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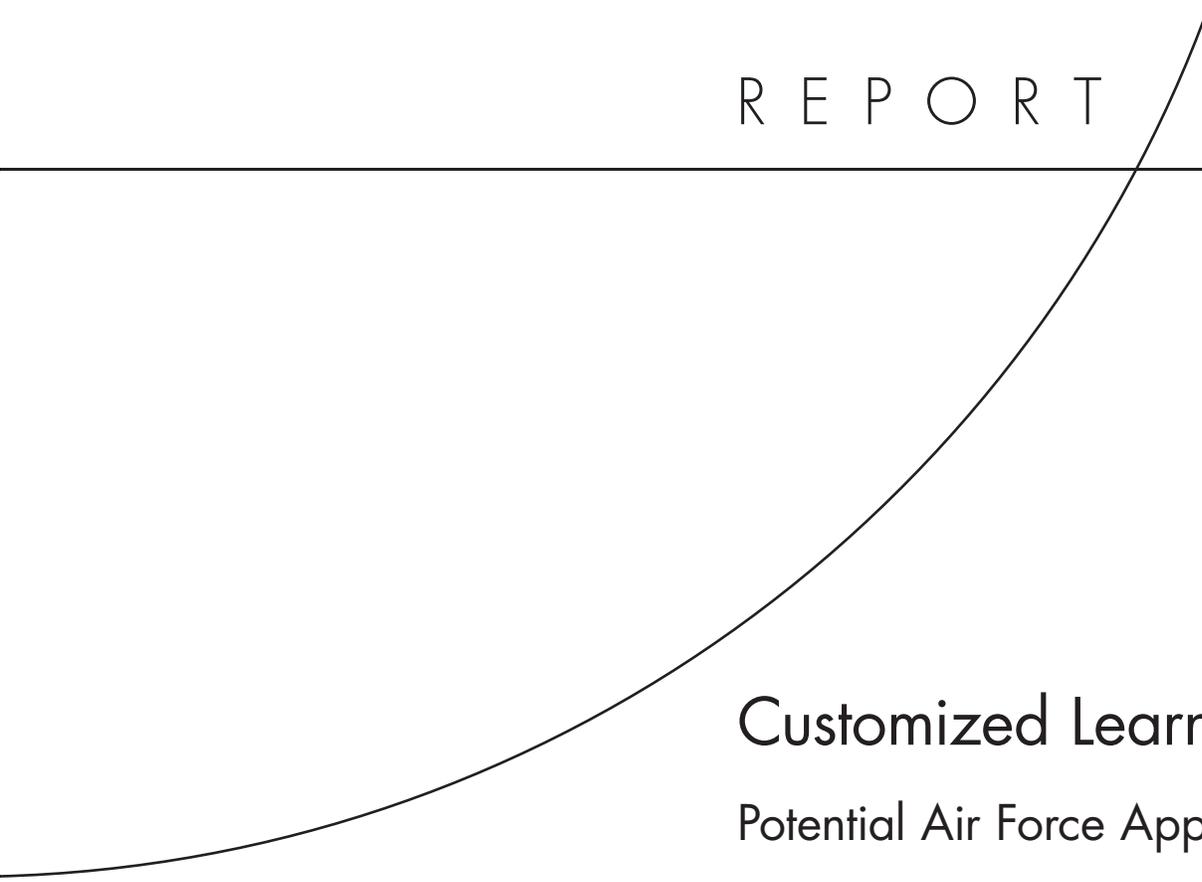View document details

Customized Learning

Potential Air Force Applications

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Summary

Background

In January 2008, Air Education and Training Command (AETC) published a white paper entitled "On Learning: The Future of Air Force Education and Training." Under its concept of *precision learning*, AETC envisions that

> Learning is customized to learner needs and abilities and delivered across a spectrum of live, virtual and constructive means using a variety of multi-media tools and modes. Learning is tailored to learners . . . by leveraging technology to deliver knowledge when, where and how needed. (pp. 13–14)

Around the same time, the National Academy of Engineering identified personal learning as one of 14 major challenges of the 21st century. And in February 2009, AETC/A5/8/9 asked RAND to look at the concept of *customized learning* (the Air Force's term for personalized learning) for application to Air Force training.

Motivation

The Air Force spends approximately $750 million per year on IST, plus an unknown amount for on-the-job and other types of training. This training has arguably helped make the U.S. Air Force the best air force in the world. However, current training methods may not be as efficient and effective as emerging alternatives. This study looks at educational approaches that would customize training to individual characteristics with the intent of minimizing the trainee's time in training, focusing the training on the trainee's needs, and getting the trainee productive sooner, all leading to reduced costs.

