F2F and Online "Live Personalization" of Learning and Implications for Learning Object Repositories and Automated eLearning (A Survey and Analysis)

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Abstract - Learning object repositories, eLearning systems, and other data management systems have built personalization for their learners through intelligent agents, user profiling (personality, role, needs, histories, "interest" measures, live online behaviors, and learning styles metrics), user-directed learning, social networking, and other strategies.

"Online 'Live Personalization' of Learning and Implications for Learning Object Repositories and Automated eLearning" will explore what F2F (face-to-face) and online instructors bring to their teaching that personalizes the learning for unique individual learners. Finally, some ideas for personalizing learning object (and data) repositories and automated eLearning systems will be explored in the light of human-mediated F2F and online instructor customization strategies.

Key Words: Adaptive learning, personalization, automation, live personalization, learner profiling, automated eLearning, courseware recommendation systems, F2F learning, online instructor-led learning, and customization

Personalization and Adaptability in eLearning Databases and Systems

eLearning has been seen as a tool that addresses the limitations of "location, time, (and) age" as a lifelong learning vehicle. The lack of individual learning path adaptations may be a major stumbling block (Liu and Yang, 2005). A key enabler for various types of eLearning informational systems revolves around personalization. At the core of this is learner-centered design, or a focus on the needs of the learner in learning design. "The issues of how to support adaptivity in learning systems, and provide students with personalized learning materials, can be partially solved by providing student-centered, self-paced, highly interactive learning materials and introducing automatic and dynamically adaptive learning methods" (Sun, Joy and Griffiths, 2005). This effort has stemmed from the interaction between usability and learning (Costabile, De Marsico, Lanzilotti, Plantamura and Roselli, 2005). How well does the system assess the needs of the respective users and deliver the individualized learning?

Potential Benefits. A number of benefits may be attained with the customization of learning. Some see a dangerous rigidity in eLearning that needs to mitigate for the human factors in learning. "Our shared belief is that learning, like other human activities, cannot and will not be confined within rigidly defined course systems or learning repositories, enclosing learning resources which cannot be tailored to the different learner's needs, skills, interests, preferences, goals, etc." (Chatti, Klamma, Quix and Kensche, 2005). Micro-modularization of curricular content has also been proposed as another way to deliver "competence-dependent units" (Del Corso, Ovcin and Morrone, 2005, p. 574). Adaptation of learning fragments may be based on custom situations for learners (Blõchl, Rumetshofer, and Wõb, 2003).

One of the motivations of automating Web-based learning materials is to hedge the high costs of the human development of eLearning (Shirota, 2004). Various models offer machine-based reasoning and decision-making about how learning objects are delivered to learners based on particular learner traits, attitudes, personalities, capabilities, online behaviors, and situations. Optimal individualized eLearning paths may be individualized through instructors.

However, live instructors have practical class size limits if they want to personalize learning. The "staff power" required may not be efficient (García, Rodríguez, Rosales, and Pedraza, 2005, p. 90). A technological solution would be eminently scalable, if the design factors may be created in a malleable and learning-effective way.

Some even argue that most courses are defined for "a generic student" and that an instructor cannot generate "personalized learning paths tailored to each student's needs." Also, the variation between different instructors' teaching may involve a range of quality including some poor approaches (Carchiolo, Longheu, Malgeri and Mangioni, Using web-based personalized learning system in academic context, 2004).

Various technological innovations have been applied to this challenge of personalizing learning. Pre-tests and learner profiles (built around personality, cognition, prior learning, learning styles, role levels, and needs) have been collected up front for customizing the learning. Various algorithms strive to detect learner interest in particular fields and to deliver those contents. Social networking solutions have

been explored. Recommendation systems have been created to "push" different courses and learning paths to different learners. "A good teacher is able to customize the lesson to fit the requirements and needs of the learners he or she has in the classroom. This process becomes difficult and expensive in open and distance education, where customization means availability of similar contents, presented in diversified styles" (Del Corso, Ovcin and Morrone, 2005).

The scalability of customized online learning has been identified as a cost-saving measure. Indeed, the use of computerized automation of many aspects of teaching and learning may suggest something of the classical Kerr and Jermier "leadership substitutes" (1978) theory, which suggests that mechanisms (in this case, educational technologies) may replace specific leadership (instructor) behavior. Paramythis and Loidl-Reisinger suggest that there are various levels of abstraction at which adaptation may be defined (2004). Labor costs may be lowered with proper automated instructional design.

Instructor workload issues may be mitigated in high-enrollment courses. "The only affordable way of managing these mass courses has been to use automation to assist instructors. There are other options, such as limiting the number of laboratory exercises, setting very simple exercises, or not checking result correctness; all of them lead to poor quality laboratory work and also reduce student learning options" (García, Rodríguez, Rosales, and Pedraza, 2005, p. 96). This offers an example of automation as an augmentation to F2F learning.

An instructor may take advantage of a kind of digital "multiplier effect." Such a "scalable" approach should be "adaptive to the individual, generative rather than pre-composed, [and] scalable to industrial production levels without proportional increases in cost" (Graven and MacKinnon, 2005, p. F2C-21). Potentially more learners may be addressed than before: "With the flexibility allowed to the digital form of media presentation, an online learning system should try to accommodate the needs of as many different students as possible through personalization" (Cheong, Kam, Azhar, and Hanmandlu, 2002).

What may be customized? The literature points to digital learning objects, eLearning paths, and assessments. The look and feel of the interface and interactive space may be customized for particular users and audiences (Graf and List, 2005; Dringus and Cohen, Oct. 2005, p. T2H-6).

Research highlights the potential learning benefits of customization. "Learners have been shown to respond well to content and education systems that adapt to their personal preferences" (Conlan, Dagger, and Wade, n.d., n.p.). Learner motivation may be enhanced through personalization (Xu, Wang and Su, 2002).

Customization may enhance learner persistence, particularly in an online environment that often has lower retention rates and more challenges than "four walls" courses. "The reality is that many online learners (after years of instructor-managed learning) are simply not adequately prepared for self-managed online learning. Too many lack the self-motivation, intentions, independence, learning efficacy, or learning management skills to stay online learning continually and successfully" (Martinez, "Designing Learning Objects to Personalize Learning," n.d.).

