

[16] Duke, B, Harper, G, & Johnston, M 2013, 'Connectivism as a digital age learning theory', *The International HETL Review*, Special Issue 2013, pp. 4–13, p. 9, viewed 12 Jul 19, https://www.hetl.org/wp-content/uploads/2013/09/HETLReview2013SpecialIssueArticle1.pdf.

[17] Li K and Keller JM 2018. Use of the ARCS model in education: A literature review, Computers & Education 122 (2018) 54–62. Viewed on 20 May 2019.

[18] Lia K and Keller JM 2018. Use of the ARCS model in education: A literature review, *Computers & Education* 122 (2018) 54–62.
Viewed on 20 May 2019 at
http://www.scipaper.ir/Archive/www.sciencedirect.com/scipaper.ir-use-of-the-arcs-model-in-education-a-literature-review-2018.pdf

ANNEX B TO
BLENDED LEARNING PAPER – BQ4787781
30 JUL 19

KEY POINTS FOR DEVELOPING THINKING SKILLS

1. 'Thinking skills are relatively specific cognitive operations that can be considered the "building blocks" of thinking'[1]. Benjamin Bloom chaired a committee which created a taxonomy of thinking. It has three domains, Psychomotor (skills), Affective (attitudes/behaviours), and Cognitive (knowledge). 'The abilities and skills within the (Cognitive Domain) domain are listed in six major categories starting from the simplest thinking behaviour to the most complex'. They are: remembering, understanding, applying, analysing, evaluating, and creating[2].

2. 'Experts define Higher Order Thinking (HOT) with different approaches and viewpoints. Resnick [3] argues that HOT is hard to define, but easily recognizable by its characteristics' [4]. The nine characteristics of HOT that Resnick [5] lists are:

a. 'non-algorithmic, meaning that the action steps can not be fully determined at the beginning

b. tends to be complex, meaning that steps can not be seen or predictable directly from a certain perspective

c. often produces a lot of solutions rather than a single solution

d. involve disagreements (nuanced judgment) and different interpretations

e. involves the application of multiple criteria, which are sometimes mutually contradictory

f. often involve uncertainty

g. involving self-regulation in the process of thinking

h. involving imposing meaning, such as discovered the structure of the irregularity

i. requires (commitment of effort); if examined closely, the general characteristics of HOT above demonstrates the need for unusual thought processes or thinking that is more complex and requires an unusual effort anyway'.

3. 'Studies have found out that 80% of people, especially young people, have clip thinking' [6] [7] [8]. They learn in short clips. Because of this, the mastering of learning elements occurs better in short modules no longer than 15 minutes[9]. Here are some features of the students with clip thinking:

a. they do not know how to analyse, there is no crisp logic, they are not able to distinguish the most essential things and establish logical connections

b. they have a short-term memory, while the long-term memory is absent. They completely forget the 2nd-3rd-4th weeks' material

c. they can operate on only the senses of short length. The increase of complexity of the objects of interest leads to an absolute misunderstanding of the studied material

d. there is lack of interest in the study of the subject, because they do not understand what at issue is

e. they have an easy fatigability that is expressed in studying compulsory subjects

f. due to lack of interest, there is poor discipline

g. young people with clip thinking cannot work without assistance'[10].

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[1] Kizlik, B 2019, *Thinking Skills Vocabulary and Definitions*, viewed 18 July 2019, http://www.adprima.com/thinkskl.htm.

[2] Collins, R 2014, 'Skills for the 21st Century: teaching higher-order thinking', *Curriculum & Leadership Journal*, vol. 12, issue 14, 29 August 2014, viewed 18 July 2019, http://www.curriculum.edu.au/leader/teaching_higher_order_thinking,37431.html?issueID=1 2910

[3] Resnick, LB 1987, *Educational and Learning to Think*, Washington DC, National Academy Press, cited in Alpino & Retnawati, 2017.

[4] Apino, E & Retnawati, H 2017, 'Developing Instructional Design to Improve Mathematical Higher Order Thinking Skills of Students', Journal of Physics, IOP Conf. Series 812, 2017.

[5] Resnick, LB 1987, *Educational and Learning to Think*, Washington DC, National Academy Press, cited in Alpino & Retnawati, 2017.

[6] 'Clip Thinking', Documentary, URL: http://www.youtube.com/watch?v=qXfNHzNKDkk, cited in Sharafeeva, 2016.