Context

The Air Force brings in approximately 34,000 new recruits each year. An individual is recruited and sent to a processing center where a job or job category is tentatively selected. The Air Force next sends the recruit, depending on a number of availability factors, to basic military training (BMT). During BMT, the career field is finalized, and on graduation (after approximately eight and one-half weeks), the student proceeds to the schoolhouse for job-specific training, also called IST.

IST can last as long as two years or as little as six weeks, depending on the specialty. All students in a particular course receive exactly the same training over exactly the same time.

The Air Force has an active program of on-the-job training and in-residence schools for special training. The Air Force also teaches professional military education to officer and enlisted personnel according to grade.

Analytic Approach

We approached the problem from three avenues:

1. We talked to experts in and out of the military.
2. We reviewed literature on personalized learning.
3. We reviewed meta-analyses on case studies of personalized learning and assessed some contemporary models.

Understanding Customized Learning

The concept of personalized learning has a long history. There are two camps in the education community regarding this subject: the progressive movement dating back to John Dewey (which includes personalized learning concepts) and the uniform approach (skill and drill).

Some research suggests that, in the absence of severe mental retardation, students tend to learn in the same way but that everyone brings different predispositions and prior experience to the learning situation. So, learning is not based only on common cognitive ability but is also shaped by prior experience, unique skills, and individual talents. This leads to arguments for more-personalized learning pedagogies allowing students to progress at their own pace, given their prior experience, skills, and talents.

Other research suggests that students have learning styles that allow them to learn better when the environment and teaching styles match their learning styles. Additionally, many educators believe that there is a difference in how the millennial generation thinks, learns, and processes information. There is no direct evidence to support this claim as of yet, only an intuitive feel that this technology-savvy generation is different.

In 2004, Coffield et al., of the Learning and Skills Research Centre (LSRC), a UK-based organization, published an exhaustive report examining 71 learning styles from 2,800 references; the majority of studies were based on American research. The study categorized the 71 learning style theories into five families and then examined 13 styles across the five families in depth. Each learning style is associated with a theory of use and an instrument for testing the student to determine what style within the theory the student possesses. Table S.1 summarizes the results of their study.

Only one of the learning styles satisfied all of the criteria identified as important for proving the value of learning styles. This style, Allinson and Hayes, is more properly a tool for classification or selection of management personnel than a true learning style. Four of the styles met the study's criteria for predictive validity—individual scores were correlated with success in learning. Two of those styles belong to the family of constitutionally based learning styles—they are based on attributes that individuals are born with and do not change. In both

Table S.1
Evaluation of Representative Learning Style Theories

Theory/Instrument	Family	Internal Consistency	Test-Retest Reliability	Construct Validity	Predictive Validity
Allinson and Hayes	Flexibly stable	Yes	Yes	Yes	Yes
Apter	Stable personality	Yes	Yes	—	Yes
Dunn and Dunn	Constitutionally based	No	No	No	Yes
Entwistle	Learning approaches	Yes	—	Yes	No
Gregorc	Constitutionally based	No	No	No	Yes
Herrmann	Flexibly stable	—	Yes	Yes	—
Honey and Mumford	Flexibly stable	No	Yes	No	No
Jackson	Stable personality	—	—	—	—
Kolb	Flexibly stable	—	Yes	No	No
Myers-Briggs	Stable personality	Yes	Yes	No	No
Riding	Cognitive structures	No	No	No	No
Sternberg	Learning approaches	No	No	No	No
Vermunt	Learning approaches	Yes	Yes	Yes	No

SOURCE: Coffield et al., 2004a.

NOTE: Yes = criterion met; No = criterion not met; — = no evidence either way or issue still to be settled.

of the cases, though, the learning styles failed to meet the criteria of construct validity, which measures how well test scores can be interpreted as measuring what they intend to measure.

Conclusions

Our literature review leads us to conclude that attention to learning styles has potential benefit for the Air Force, but with limitations, and that the effectiveness of individualized teaching is often greatly exaggerated. We recommend that the Air Force conduct some experiments with Air Force vocational training before implementation across Air Force training is considered.

The use of learning style instruments does have positive impacts (self-awareness and meta-cognition), even when the case cannot be made as to why they would have impact.

Learning style feedback shows the student how to enhance his or her own learning, and it fosters a discourse between student and teacher on how the student can improve in a course.