Personalization of learning may result in a greater sense of creativity or "nonidentical solutions" to shared problems or challenges (García, Rodríguez, Rosales, and Pedraza, 2005, p. 89). This movement has also spawned the term "learning orientations." This conceptualization considers the whole-person perspective of learning (instead of the cognitive-rich theories) "and recognizes the impact of emotions and intentions on learning. Learning orientations offer strategies and guidelines for designing, developing, and using objects for personalized learning" (Martinez, "Designing Learning Objects to Personalize Learning," n.d.). The whole student movement includes considerations for their ethics and overall development.

Types of Learning. Personalization has been identified as part of a strategy for discovery-based learning. It may affect the pacing of course materials, uses of assessments (also identified as "check point analysis"), and the turning raw contents into something meaningful (Altman, 2003, pp. 475 – 478). Customized automated deployment of teaching and learning may be used efficiently in a large corporate environment (Lau, 1998, p. 91). Proponents of ubiquitous learning see customization of learning as effective for "just-in-time" learning and Web-based decision support systems (WSSs).

With the shift from learning in fixed locations to more informal and mobile forms, "innovative cooperation and collective forms of purposive cultural expression" may be required (Crawford, 2004).

These are "online information systems that provide decision-making information to its users (decision makers) based on available data, information, or knowledge. An adaptive WSS helps its users to quickly locate and find information they are looking for. It also maximizes a user's ability in finding relevant information by exploiting their historic usage…and other environmental contexts" (Sadat and Ghorbani, n.d., p. 1).

Personalization / Adaptivity in eLearning

Approaching this issue of customization may begin with a definition of terms. How learning is defined in the first place may affect the type of strategy to create personalization in learning. For some researchers, learning is complex, conversational, knowledge-based, ubiquitous and pervasive and quality-driven in one construct (Gaeta, Ritrovato, Orciuoli and Gaeta, 2005, p. 4). The deep learning (transferability of the learning) angle comes to the fore in customized eLearning. "The proposed framework utilizes knowledge structure map(ping) for representing a dynamic cognitive learning process to support students' deep learning, efficient tutoring, and collaboration in web-based learning environment." (Fan, n.d.)

Personalization in eLearning involves a process that "changes the functionality, interface, information content, or appearance of a system to increase its personal relevance to an individual. Personalization systems accommodate an individual's needs and interests explicitly through changes and selections initiated by the user, and implicitly through automatic adaptation techniques" (Turpeinen and Saari, 2004, p. 1). This initiative stems from the power of adapting learning to learners based on their ages, learning styles, objectives, and motivations.

Adaptivity brings with it various definitions as well. "The term 'adaptive' is associated with quite [a] range of diverse system characteristics and capabilities in the e-Learning industry, thus making it necessary to qualify the qualities one attributes to a system when using the term. In the context of this paper, a learning environment is considered adaptive if it is capable of: monitoring the activities of its users; interpreting these on the basis of domain-specific models; inferring user requirements and preferences out of the interpreted activities, appropriately representing these in associated models; and, finally, acting upon the available knowledge on its users and the subject matter at hand, to dynamically facilitate the learning process" (Paramythis and Loidl-Reisinger, 2004).

Acronyms. Various acronyms relate to this concept of personalization. "PAL" stands for "personalized adaptive learning" (Chatti, Klamma, Quix and Kensche, 2005). "PE" stands for Personalized Education as cited by Fok, Wong and Chen, 2005). The "PES" represents the Personalized Education System. "This includes intelligent user profiling and multimedia content searching and clustering as well as an intelligent man-machine interface that adapts dynamically to in [an] dividual user's behavior and interactions with the system" (Fok, Wong and Chen, 2005). "ALEs" are "adaptive learning environments" (Paramythis and Loidl-Reisinger, 2004).

The Research

A review of the current eLearning literature shows a variety of methods used to create automated personalization on a technological and content labeling level. This paper considers the personalization question from the angle of, "What would a live professor do?" How do instructors personalize learning in face-to-face (F2F) classrooms and in eLearning (online) courses? How do these findings affect how personalized automated learning may be further nuanced for learner use? This study uses two survey instruments to probe how instructors customize the learning in face-to-face (F2F) courses and also in online courses.

Organization and Limitations. This paper will offer a brief review of the literature and will cover the main endeavors for digitized automated customization of eLearning and then the main extant challenges. The next segment will review the survey findings of instructor personalization of learning in face-to-face (F2F) courses and then in eLearning courses. The survey responses, while internationally solicited, only offer some initial findings for F2F and eLearning customization by instructors. This research offers some initial approaches only. New ideas will be offered for automated personalization functionalities based on the findings of the qualitative and quantitative research.

I. Existing Computerized Methodologies for User Personalization in Online Learning

The quality of the personalization in the learning may be seen in the fit between the curriculum and the learning experience of the learners. Their learning paths may be linear or non-linear (branching, irregular, and others), and static or dynamic. Such automation changes both the "substance and form of information …for maximum cognitive efficiency" (Turpeinen and Saari, 2004, p. 6). The accuracy, timeliness, and practicality of the contents may be other factors. The latency between the request and the delivery of the learning may yet be another. How well a learner's privacy is protected by the delivery system also may affect customization system quality.

The typical "platforms" described in terms of customized learning involve virtual learning environments (VLEs), learning object repositories, learning management systems / course management systems (LMSes / CMSes), and websites linked to databases. Often, the assumed space is Sharable Courseware Object Reference Model (SCORM)-empowered and has been populated with digital learning objects replete with metadata. SCORM is mentioned for the functions of identifying and pulling out various learning objects to offer goal oriented personalization (Power, Davis, Cristea, Stewart and Ashman, 2005). For others, it's a "federation and brokerage" system for learning objects and their metadata (Van Assche and Massart, 2004), no matter what the standard.

These repositories, databases, or information systems are described as the environments for automated learning (Vossen and Jaeschke, 2003). Off-the-shelf virtual learning environments (VLEs) offer "very little functionality for personalization" (Ong and Hawryszkiewycz, 2003). This sets the stage for a plethora of multi-field explorations into possible solutions. Indeed, user relevance and customization goes well beyond eLearning, for example, applying to dynamic background libraries. "Our knowledge-driven society requires *efficient* and *dynamic* learning methods for members of virtu-

ally all ages in educational activities and in the life-long learning process" (Garcia-Barrios, 2006). Personalization may aid in the controlling of information overload.