[7] Zelentsov, BP 2009, 'Formation of Thinking Abilities in Students', Zelentsov, BP & Tyatenkova, II, 'Continuing professional education: International collection of scientific articles',Fadeikina, NV (ed) Novosibirsk, SAFB, 2009, pp. 191–198, cited in Sharafeeva, 2016.

[8] Sharafeeva, LR 2016, 'Peculiarities of Organization of Training Students with Clip Thinking', *International Journal of Humanities and Cultural Studies*, Special Issue July 2016, pp. 440–447, p.442, viewed 29 May 2019, https://www.ijhcs.com/index.php/ijhcs/article/download/2143/2003.

[9] Dostovalova, EV, Lomasko, PS, Maschanov, AA, Nazarenko, EM, Simonova, AL 2018, 'Teaching in a Continuously and Dynamically Changing Digital Information and Learning Environment of a Modern University', *The New Educational Review*, November 2018, viewed 11 May 2019, https://www.researchgate.net/profile/Maria_Agueero4/publication/328811516_Foreign_Language_Teachers'_Feedback_Practices_a_Comparative_Study/links/5be46dbea6fdcc3a8dc77eaf / Foreign-Language-Teachers-Feedback-Practices-a-Comparative-Study.pdf#page=126.

[10] Zelentsov, BP 2009, 'Formation of Thinking Abilities in Students', Zelentsov, BB & Tyatenkova, II, 'Continuing professional education: International collection of scientific articles', Fadeikina, NV, Novosibirsk, SAFB, 2009, pp. 191–198, cited in Sharafeeva, 2016.

ANNEX C TO
BLENDED LEARNING PAPER – BQ4787781
30 JUL 19

APPLYING COGNITIVE LOAD THEORY

1. **Cognitive load theory.** John Sweller developed the cognitive load theory of learning (CLT) model, first published in 1988[1]. 'Proponents of CLT suggest that learning interference is related to the amount of effort associated with thinking and reasoning and that some learning environments demand greater cognitive effort than others, thus requiring the learner's working (short-term) memory to use higher loads of information-processing resources'[2]. Another research wrote, '(the) central tenet (in cognitive load theory is) that instruction should be designed in such a way that it is at an optimal level of complexity (ie. intrinsic load), reduce(ing) the load on working memory resulting from processes that do not contribute to learning (ie. ineffective or extraneous load), and optimis(ing) as far as possible the load resulting from processes that foster learning (ie. germane load)'[3]. The three levels of cognitive load, progressing from lowest to highest, are intrinsic, germane and extraneous loads[4].

2. The discussion around the term cognitive architecture can be complex, suffice to note that the term applies to the way individuals learn and remember[5]. Long-term memory is part of an individual's cognitive architecture, and has developed over the individual's lifetime. It links knowledge with multiple concepts and experiences[6]. Advances in learning technologies enables a Blended Learning approach to provide multiple concept and experience options, therefore increasing the likelihood of learning retention.

3. **Nine ways to reduce cognitive load.** Mayer and Moreno[7] list nine ways to reduce cognitive load on learners when applying multimedia. They are:

a. Accompany images with text as narration (not written)
b. Present learning in successive bite-size segments
c. Present multimedia explanations in paced segments
d. Pre-train learners' contextual material before class
e. Weed out extraneous information, sounds, and images
f. Signal key information by providing cues
g. Synchronise visual and auditory material
h. Align words and images (integrated presentation/animation)
i. Eliminate redundancy of narration of on-screen text[8].

What are the guidelines for cognitive load theory in relation to eLearning? [9]

4. The Cognitive Load Theory adheres to the following principles, all of which should be kept in mind when designing an eLearning course:

a. You can reduce the amount of load that is being placed upon the learners' working memory by integrating the various sources of information, rather than giving them the various sources individually.

b. In tasks or lessons that require problem solving skills, avoid using activities that require a "means-ends" approach, as this will place a load upon the working memory. Instead, use goal-free problems or examples to illustrate the point.

c. Reduce the amount of redundancy in eLearning course design in order to reduce the amount of unnecessary repetition-induced load that is put upon the working memory.

d. Use visual and auditory instruction techniques to increase the learners' short term memory capacity, particularly in situations where both types of instruction are required[10].