Customized learning increases the probability of creating lifelong learners. As individuals discover their learning styles, they are motivated to use that knowledge. If they have had bad experiences in the past, the new knowledge gives them a fresh point at which to reengage in learning.

Attention to learning styles can be a catalyst for organizational and systemic change. New and better pedagogies have not been an active pursuit or subject of study for the Air Force. The Air Force needs an educational center of excellence for the study of new approaches to educa-

tion and training. During the course of this study, the Air Force stood up an office in AETC for this purpose.

Learning styles can also provide a lexicon for dialogue between professional educators.

Implications

While the Air Force uses professional educators in some roles, it typically does not employ professional educators as instructors, but rather uses subject-matter experts to teach courses in initial skills and professional military education. Consequently, the majority of instructors do not have the expertise or ability to adapt their teaching style to a learning style.

The Air Force can take steps to lessen these concerns. First, the Air Force could update the Basic Instructor Course (BIC) with specific instruction on adapting teaching style to the style of the learners. Second, the Air Force could add additional instructor continuing education courses for the entire length of an instructor's tour. Third, the Air Force could hire educational mentors whose job would entail sitting in during instruction and constructively critiquing instructors on teaching effectiveness.

The Air Force operates a very structured IST process that requires each class of students to start and end courses together. The same is true for professional military education. The Air Force can run self-paced courses, as it did for some courses in the 1970s for initial skills training. We recommend that the Air Force perform an experiment on a self-paced initial skills course.

The eight-hour instructional day is too restrictive and does not give course managers or instructors the freedom to determine the best method or use of time to help students learn.

Customized learning does not have to be dependent on the instructor. Technology offers solutions that have not existed in the past. Technological solutions—software that adapts to the learner—can minimize the role of the instructor, thereby alleviating the need for professional educators. With appropriate technology, the instructor can take on the role of a coach or mentor with expertise in the subject area but without the need for unique teaching skills.

Customized Learning Applied to Air Force 2.0

Developing a learner-centric philosophy is a key component of customized learning. It shifts the relative importance from the process of transmitting information to the student to ensuring that the information is transmitted in a way that is best processed by the learner. It will require the new learning organization to create alternate means of conveying information such that the student can process information most effectively.

Customized learning will create new demands for an expanded knowledge base. Without argument, knowledge databases are critical to learning now and will be increasingly so in the future. One solution is to take advantage of the millennial generation's technological literacy and use it to create the knowledge databases of the future. Today's average instructor is becoming increasingly technologically literate and, perhaps, could develop computer-based instruction (CBI) and virtual world applications. Also, the software for CBI and virtual world development is increasingly user friendly. The Air Force needs to take advantage of software advances and a technologically literate force to develop the knowledge base of the future.

Customized learning could increase the need for knowledge-on-demand systems. It may be possible to move additional portions of IST into on-the-job training if knowledge systems are available for the Airmen to tap. With this approach, in addition to learning at their own pace and style, Airmen might also learn at a more propitious time.

Customized learning can improve education in the affective domain by making the learner the focus of the training and by giving the learner more control over the education process. As the organization communicates value to the individual, the individual is more likely to reciprocate and internalize the values of the organization.

The use of simulations can have a tremendous payoff. They provide an approach to learning that contrasts with the sterile environment of a lecture. They also provide users with a sense of the environment they will encounter on the job. Simulations can challenge users with virtual problem solving and virtual games, thereby increasing interest in the field of study.

The literature suggests that customized learning approaches motivate students to be continuous learners. Already today, young Airmen know how to find knowledge through the Internet. Most apply that ability to social networks and personal interests. It is a small step to apply that ability to job tasks, especially among motivated learners.

Technology Is Key

This report describes a number of tools and systems illustrative of emerging technological opportunities. For the Air Force, three insights are important: that new learning technologies hold the promise of mitigating some of the challenges its training programs confront by allowing greater responsiveness to the individual's learning style, prior knowledge, speed of learning, capabilities, and interests; that a very large pool of applications is available to draw upon and that these can also be adapted, or entirely new applications could be developed; but also that these applications are tools, not complete solutions. Overreliance on new learning technologies would not be a good idea.

Recommendations

We recommend that the Air Force take advantage of the new Advanced Learning Technology Demonstrations that AETC has established to test these ideas before large-scale implementation. There is much hyperbole regarding technology and new pedagogies. The best way to separate reality from hyperbole is to test the ideas in a real-world environment.