Personalization Strategies for Individual Learners

Personalization strategies involve various factors. The human piece examines learners as individuals and the use of profiling, stereotyping, and empowerment—to maximize individuation of learning paths.

Various factors have been identified as differing between learners. "…students differ in learning rate, personal capabilities, time availability, and owned knowledge, hence the same course must be tailored to each student, or to a group of them (class) sharing some characteristics." Students' aims and profiles (student's preferences and knowledge base) affect the learning paths (Carchiolo, Longheu, Malgeri, and Mangioni, Automatic generation of learning paths, 2003, 1236 - 1237). Differences exist between students in terms of "learning rate, personal capabilities, time availability, and owned knowledge" (Carchiolo, Longheu, Malgeri, and Mangioni, 2003). Learners have different educational requirements, defined as their "goals, past experiences, learning preferences…tasks" and other factors (Quarati, 2003). Morrison, Ross, and Kemp suggest that learner information should include the following: (1) general characteristics (defined as "gender, age, work, experience, education, and ethnicity"), (2) specific entry competencies, and (3) academic information (2000, as cited by Sabin and Ahern, 2002, p. S1C-11).

Learner ability figures centrally into this profile. Researchers note that the human user is the key factor in eLearning success (Forlani, Bianco and Albrigo, 2006) In the context of eLearning, which may be disorienting to some, the level of course material difficulty and learner ability may be matched to provide individual learning paths. (Chen, Lee and Chen, n.d.) Learners with less experience and less discipline may need more scaffolding and highly structured course builds, while more expert level learners may experience higher flexibility (Martinez, "Designing Learning Objects to Personalize Learning," n.d.).

Stereotyping. A strategy called "stereotyping" may be employed for the customization of eLearning. New learners may be compared against a database of information of prior learners and their learning. Stereotyping personalizes for a "type" of student, not per the actual individual with unique and changing needs. Stereotypes are classifications of identified homogeneous characteristics among subgroups of users. "This may be used later for assigning a standard model to new users, which is composed of common information retrieved from the models of other users in the same category that have previously interacted with the system. As the application begins interacting with the new users, more accurate assumptions can be made, and their models will be gradually modified" (Paredes, Ogata, Yano, and San Martin, 2005).

Such information may define social groups in the learning space. Some researchers suggest that best matches be identified for peers with whom learners interact, based on like-mindedness, similarity of interests, psychological profiles, and personality matches. Tracking functionalities in eLearning systems may define the actual situation of "the learner, the environment characteristics, and objects or people s/he can interact with" (Paredes, R.G., Ogata, H., Yano, Y. and San Martin, G., 2005).

Peer users offer information for a collaborative recommender system. "With *collaborative filtering* every user is assigned to a peer group whose members' content ratings in their user profiles correlate to the content ratings in the individual's user profile. Content is then retrieved on the basis of user similarity rather than matching user requirements to content. The peer group's members act as recommendation partners. (In self-organizing learning networks, *stigmergy*—coined by French entomologist Grasse—describes "the indirect communications taking place among individuals in a social insect colony" (Bonabeau, 1999, as cited by Koepr and Tattersall, 2004, p. 697). Visits made to activity nodes by learners "in a particular order are recorded and revealed to other learners as an aid to navigation—'others who went before you proceeded that way to reach the destination.'" (Theraulaz and Bonabeau, 1999, as cited by Koper and Tattersall, 2004, p. 697). With this filtering, the quality of filtered content increases proportionally to the user population size, and since the matching of content to user requirements doesn't drive filtering, collaborative recommendations don't restrict a user to a region of the content model. One major drawback is the inclusion of new, and hence, unrated content in the model. It may take time before other users see and rate the content. Also sometimes users who don't fit into any group end up being included because of unusual requirements." (Angelides, 2003, p. 14)

A new user may have his or her profile compared with the aggregated information of others with like interests. From this information, predictions may be made, possibly in combination with their own stated preferences (Lee and Wang, 2004, p. 1010).

Recommender systems, often built on content-based filtering and collaborative filtering, have been used as part of marketing to make sites "compelling and sticky." There have been behavioral rules written for the data that may lead to "deep personalization" for users (Puntheeranurak and Tsuji, 2005, p. 445).

One model combines both the stereotype and overlay models: "The Stereotype and Overlay techniques of user modeling are often combined in educational adaptive hypermedia systems. The student may be categorized by stereotype initially and then this model is gradually modified as the overlay model is built from information acquired from the student's interaction with the system" (Conlan, Dagger, and Wade, n.d., n.p.). The Overlay Model refers to the building of student knowledge concept-by-concept and is updated as the user progresses through the system (Brusilovsky, 1996, as cited by Conlan, Dagger and Wade, n.d., n.p.).

User Profiling for Customization

Factors for User Profiling. The various models for personalization of learners tap into different constructs. Users' psychology, learning styles (with a number of models), levels of interests, personal preferences, learning and work situation, "access level" and corresponding role, and selected customization all play a role in their uniqueness and the outputs from customized systems.

Psychological Customization. Psychological customization may involve user psychological profiles, defined as "aesthetic preferences, cognitive style, and personality" (Turpeinen and Saari, 2004, pp. 2 - 3).

In one model, users may be divided into the following types based on attitudes, behaviors, and prior experiences with eLearning: The Interested Non-user, The Dabbler, The Reluctant User, The Expert, and The Power User. These types and labels may be transitory and are not permanent labels by any means (Blõchl, Rumetshofer, and Wõb, 2003). The types of users would affect the sequencing of the learning, the choices of electronic tool kits, and the choice of contents.

One model tracks the psychological aspects of learning to what may be adaptable in the learning. Here, cognitive styles may track with the learning sequence, context/ surroundings, navigation, and help. The psychological aspect of learning strategies would affect access to services and assessments. The skills aspect would link to the "kind…and severity of content." And learning modalities would affect the "visualization of content and the embedded system." (Blõchl, Rumetshofer, and Wõb, 2003). The MBTI personality indicator test has been suggested for yet another (Whittington and Dewar, 2000, pp. 171 – 172).