What are the types of cognitive load? [11]

5. There are three types of cognitive load that directly pertain to eLearning scenarios:

a. **Intrinsic.** This is the complexity that is inherently involved in certain tasks or materials. Simply put, some activities are harder to learn and to master than others. If they are more difficult, then they have the potential to cause an intrinsic cognitive overload.

b. **Extraneous.** This form of cognitive load consists of non-relevant, unimportant elements, such as activities or instructional materials that make the learners use their mental processes. For example, if you use a graph that requires extra information processing, but isn't really necessary, this would be an example of extraneous cognitive overload.

c. **Germane.** These elements enable the learners to devote their cognitive mental resources to the learning process and help to facilitate the development of a learner's knowledge base[12].

How can the cognitive load theory be applied in learning settings? [13]

6. In order for real learning to take place, a learner's schematic structure must be altered, according to the Cognitive Load Theory. If this occurs, learners will actually be able to grasp the information that is being provided, process it within their short term (working) memory, and finally commit it to long term memory. In this case, they will be able to build upon previously learned information, so that they can expand their knowledge base.

7. However, if cognitive overload takes place, then learners will be more likely to make errors, not fully engage with the subject materials, and provide poor effort overall. The change in the schematic structures and pathways will not occur, simply because the learner cannot process the information being offered within the lesson. Therefore, from an instructional design point of view, eLearning courses should be created in such a way that reduces the cognitive load that is placed upon the learners. This will give the learners the opportunity to process what is being taught effectively and more easily[14].

Three tips to reduce cognitive overload in you eLearning course design [15]

8. Here are some tips of how you can reduce cognitive overload in your eLearning course design:

a. **Keep it simple.** Remove all content that isn't absolutely necessary for the learning process. For example, if you are designing a slide show to provide information, try to reduce the amount of extraneous graphics you use throughout.

b. **Use different instructional techniques.** Present information in different ways. For instance, offer some data verbally and other data visually, such as through images or graphs. This will allow the learner to absorb information using different processing methods, which will reduce cognitive overload.

c. **Make learning 'bite sized'.** Divide content up into smaller lessons and encourage them to only move forward with the course when they have fully grasped the current material. This will ensure that they do not overload their working memory and can effectively move the information to their long-term memory[16].

Four principles for instructional design[17]

9. Specific recommendations relative to the design of instructional material include:

a. Change problem solving methods to avoid means-ends approaches that impose a heavy working memory load, by using goal-free problems or worked examples.

b. Eliminate the working memory load associated with having to mentally integrate several sources of information by physically integrating those sources of information.

c. Eliminate the working memory load associated with unnecessarily processing repetitive information by reducing redundancy.

d. Increase working memory capacity by using auditory as well as visual information under conditions where both sources of information are essential (i.e. non-redundant) to understanding[18].

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[1] Sweller, J 1991, 'Cognitive Load Theory, learning difficulty, and Instructional Design', *Learning and Instruction*, vol. 4, pp. 293 – 312, Elsevier Science Ltd, Great Britain, viewed 14 July 2019, http://coral.ufsm.br/tielletcab/Apostilas/cognitive_load_theory_sweller.pdf.

[2] Kaylor, SK 2014, 'Preventing Information Overload: Cognitive Load Theory as an Instructional Framework for Teaching Pharmacology', *Journal of Nursing Education*, vol. 53, no 2, 2014, p.108, viewed 21 May 2019, https://search.proquest.com/docview/1494065020/fulltextPDF/EF13D2709EC74797PQ/1?accountid=10479.

[3] van Gog, T, Paas, F & Sweller, J 2010, 'Cognitive Load Theory: Advances in Research on Worked Examples, Animations, and Cognitive Load Measurement', *Education Psychology Review*, vol. 22, pp. 375–378, viewed 22 May 2019, https://link.springer.com/content/pdf/10.1007%2Fs10648-010-9145-4.pdf

[4] Brame, CJ 2016, 'Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content', *CBE Life Sciences Education*, vol. 15, no 4, viewed 24 May 2019, https://www.lifescied.org/doi/10.1187/cbe.16-03-0125.

[5] Lieto, A, Chellac, A & Frixione, M 2017, *Conceptual Spaces for Cognitive Architectures: A Lingua Franca for Different Levels of Representation* (paper), Elsevier, viewed on 24 May 2019, https://arxiv.org/pdf/1701.00464v1.pdf

[6] Kaylor, SK 2014, 'Preventing Information Overload: Cognitive Load Theory as an Instructional Framework for Teaching Pharmacology', *Journal of Nursing Education*, vol. 53, no 2, 2014, viewed 21 May 2019, https://search.proquest.com/docview/1494065020/fulltextPDF/EF13D2709EC74797PQ/1?accountid=10479.

[7] Mayer, RE & Moreno, R 2003, 'Nine Ways to Reduce Cognitive Load in Multimedia Learning', *Educational Psychologist*, vol. 38, no. 1, pp. 43–52, viewed 28 May 2019, http://www.uky.edu/~gmswan3/544/9_ways_to_reduce_CL.pdf.

[8] Ibid.

[9] Pappas C 2014, *Cognitive load theory and instructional design*, viewed 25 May 2019, https://elearningindustry.com/cognitive-load-theory-and-instructional-design.

[10] ibid.

[11] ibid.

[12] ibid.

[13] ibid.

[14] ibid.

[15] ibid.

[16] ibid.

[17] Soloman, H 2019, 'Cognitive Load Theory', *InstructionalDesign.Org*, viewed 25 May 2019, https://www.instructionaldesign.org/theories/cognitive-load/.

[18] Ibid.

ANNEX D TO
BLENDED LEARNING PAPER – BQ4787781
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CHARACTERISTICS OF DIGITAL NATIVES THAT INFLUENCE LEARNING

1. Tapscott (p.34)[1] lists characteristics of Digital Natives that influence how they learn. They are:

a. 'They prize freedom and freedom of choice.
b. They love to customize things, make them their own.
c. They're natural collaborators, who enjoy a conversation, not a lecture.
d. They'll scrutinize you and your organization.
e. They insist on integrity and openness.
f. They want to have fun, even at work and at school.
g. They have a need for speed and speed is normal for them.
h. They are innovators and for them innovation is part of life.
i. They instinctively turn first to the Net to communicate, understand, and learn.
j. They are constantly creating or changing online content.
k. They seem to feast on technology and have an appetite for all things digital that is sometimes mind-boggling.
l. They seem to lack long attention spans, at least when it comes to listening to lectures.
m. They show signs of learning differently and the best of them make yesterday's cream of the crop look dull.
n. Growing up digital has had an impact on how they think and even changed the way their brains are wired.
o. Two of the smartest brain scientists, - Stanley Kutcher and Matthew Kutcher – conducted research which found that Net Geners' brains have indeed developed differently than those of their parents (p.29). They are wired differently from those of the previous generations.
p. The generation is smarter and quicker than their predecessors.
q. In education, they are forcing a change in the model of pedagogy, from a teacher-focused approach based on instruction to a student-focused model based on collaboration.
r. They use the programmable web to create their own content, collaborate with others, and build communities.
s. They don't just take what they are given. They are the active initiators, collaborators, organizers, readers, writers.
t. They do not just observe, they participate.
u. They inquire, discuss, argue, critique, investigate, seek and inform.
v. They search for, rather than simply look at information. This helps them to develop thinking and investigative skills.
w. They care about their/, education: the vast majority thinks that having a college degree is more important today than it was for their parents.
x. For once in our civilization, children are educating older people. Adults are looking to children for information and help with computer related stuff.
y. In Finland, the government has chosen 5,000 Net Geners to train the country's teachers in how to use computers. For the first time ever, in one domain, the students will be the teachers and the teachers the students.
z. They want to learn, but they want to learn only what they have to learn, and they want to learn it in a style that is best for them.
aa. Sitting mutely in front of a teacher doesn't appeal to them'[2].

[1] Tapscott, D. (2009). *Grown up digital: How the net generation is changing your world*. New York: McGraw-Hill. Cited in Kivunja 2014.

[2] Ibid.

ANNEX E TO
BLENDED LEARNING PAPER – BQ4787781
30JUL 19

COMPARISON OF TRAINING SYSTEM SUITE COURSES WITH SADL

1. **SADL contrasted with Training System suite**. A contrast between the requirements of the five SADL[1] phases and the various Training Systems suite of courses is provided in Table 1, below.