Learner Motivation. Another conceptualization of learner difference focuses on the emotional / intentional motivational aspects, the self-directed strategic planning and committed learning effort, and then learning autonomy. Within this context are various learner types: transforming, performing, confirming, and resistant. These types are listed out with ways to reach out to each (Martinez, "What is personalized learning?" 2002).

Learning Styles Models. Categorizing learners (as "activists, reflectors, theorists and pragmatists" and other ways) is based on learning styles as a type of profiling (Del Corso, Ovcin and Morrone, 2005, p. 575; McNutt and Brennan, 2005, pp. F1H-27 to F1H-31).

Subliminal Effects. An experimental psychology approach to customization and eLearning focuses on subliminal effects of various sensory inputs to human cognition and learning. "Studies in experimental psychology have shown that recognition and memory can be influenced or even enhanced by previous exposure to subliminal visual or auditory images of which the subjects are not consciously aware. Some of these effects are produced in interaction with individual differences, such as cognitive style, personality, age, and gender" (Turpeinen and Saari, 2004, p. 5).

User Profiling in Ubiquitous or Mobile (M-) Learning. For ubiquitous or mobile learning, personalization systems include the following profiling: "Profiles provide configured and learned behaviour, preferences and capabilities of users, devices, networks and services to a personalisation system" (Drogehorn, Haseloff, Loeffler, Dargie, Lau and David, 2005, p. 211). Personalization in mobile learning may involve context-sensitive detection (Casalino, D'Atri, Garro, Rullo, Sacca and Ursino).

Balance against Learner Privacy. One caveat to the collection of personalized learner information is concern for privacy. "Privacy provision and data protection are basic requirements for professional learning, especially when personalized systems are used that adapt to sensitive learner personal data." (Klobuèar, 2006)

As a counterpoint to profiling, as Franz and Borcea-Pfitzmann observe, data once collected may be misused. These authors propose the use of "partial identities" to enhance learning without the potential embarrassment or stigma of having to repeat course materials in a way that may be tracked to individual learners. These temporary partial identities would allow a user to control his or her own information and then use convenient identities under which to experience other learning. Each learner could ostensibly be the "owner" of disparate pieces of information but not have much of it trackable back to themselves. This proposal employs the strategic use of targeted anonymity in digital learning ecologies and spaces (Franz and Borcea-Pfitzmann, 2006).

Franz and Borcea-Pfitzmann didn't define when users would switch between their partial identities and their main authentic one in this privacy-aware working environment. They anticipate the conflicting pulls of various factors: How may the authenticity of learning materials be maintained if anonymous changes may be made to them? How may individuals be kept accountable for their actions? How may they prevent illegal or inappropriate access to resources? How may they control access so as not to overload the system and yet maintain anonymous accesses? Will the use of strategic anonymity harm educators' ability to assess the quality of the provided contents and the tutoring (Isn't a baseline knowledge of learners important for a reasonable assessment?)? (Franz and Borcea-Pfitzmann, 2006). How may the social building of relationships and contacts be made for some aspects of the learning if "partial identities" are in play? How would learners know when to build on their centralized identity vs. the anonymous compartmentalized ones?

Some Roles of Time

Time. Some personalization information tracking occurs with time-of-the-week factors. "The intuition guiding this work is that users' navigation on the weekend when they have leisure time should differ form their navigation on weekdays when they are at work; users will have different goals and desires in these different time periods" (Halvey, Keane, and Smyth, 2005).

The profiling of learners must necessarily be continuous and evolve over time. Learners' needs and abilities change. For example, Smith discusses the "decrement," "stability," and "growth" models of learning regarding older adult learn-

ers (March 2006, pp. 112 – 113). The variety of theories regarding this one segment of the learning population shows a small aspect of the diversity of learners and their various needs. Sabin and Ahern point out that traditionally, people who design instruction see their audience as "homogeneous and gender neutral." This differentiation now results in more tailored instruction and niche delivery of learning (2002, pp. S1C-10 to S1C-11).

Online behaviors may be eminently trackable through a non-intrusive "monitoring trawl" for information (Bûchner and Patterson, 2004). One challenge occurs with the tracking of user behaviors over long sequences. "However, it is not clear how to analyze and visualize web usage data involving long sequences of on-line activities without losing the big picture" (Zaïane, 2002).

Instructional Design Piece

Researchers see personalization functioning in eLearning virtual environments through web mining. Such electronic educational systems have been compared to a closed system "in the sense that every action performed by the users are related to the learning process, and with a set of previously established goals" (Carbó, Mor, and Minguillón, 2005). Another aspect to this closed environment relates to the designing of all possible learning objects prior to deployment to learners. The prototyping and development for real-world complex learning may well involve an inordinate amount of instructional design work. There have not been descriptions in the literature of more open and dynamic systems with ever-changing contents or automated AI learning of eLearning systems.

Technology Solutions

eLearning has benefited from enhancements via intelligent tutoring systems, digital games, simulations, microworlds, and help systems (Mühlhäuser, 2003).

Ubiquitous learning now includes features such as "hybrid museums" to enhance the richness of mobile learning (Jaén, Esteve, Mocholi and Canós, Oct. 2005). Technologically, some tools used to effect personalization may involve the tracking of learner behaviors online. It may involve the maintaining of learner profiles and data sets.

Various learning contents may be labeled and categorized strategically for easy call-up (Etkind and Shafrir, 2006), with heterogeneous ontologies and automatic mapping (Bouzeghoub and Lecocq, 2005). Others have developed meaningful schemas, domains, and typologies coupled with software-coded mapping services, which have been identified as particularly important in open and dynamic informational networks (Dolog and Sintek, 2004, p. 170). Some have created a "didactical modeling language" (Pawlowski, 2005, p. 1). Some models involve dynamic generation of Web pages for learners as "page synthesis." These pages may draw from previously stored pages or data in the database (Sadat and Ghorbani, n.d., p. 5).

Other research describes the use of developmental-phase-based triggers that create changes "when it reaches a state that satisfies the predefined conditions. Repetitive changes that the application may want to perform to the models should be included here." These may even (re)locate participants where they need to be at a particular time as in a synchronous pre-scheduled meeting (Paredes, R.G., Ogata, H., Yano, Y. and San Martin, G., 2005).

Intelligent agents may be used for customization of eLearning: in which a user agent may configure "memory usage, processor usage, frequency of getting information from server agent," and other factors (Hussain and Khan, 2005, p. 142).

Some systems try to read searcher intention based on a user's search history, a searcher profile, and categorization of information as a context for each query (Liu, Yu, and Meng, 2004). Searches may be tailored then based on the searchers' apparent intentions, based on inferential logic.

Ideally, such systems would be updatable with new pedagogical rules. They would be context-sensitive and field specific. They would offer different levels of sequencing, and they would consider learner progress over time and changing evaluations (Zarronandia, Fernandez, Diaz, Torres, 2005). Adaptivity has been applied to tutoring systems as well (Albert and Hockenmeyer, 2002).

Latent semantic analysis and other innovations may well enhance the ability to create personalization. "Latent Semantic Analysis (LSA) is a powerful semantic matching technique. It is used to extract semantic similarity between pieces of textual information using statistical techniques. Similarly, there also exist other techniques, which involve graphical classification of the concepts and then semantic matching based on set theory and AI concepts. A significant body of work could be found in the literature where such semantic or inexact matching techniques are proposed or applied to the grid domain" (Abbas, Umer, Odeh, McClatchey, Ali, and Ahmad, 2005, p. 14).

Some of the back-end on-ground technological challenges include latency (slowness for users) and the need to "transcode" between incompatible interfaces (Zimmermann, 2006). The push to customize extends well beyond eLearning into databases, Websites, web searches, and "informational systems" (Drõgehorn, Haseloff, Loeffler, Dargie, Lau, and Klaus, 2005). Surely, the crossover technologies will benefit the various endeavors. Kavèiè notes though, that education is a dominating application area for adaptive hypermedia (Kavèiè, 2004).

Empowering Learners as Decision Makers

Empowerment of Learners. Another strategy employed for customization of automated eLearning involves profiling learners by their self-reporting. A "buffet" model created by Ohio State University offers interchangeable paths for learning that "match their individual learning styles, abilities, and tastes at each stage of the course" (Twigg, Sept. – Oct. 2003, p. 36). Learners are empowered through information about the buffet-style setup and then given the results of online testing related to their learning styles and study skills assessments (p. 37). One challenge in self-reporting by users

is that they often do not provide accurate feedback about themselves or their interests (Naijar, Duval and Wolpers, 2006). Learners themselves may not be clear what the optimal learning path is for themselves and make choices that are not beneficial.

Oftentimes, a knowledgeable instructor may build a sense of a learner profile over time and tailor the learning to that individual. "To detect and address a learner's needs is key to successful teaching," observe Ullrich, Libbrecht, Winterstein and Mûhlenbrock (2004). In face-to-face courses, they may collect information inadvertently through overheard conversations, learner body language, and other interactions. In online classes, they observe the "communication activities between students accumulate over time in patterns that represent their behavioural characteristics as members of the online learning community they participate into (sic)" (Tzoumakas and Theodoulidis, 2005). Coman emphasizes the importance of student direction in this endeavor of personalizing learning (2002).

High Touch: Leveraging the Live Human Element

Learning Communities. Automated online learning does not necessarily mean isolated learning. "Adaptive collaboration support" considers the communal and cooperative and collaborative aspects of learning (Paramythis and Loidl-Reisinger, 2004). Some customization may occur with the use of group and collaborative activities, with the unique aspect related to the other individuals sharing the same learning space and what they bring to it (Martel, Vignollet, Ferraris, C., David, J-P. and Lejeune, 2006).

Other strategies focus on learners as social learning communities and use their various experiences and preferences as critical information in customization. In other words, the live human element may be engaged. Some researchers refer to this as "contextual support…enabling rich interaction and fruitful collaboration" (Graven and MacKinnon, 2005, p. F2C-21). The importance of interactivity in customizing has been mentioned in the research (Leung, Chan, and Wu, 2002). Computer-supported interactivity supports the "individualization of instruction" (Swan, n.d., p. 7).

Hybrid courses bring in the human element with a learning community that may form around shared learning objectives. Other "high touch" elements involve effective storytelling to make the learning more accessible and exciting (Graven and MacKinnon, 2005, p. F2C-23).

The programmed "presence" of human companions has been an endeavor of programmers for many years. Web companions have become "personalized" and digitally embodied in online spaces. Animated characters have fostered user expectations of "human adaptation behavior" (André and Rist, 2002, p. 43). "Character believability" has been designed as a critical element (André and Rist, 2002, p. 44). Some programs create automated characters' behaviors *on the fly* based on the goings-ons in the simulated context vs. centralized scripting (André and Rist, 2002, p. 44). Human coaches may be used to customize learning (Sonntag and Putzinger, 2005). Coaches seem to take on the roles of facilitators. They may direct learners to where their pedagogical needs may be addressed.

Some researchers describe a hyperlinked based system (HLBS) of adaptive hypermedia where users may annotate and personalize the learning. This serves as another learning community feedback mechanism (Ohene-Djan and Fernandes, 2000, pp. 21 – 24). Users may even be linked to particular annotations, and learning materials may be annotated by subject matter experts or others with specific fields of expertise, in order to show the multifaceted complexities related to a topic.

Future Needs Projection. Interestingly, these proposed solutions—in various stages of actualization—include a focus on predicting future preferences and needs of users. "On the WWW, predicting the next request of a user has gained importance as Web-based activity increases. The core issue in prediction is the development of an effective algorithm that deduces the future user request. The most successful approach towards this goal has been the exploitation of the user's access history to derive predictions" (Zhang, Guo, Yu, Qi and Long, 2005). That said, others point out that the use of itineraries (regular, weekly, and an activity-oriented one) and long-term navigational behavior through a site for the creation of e-learning personalization plans may be effective, but that tracking individuals over long time periods may not be feasible (Mor and Minguillón, 2004, pp. 264 - 265).