Table 1: Contrast between SADL phases and the Training Systems suite of courses

Serial	*Course*	*SADL*					*SADL Phase / UoC Element*	*Comments*
		Analyse	*Design*	*Develop*	*Implement*	*Evaluate*		
1	214917 ADF Performance Analyst[2]	✓					A1. Conduct input analysis (Performance needs analysis)	SA1
2	(LMP Version 1, 19 Mar 18)	✓					As. Conduct performance needs analysis	SA2
3		✓					A2.1. Analyse job	SA2
4		✓					A2.1. Identify tasks, prerequisites, licenses	SA2
5		✓					A2.2. Analyse target population	SA3, SA6
6		✓					A2.3. Establish SKAB gap	SA3
7		✓					A3. Conduct feasibility analysis	SA4
8		✓					A4/AP9. Produce L&D strategy / List delivery options	SA5
9	214918 ADF Training Designer (unpublished--details from records)[3]		✓				Des1. Conduct input analysis	SA3
10			✓				Des2. Conduct environmental analysis	SA1
11			✓				DesP2. Describe facilities, list resources, staff reqs	SA1
12			✓				Des3. Generate learning outcomes	SA2
13			✓				Des4.1. Design assessment strategy	SA2
14			✓				Des4.2. Develop syllabus (sequence and structure)	SA2
15			✓				Des4.3. Design learning methods and media	SA2

Serial	*Course*	*SADL*					*SADL Phase / UoC Element*	*Comments*
		Analyse	*Design*	*Develop*	*Implement*	*Evaluate*		
	214918 ADF Training Designer Course continued							
16			✓				Des 4.4. Design evaluation/learning review strategy	SA2
17			✓				Des5/DesP4. Produce draft LMP	SA4
18	214919 ADF Training			✓			Dev1. Conduct input analysis	SA1
19	Developer[4]			✓			Dev2.a. Develop learning materials and online content	SA2
20	(LMP Version 0.02, 08 Mar 18)			✓			Dev2.0. Apply pedagogical/learning theories	SA2
21				×			Dev2.6. Detail instructors responsibilities	Not detailed in LMP
22				✓			Dev2.b. Develop assessment materials	SA2
23				×			Dev2.7.b.Validate assessments	Not detailed in LMP
24				✓			Dev3. Develop learning review materials	SA4
25				✓			Dev4. Prepare learning resources	SA4
26				✓			Dev5. Trial learning solution (pilot test and adjust)	SA4
27				✓			Dev6. Finalise LMP	SA4
28	202960 Subject 1 Corporal				✓		I1. Conduct input analysis	SA7
29	Army[5]				✓		I2. Learning preparation (admin, resources, rehearsal)	SA7
30	(LMP Version 1, 06 Jul 18)				×		I3. Conduct pre-learning assessment (diagnostic)	Not detailed in LMP
31	(from: LO 2.4, SA7)				✓		I4.1. Develop lesson plan	SA7
32					✓		I4.2. Implement learning	SA7
33					✓		I4.3 Monitor learner progress (fault correction)	SA7
34					×		I4.4. Prepare for assessment	Not detailed in LMP
35					×		I4.5. Conduct assessment	Not well addressed
36					×		I4.6.b. Moderate assessment	Not detailed in LMP

Serial	Course	SADL					SADL Phase / UoC Element	Comments
		Analyse	*Design*	*Develop*	*Implement*	*Evaluate*		
	202960 Subject 1 CPL Army Course continued							
37					×		I5. Conduct post learning administration	Not detailed in LMP
38					×		I6. Conduct learning review (Reaction--L1; Learning--L2)	Not detailed in LMP
39					×		I7. Participate in learning implementation boards	Not detailed in LMP
40	212682 ARA Commissioning[6]				×		I1. Conduct input analysis	FA denotes formative assessment only
41	(LMP Version 1, 06 Jul 18)				FA		I2. Learning preparation (admin, resources, rehearsal)	
42	(From: LO 15.7, FA17--no SA,				×		I3. Conduct pre-learning assessment (diagnostic)	
43	ie only Level 3)				FA		I4.1. Develop lesson plan	
44	SADL states Level 3 training				FA		I4.2. Implement learning	
45	requires (summative) assessment				FA		I4.3 Monitor learner progress (questioning technique)	
46	and learner is to be supervised				×		I4.4. Prepare for assessment	
47	until assessed.				FA		I4.5. Conduct assessment	IHB appraisal tool only
48					×		4.6.b. Moderate assessment	
49					FA		I5. Conduct post learning administration	
50					×		I6. Conduct learning review (Reaction--L1; Learning--L2)	
51					×		I7. Participate in learning implementation boards	
52	216149 Basic Instructor Training[7]				✓		I1. Conduct input analysis	SA1
53	(LMP Version 3, 15 Mar 18)				✓		I2. Learning preparation (admin, resources, rehearsal)	SA1
54					×		I3. Conduct pre-learning assessment (diagnostic)	Not detailed in LMP
55					✓		I4.1. Develop lesson plan	SA1
56					✓		I4.2. Implement learning	SA1
57					✓		I4.3 Monitor learner progress (questioning technique)	SA1

Serial	*Course*	*SADL*					*SADL Phase / UoC Element*	*Comments*
		Analyse	*Design*	*Develop*	*Implement*	*Evaluate*		
	216149 Basic Instructor Training Course continued							
58					✓		I4.4. Prepare for assessment	SA2
59					✓		I4.5. Conduct assessment	SA2
60					✓		4.6.b. Moderate assessment	SA3
61					✓		I5. Conduct post learning administration	SA2
62					×		I6. Conduct learning review (Reaction--L1; Learning--L2)	Not detailed in LMP
63					×		I7. Participate in learning implementation boards	Not detailed in LMP
64	120031 Recruit Instructor[8]				×		I1. Conduct input analysis	Not detailed in LMP
65	(LMP Version 1, 24 Jan 18)				×		I2. Learning preparation (admin, resources, rehearsal)	Not detailed in LMP
66					×		I3. Conduct pre-learning assessment (diagnostic)	Not detailed in LMP
67					×		I4.1. Develop lesson plan	Not detailed in LMP
68					✓		I4.2. Implement learning	SA1
69					✓		I4.3 Monitor learner progress (questioning technique)	SA1
70					×		I4.4. Prepare for assessment	Not detailed in LMP
71					×		I4.5. Conduct assessment	Not detailed in LMP
72					×		4.6.b. Moderate assessment	Not detailed in LMP
73					×		I5. Conduct post learning administration	Not detailed in LMP
74					×		I6. Conduct learning review (Reaction--L1; Learning--L2)	Not detailed in LMP
75					×		I7. Participate in learning implementation boards	Not detailed in LMP
76	TAESS00015 Enterprise Trainer and Assessor Skill Set[9]				×		I1. Conduct input analysis	
77					×		I2. Learning preparation (admin, resources, rehearsal)	
78					×		I3. Conduct pre-learning assessment (diagnostic)	
79					×		I4.1. Develop lesson plan	

Serial	*Course*	*SADL*					*SADL Phase / UoC Element*	*Comments*
		Analyse	*Design*	*Develop*	*Implement*	*Evaluate*		
	TAESS00015 Enterprise Trainer and Assessor Skill Set continued							
80					✓		I4.2. Implement learning	TAEDEL301
81				✓			Dev2.b. Develop assessment materials	TAEASS401
82					✓		I4.5. Conduct assessment	TAEASS402
83					✓		I4.6.b. Moderate assessment	TAEASS402
84				✓			Dev2.7.b.Validate assessments	TAEASS403
85					×		I5. Conduct post learning administration	
86					×		I6. Conduct learning review (Reaction--L1; Learning--L2)	Kirkpatrick's model
87					×		I7. Participate in learning implementation boards	
88	TAESS00011 Assessor Skill Set[10]				×		I1. Conduct input analysis	
89					×		I2. Learning preparation (admin, resources, rehearsal)	
90					×		I3. Conduct pre-learning assessment (diagnostic)	
91					×		I4.1. Develop lesson plan	
92					✓		I4.2. Implement learning	
93				✓			Dev2.b. Develop assessment materials	TAEASS401/502
94					✓		I4.5. Conduct assessment	TAEASS402
95					✓		I4.6.b. Moderate assessment	TAEASS402
96				✓			Dev2.7.b.Validate assessments	TAEASS403
97					×		I5. Conduct post learning administration	
98					×		I6. Conduct learning review (Reaction--L1; Learning--L2)	Kirkpatrick's model
99					×		I7. Participate in learning implementation boards	