Assessment Tools

Many software programs are currently employed to assist in learner assessment. Student files delivery agents, automatic project evaluators, and plagiarism detection assistants have all been employed (García, Rodríguez, Rosales, and Pedraza, 2005, p. 90).

Various computer graders strive to offer live instructor-like feedback through textual analysis of formal essays. Other automated grading programs engage textual analysis (message length and count as a sign of "knowledge density," and key word weighting strategies) though online class discussions (Wu and Chen, 2005).

Adaptivity applies to adaptive assessment content in eLearning, alongside the options of automated predefined assessment, instructor-driven assessment, and learner self-assessment (Alotaiby and Chen, 2005). Personalization may be deployed for the creation of real-time personalized testing (Abidi and Goh, 2001, pp. 441 – 442). Adaptivity has been defined as "system-initiated personalization" (Ohene-Djan and Gorle, 2003).

"The design of assessment tools in open environments and over distributed repositories demands effective personalization approaches which provide learners with guidance and individualized support. It also requires advanced approaches to assessment which are appropriate to distributed and open e-learning environments. In those environments, indeed, personalization plays an important role as the information derived from both assessment functionalities and

learners' interaction with the environment enables a better selection and generation of learning and assessment strategies" (Cheniti-Belcadhi, Henze, and Braham, 2006).

Stakeholders to Customization

The stakeholders to personalization include educators, learners, policy-makers, software developers, instructional designers, and others. Any who have a buy-in to the quality of eLearning likely have important perspectives on these endeavors. Practitioners in the field emphasize the need for further research in this area. "It is obvious from the description of different types of domain knowledge that a host of research and development is required to achieve an acceptable level of personalized e-learning experience. It is compulsory that these endeavors are undertaken in a *synergistic* way, that is knowledge engineers and pedagogical experts have to work in tandem" (Bûchner and Patterson, 2004).

"A key role in this task (for creating learner-centered education—author note) is assigned to the instructional designer; he or she must both be aware of technological possibilities and expert in pedagogical methods. More important, he or she must be able to explain to authors how they can redesign their material to reach the best results (in terms of educational efficacy) with a reasonable effort (in terms of authoring time and production costs.)" (Del Corso, Ovcin and Morrone, 2005)

II. Instructor Personalization of F2F and eLearning Instruction

Empathy exists as a powerful human trait. A perceptive instructor may develop a sense of the individual behind the role of learner and not fall into a stereotypical understanding of the students in a course. As noted above, a variety of

factors may be considered regarding learners—their identity, abilities, knowledge gaps, motivations, and ambitions. Instructors need to meet learner needs where they're at and balance between doability and excessive pressure. They need to offer support where needed but not overstep boundaries of learner decision-making. The cultural and interpersonal nuances may be complex and manifold.

An instructor may build learning ecologies or environments to promote particular types of thought, practice, and social interaction. Instructor support may manifest in the provision of both personal and professional/educational advising. An instructor may play a social networking role as a "node" between learners and each other and also as a conduit to professionals and experts in the field. Intercommunications, collaborations, and synergies may be rich and creative. Part of the instructor personalization of learning may involve a sense of care for the whole individual, defined as including a person's emotions, wellbeing, social needs, and ethics. It may involve a rewards structure that may vary between learners based on varying needs and circumstances.

F2F and eLearning Affordances. A F2F classroom provides a particular set of affordances for learning about learners—including incidental hallway or cafeteria conversations, reading student newspapers, speaking with colleagues, serving with students on committees, and run-ins on campus, with the subtleties of body language. Here, the learning is embodied, with a person filling a particular "public space." An online environment provides a particular set of affordances for learning about learners as well—such as interchanges on message boards between learners, posted biographical statements and profiles, and their created telepresence. The ability to track and archive online behaviors and interactions may offer some ways to profile users and deliver learning.

Creation of the Online Survey Instruments

Two mirror survey instruments were created to compare the differences in instructor strategies in terms of personalizing learning in the respective F2F and online learning environments. These questions were created based on the extant literature on customization in eLearning as well as general instructional strategies.

The identifying questions for survey respondents probed their teaching history and the range and average number of learners in their courses. Qualitative "short answer" questions examined respondents' attitudes and practices related to customization of teaching and learning. It looked at their level of information collection about learners in order to adapt the curriculum. It also looked at the percentage of customization in a course.

The quantitative questions measured on a Likert-like scale explored issues of learner individuation, communication, social context / learning environment, learner empowerment, management supports, enriched learning, advising, and rewards structures—as related to customization of teaching and learning. (Copies of the survey instruments follow in the appendices.)

Announcements about this research and the two surveys were distributed through the Canadian Institute of Distance Education Research (CIDER), DEOS listserv, WashingtonOn-

line Virtual Campus (WAOL) faculty rosters, Kansas State University through *InfoTech Tuesday* and *DCE Connections*. The surveys were available for a month from Oct. 10 to Nov. 10, 2006, with the launch occurring after approval by the KSU Research Compliance Office.

III. New Ideas for Automated Personalization Functionalities

Academics have written about the "run-time adaptation" of faculty, in a cyborg-like melding of computers and human instructors. Software developers and others have been striving to create this actual customization using computers alone, with front-end development work by people for human learners. Teaching and learning involve human motivations, cognition, emotions, principles, abilities, varying contexts, and learner readiness—in its various permutations.

F2F Instructor Survey Findings

A total of 14 F2F faculty responses were usable from the survey. These worked an average of 5.9 years teaching part-time at college and/or university, and an average of 6.8 years teaching full-time. These respondents spent an average of 12 years total teaching face-to-face. The average size range of learners per course was 17 to 39, with 25 as the average.

F2F faculty offered a range of circumstances when personalizing learning may be desirable.

They suggested that students have documented learning disabilities and test anxiety for which some accommodations should be made. If students are stuck on a concept, they should be offered personalized support. Indeed, another suggested that personalization should be offered whenever a student needs it, albeit within "the constraints of the class and teaching load" and when it's "feasible for individual projects, research, (and) independent study". Personalization should be employed when learning may be applied to learners' own lives. It should be employed to target particular learning styles and to emphasize learner meta-cognition. F2F faculty also personalize learning when learners select topics for projects. One said that when students have progressed far enough along in their studies, in the "typical university model," then personalization should be offered in terms of learner interests. Another said that when there are certain course demographics, that may mean particular customizations. One expressed disagreement with personalized learning, saying that this should "seldom" be offered and that students need to "get with the program."