Serial	*Course*	*SADL*					*SADL Phase / UoC Element*	*Comments*
		Analyse	*Design*	*Develop*	*Implement*	*Evaluate*		
100	TAE40116 Certificate IV in Training and Assessment [11]				✓		I1. Conduct input analysis	TAEDEL401
101					✓		I2. Learning preparation (admin, resources, rehearsal)	TAEDEL401
102					✓		I3. Conduct pre-learning assessment (diagnostic)	TAELLN411
103					✓		I4.1. Develop lesson plan	TAEDES401
104					✓		I4.2. Implement learning	TAEDEL402
105				✓			Dev2.b. Develop assessment materials	TAEASS401/502
106				✓			Dev2.7.b.Validate assessments	TAEASS403
107					✓		I4.5. Conduct assessment	TAEASS402
108					✓		I4.6.b. Moderate assessment	TAEASS402
109					✓		I5. Conduct post learning administration	TAEDEL401
110					✓		I6. Conduct learning review (Reaction--L1; Learning--L2)	TAEDEL402
111					×		I7. Participate in learning implementation boards	
112	Evaluator LMP					?	E1. Conduct input analysis/review triggers for eval'n	
113	(unavailable)					?	E2. Plan and prepare for evaluation	
114						?	E3. Conduct evaluation (Behaviour--L3; Results--L4)	Kirkpatrick's model
115						?	E4. Analyse and interpret data	
116						?	E5, E6. Produce evaluation report	
117						?	E7. Participate in learning review boards	

2. **Nationally recognised training.** Australian nationally recognised training includes training packages, qualifications, units of competency accredited courses, and skill sets. These are regulated by the Australian Skills Quality Authority. Table 2 lists the UoCs for the Enterprise Trainer and Assessor. Table 3 lists the UoCs for the Assessor Skill Set. Table 4 lists the units of competency (UoC) for the current Certificate IV in TAE. These are included for comparison with the SADL requirements for instructor.

Table 2: The units of competency for the current Enterprise Trainer and Assessor

AESS00015 - Enterprise Trainer and Assessor Skill Set
TAEASS401 Plan assessment activities and processes
TAEASS402 Assess competence
TAEASS403 Participate in assessment validation
TAEDEL301 Provide work skill instruction

Table 3: The units of competency for the current Assessor Skill Set

TAESS00011 - Assessor Skill Set
TAEASS401 Plan assessment activities and processes
TAEASS402 Assess competence
TAEASS403 Participate in assessment validation
TAEASS502 Design and develop assessment tools

Table 4: The units of competency for the current Certificate IV in Training and Assessment

TAE40116 - Certificate IV in Training and Assessment
9 core units plus 1 elective unit
Core Units
TAEASS401 Plan assessment activities and processes
TAEASS402 Assess competence
TAEASS403 Participate in assessment validation
TAEASS502 Design and develop assessment tools
TAEDEL401 Plan, organise and deliver group-based learning
TAEDEL402 Plan, organise and facilitate learning in the workplace
TAEDES401 Design and develop learning programs
TAEDES402 Use training packages and accredited courses to meet client needs
TAELLN411 Address adult language, literacy and numeracy skills

[1] Department of Defence, 2019, *The Systems Approach to Defence Learning (SADL)*, viewed 16 May 2019, http://drnet.defence.gov.au/JCG/ADC/LCD/SADL/Pages/SADL%20Home.aspx

[2] Department of Defence, 2018, *214917 ADF Performance Analyst LMP*, Version 1, 19 Mar 18, viewed 01 April 2019.

[3] Department of Defence, 2019, *214918 ADF Training Designer* course (various documents: AC2038332, AO1579003, AO1579006, AO1579478, V2829695), viewed 02 April 2019.

[4] Department of Defence, 2018, *214919 ADF Training Developer* LMP, Version 0.02, 08 Mar 18, viewed 01 April 2019.

[5] Department of Defence, 2018, 202960 Subject 1 Corporal Army LMP, Version 1, 06 Jul 18, viewed 01 April 2019.

[6] Department of Defence, 2018, *212682 ARA Commissioning* LMP, Version 1, 06 Jul 18, viewed 01 April 2019.

[7] Department of Defence, 2018, *216149 Basic Instructor Training LMP*, Version 3, 15 Mar 18, viewed 01 April 2019.

[8] Department of Defence, 2019, *120031 Recruit Instructor LMP*, Version 1, 24 Jan 18, viewed 03 April 2019.

[9] Department of Education and Training, 2019, TAESS00015 Enterprise Trainer and Assessor Skill Set, viewed 03 April 2019, https://training.gov.au/Training/Details/TAESS00015.

[10] Department of Education and Training, 2019, TAESS00011 Assessor Skill Set, viewed 03 April 2019, https://training.gov.au/Training/Details/TAESS00011.