Why should or shouldn't F2F learning be personalized?

The main responses for personalization dealt with effective learning, for situations when students have a "legitimate shortcoming," and to make an "approachable context" for students. Personalization in learning should occur to ensure student engagement and to make learning "fun." Personalization may be adopted to accommodate different learners based on their respective maturity levels; one gave the example of older learners who need more "hands on and practical" approaches. Learning should be personalized to "make parallels to everyday experience." One respondent said that a sense of "personal reward" is achieved when personalized learning reaches students. Learning should be personalized to make students feel better about themselves and their learning. Personalization may empower learners to make decisions about their own learning.

F2F instructors engage a variety of actions to "see" their students as individuals.

Seeing students as individuals was one of the first endeavors—by soliciting student biographical information, learning names quickly (and asking for nicknames) and making corrections if mispronunciations occur. Instructors introduce themselves early on. They engage in less formal conversations to connect to students in a "non-class-related way." They make a conscious effort to listen to students' personal anecdotes, remember them, and ask them about events in their lives. They observe "body language or unconscious gestures." They tune in to learner expressions of originality and their educational and professional goals.

One will "remind myself of what it was like to be a student." Another way to see learners as individuals is to schedule one-on-one conferences. Several mentioned controlling for smaller class sizes so as to "know my students and their needs." One encourages learners to know their own learning styles. Some consciously design questions and assignments to encourage personalization of the subject matter. They also provide extensive feedback on "submitted Master's thesis projects," which presumably will involve further interchanges with the learners.

F2F instructors look to particular "salient aspects" of individual learners to individualize them.

These topics ran the gamut. One looks for a unique background such as "country of origin or unusual job," along with private health or mental issues, or "rude or nasty" behaviors in class. Another focuses on life experience, geographical location (of origins), and cultural background (specific traditional or non-traditional). One individualizes students by their expressed worldviews. Another looks for "self discipline, work ethic, and attitude." One looks for creative talent, along with their ways of expression (conceptual or concrete, visual, or verbal). Another examines a student's active or passive approach to learning. Attitude (maturity, self-direction) is mentioned several times by respondents. The amount of a learner's self-control is used to individualize learners. Physical distinctions and racial characteristics, the willingness to talk to the instructor, "personality / charisma / willingness to speak in class / self-esteem," and "writing style and intellect" all were used by another respondent. The top three salient points for another respondent were the following: "learning style, intellect, personality." One F2F instructor focuses on the "natural traits" or personality, nurture and respect. One focuses on students who do exceptionally good work and make substantive contributions to the learning and have a "keen sense of humor." One expressed interest in learners' "commitment to education, interests, (and) age group." One looked for similarities in regards to background: "I am retired military, and have a sense of rapport…shared by/with other vets." One responded: "I try not to judge students on first impressions."

How much of their F2F course is standardized vs. customized?

F2F instructors fell into three main groups. One was the highly standardized course. Two said that 100% of their courses were totally standardized. Another two responded with 98% standardized and 2% personalized. One described 90% of this person's course as standardized in terms of "coordinated lecture format" and "multiple choice exams." One explanation read: "Content is nearly all standardized. The delivery is personalized." Five respondents said that their courses were half-standardized and half-customized. One of these added: "I have specifically rewritten the curriculum to reflect the students I am teaching the subject matter to." One respondent would customize a course up to 50% for special needs learners. The third group involved a fair amount of customization. One wrote: "None is standardized." One described courses that were 30% standardized and 70% personalized, and another "25% standardized and 75% modified slightly." This respondent added: "One example of a major personalization of an entire course would be if a number of the students had an instructor in a prerequisite course who failed to adequately prepare the students for my course. Hey, it happens."

Methods of personalization for different learners involved a range of instructional strategies.

Some F2F faculty create courses where learners write their own test questions or design their own assignments. Student choices may extend to their topic selection for assignments and research projects, and even exam questions. One offers capable learners even more demanding tests than the minimum required for certification in order "to earn more valuable and higher level professional credentials." Several offer more personalization during one-on-one learner assistance. One instructor uses varieties of groupings to customize instruction—whether students learn alone, in dyads or in groups. One respondent wrote, "I give broad parameters with single identifiable measurable goals." Several use a variety of teaching and learning strategies in order to meet the needs of a broad range of learners. Strategies mentioned include lecture, small group discussions, large group discussions, audiovisual examples, analyses, hands-on simulations, and practices with skills or techniques. One mentioned the use of email and online classrooms for those who prefer some hybridization in their learning or those "who need the extra help." Several instructors build on learners' lives by applying learning outcomes to their respective life experiences and interests.

Two respondents said that personalization is not a goal. One said that standardized teaching may itself offer personalized results: "I give examples that are intended to generate personal examples in their own minds."

How regularly do F2F faculty give personalized vs. generic feedback to learners?

A majority of responses fell along the lines that virtually all feedback to students was personalized. "Every student every day – normally multiple times." "Constantly." "I have no exams, only papers. On each returned paper I write comments…" "All feedback in class, out of class, and on assignments is personalized." "Very often, given (that) hands-on exercises/requirements result in a near-endless variety of ways to mess up…or to do something uniquely well." "I almost never give generic feedback, except in early lessons in early courses." "I give personalized feedback frequently and give generic feedback often." Indeed, personalized feedback is offered "informally" through the course of discussion.

For one, the personalized feedback given ranges from 50 – 75%. Others were more time-regulated and measured in

their offering of personalized feedback. One offered personalized feedback at least twice for every five assignments given. Another gave personalized feedback "once a week" and yet another offered: "Every week in online classes; every other week in F2F classes."