[11] Department of Education and Training, 2019, *TAE40116 Certificate IV in Training and Assessment*, viewed 03 April 2019, https://training.gov.au/Training/Details/TAE40116.

ANNEX F TO
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SIX STRATEGIES THAT PROMOTE LEARNING[1] [2]

1. In order to better implement education and training for Digital Natives as well as other learners, research shows that there are six strategies that work, as detailed below.

How were these strategies determined?

In *Organizing Instruction and Study to Improve Student Learning: A Practice Guide*, the Institute of Education Sciences (IES), the research arm of the U.S. Department of Education, identified proven practices that promote learning for all students, regardless of grade or subject, and that are especially potent with struggling students. Six practices stand out for the research behind them. There is little debate among scholars about the effectiveness of these six strategies:

What are the six strategies that work?

The first two help students take in new information:

1. **Pairing graphics with words.**
   Young or old, all of us receive information through two primary pathways — auditory (for the spoken word) and visual (for the written word and graphic or pictorial representation). Student learning increases when teachers convey new material through both.
2. **Linking abstract concepts with concrete representations.**
   Teachers should present tangible examples that illuminate overarching ideas and also explain how the examples and big ideas connect.

The second two ensure that students connect information to deepen their understanding:

3. **Posing probing questions.**
   Asking students "why," "how," "what if," and "how do you know" requires them to clarify and link their knowledge of key ideas.
4. **Repeatedly alternating problems with their solutions provided and problems that students must solve.**
   Explanations accompanying solved problems help students comprehend underlying principles, taking them beyond the mechanics of problem solving.

The final two help students remember what they learned:

5. **Distributing practice.**
   Students should practice material several times after learning it, with each practice or review separated by weeks and even months.
6. **Assessing to boost retention.**
   Beyond the value of formative assessment (to help a teacher decide what to teach) and summative assessment (to determine what students have learned), assessments that require students to recall material help information "stick."

[1] Pashler H, Bain P, Bottge B, Graesser A, Koedinger K, McDaniel M, and Metcalfe J 2007, *Organizing Instruction and Study to Improve Student Learning* (NCER 2007-2004). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education, viewed 22 May 2019, https://files.eric.ed.gov/fulltext/ED498555.pdf.

[2] Pomerance L, Greenberg J and Walsh K 2016, *Learning About Learning: What every new teacher needs to know*, January 2016, National Council on Teacher Quality, viewed 22 May 2019, https://files.eric.ed.gov/fulltext/ED570861.pdf.

ANNEX G TO
BLENDED LEARNING PAPER – BQ4787781
30 JUL 19

KEY BASK FOR TRAINING ESTABLISHMENT INSTRUCTORS

1. The generational changes, combined with adoption of technological changes, impose the necessity for Training Establishment (TE) instructors to develop broader skills in order to complete their tasks with increased efficiency and effectiveness. The list below is based upon the SADL[1] framework. The nomenclature refers to that applied in Annex E. It considers those Behaviours, Attitudes, Skills and Knowledge (BASK) imparted in the current Training Systems suite of courses.

2. As a dedicated Instructional Designer qualification is absent from the Training Systems suite of courses, TE instructors are to command rudimentary Instructional Designer BASK. Relevant BASK drawn from the SADL Develop Phase include:

a. Dev1. Conduct input analysis
b. Dev2.a. Develop learning materials and online content
c. Dev2.0. Apply pedagogical/learning theories
d. Dev2.6. Detail instructors responsibilities
e. Dev2.b. Develop assessment materials
f. Dev2.7.b.Validate assessments.

3. TE instructors require advanced instructional BASK. Relevant BASK drawn from the SADL Implement Phase include:

a. I1. Conduct input analysis
b. I2. Learning preparation (admin, resources, rehearsal)
c. I3. Conduct pre-learning assessment (diagnostic)
d. I4.1. Develop lesson plan
e. I4.2. Implement learning
f. I4.3 Monitor learner progress (questioning technique)
g. I4.4. Prepare for assessment
h. I4.5. Conduct assessment
i. 4.6.b. Moderate assessment
j. I5. Conduct post learning administration
k. I6. Conduct learning review (Reaction--L1; Learning--L2)
l. I7. Participate in learning implementation boards.

[1] Department of Defence, 2019, *The Systems Approach to Defence Learning (SADL)*, viewed 16 May 2019, ttp://drnet.defence.gov.au/JCG/ADC/LCD/SADL/Pages/SADL%20Home.aspx