F2F Instructors and General Findings:

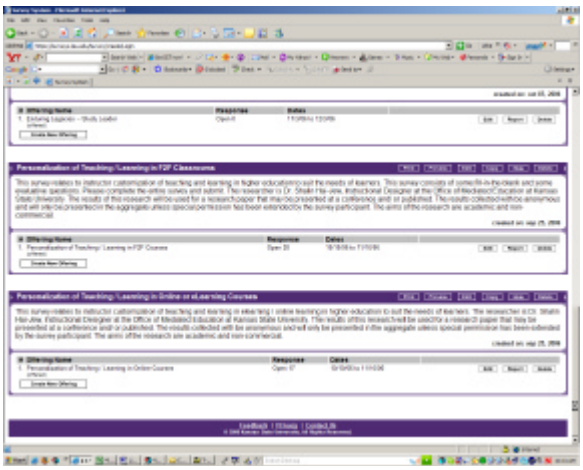
Some general findings from the statements followed by the Likert-like measures were as follows:

- F2F instructors' most common channels of communication with learners include the following (in descending order): in-class discussions, F2F, print written commentary, email, and less popularly, audio-visual responses (multimedia files), telephone, and threaded discussions.
- F2F instructors had an average transactional distance with learners of 7 on a scale of 1-to-10, with 1 as a distant relationship and 10 as a close one.
- F2F instructors will offer advice, if solicited, at an average closeness measure of 6 in a scale of 1-to-10, with 1 as the least personal and 10 the most personal.
- A full 100% of respondents will respond to the unique personalities of their different students.
- Nearly 80% of F2F instructors have alternate assignments and evaluations for learners with disabilities.
- Only 26% of F2F instructors have alternative assignments and evaluations for learners who are non-native English speakers.
- A majority of F2F instructors (78%) offer alternate assignments and evaluations for learners based on their learning preferences and needs.
- Approximately 60% of F2F instructors create assignments that may result in different tangible outcomes for different learners.
- Approximately 57% of F2F instructors have a neutral to "disagree wholeheartedly" response to the assertion that they have different expectations of different learners.
- 80% of F2F instructors "encourage and motivate" their students in "unique and different ways."
- All the F2F instructors consciously create a learning environment in their F2F classrooms.
- 60% of F2F instructors offer personalized social networking and introductions between learners who have shared interests or opportunities for mutual benefits while 20% do not.
- 40% of F2F instructors will work with the family, friends, potential employers, and employers in support of students if requested while 26% do not.
- 40% of F2F instructors collaborate with learners to enhance their learning.
- 78% of F2F instructors take into account the expressed interests and needs of individual learners in their curricular design.
- 80% of all F2F instructors who responded collected information about their students in order to see what their backgrounds are in relation to the subject matter while 14% said that they disagreed with this.
- In terms of making live adjustments to the course curriculum at student request, 20% of F2F instructors "agree wholeheartedly" to this while 42% "agree" and 14% "tend to agree." 14% "disagree" and 4% "disagree wholeheartedly".
- F2F instructors (100%) engage in power sharing with learners, asserting that their students "make important choices about their own learning."
- All but one of the F2F instructors who responded tended to agree or agreed that their students are "encouraged to be innovative and creative in their thinking and coursework."
- A majority (80%) use "synergies" between instructor and learner interests and shared expertise in the teaching of a course.
- 61% of F2F instructors consider individual student abilities in adjusting their expectations of learners while 28% disagree and 8% "tend to disagree" with that approach.
- 85% of F2F instructors surveyed offer housekeeping supports to learners such as by posting deadlines and reminders.
- Deadlines tend to be flexible "based on unique learner situations" for 78% of the F2F instructors.
- F2F faculty (92%) tend to help learners gain extracurricular learning and experiences in their chosen profession.
- Only 30% of F2F faculty use field trips to help learners connect to a larger community.
- About a third of F2F faculty assist learners with study for credentialing exams, and this type of exam was not applicable for 28% of F2F instructors.
- F2F instructors support their students in pursuing work opportunities, with all except for 20% agreeing.
- F2F instructors share information about their professional fields with students, with only 1 expressing "neutral" to this and one with "don't know."
- A third of F2F faculty introduce learners to experts in the field and encourage professional connections.
- 35% encourage their students to conduct research, publish, showcase their work, and serve as apprentices in the field.
- 50% of F2F faculty respondents offer some sort of remediation for their students.
- 70% of F2F faculty will advise learners differently in relation to their interests in a particular field or credential.
- Nearly 40% of F2F faculty will change the rewards structure in a course to offer different incentives to different learners.

eLearning Faculty Survey Findings

A total of 9 complete faculty survey responses were culled. These eLearning faculty members averaged 7 years of teaching part-time at a college or university. They averaged 4 years of teaching full-time at a college or university. They had an average of 4.5 years of teaching online whether full or

part-time. The average low-high range of students per class was 22 to 33, with 23 students average per class.



When should eLearning be personalized?

eLearning faculty showed sensitivity to the fact that many of their students are first-time online learners who "require extra help" to navigate the online learning system. eLearning should be personalized when considering "all categories of 'at-risk' students during the curriculum design phase." Several respondents suggest that all eLearning should be personalized and at all times: "I can't think of a time I would NOT think it should be personalized or customized. I don't think anonymous 'canned' classes are nearly as effective as those in which the instructor adds personal flavor." "To be honest, I believe and utilize personalization and customization at all times," wrote another. Another quipped, "As often as possible." One instructor focused on the types of learning: "When teaching objectives at the application, analysis, or higher levels and/or the content pertains to some learners more than others, the learning activities and resources must be customized for individual learners' prior knowledge and skills, needs or interests, and learning goals."

Why should or shouldn't eLearning be personalized?

Respondents suggest that eLearning should be personalized because students learn differently, need to enjoy learning, and need to attain success in their learning. Personalization helps instructors to build relationships with students as this motivates them to take the class more seriously and "gives them a safe zone" to let faculty know when they're not understanding something. One wrote, "Learners' needs, goals and interests vary – learning is not a one-size-fits-all activity." A diverse range of learners has public and hidden needs, another observed. eLearning faculty see personalization as a way of improving student retention. These instructors suggest that learning needs to be related to individuals for applicability. Personalization may enhance learner motivation and engagement: "Part of student learning is learning to engage in the course material, to ask questions, and to share ideas with other learners. Thus, students need to bring their own questions and comments—and reflections upon what they've learned—into their learning process."

eLearning faculty engage a range of purposive actions to see their students as individuals. Several request that students post biographical introductions at the beginning of each class and will greet them and acknowledge their unique stated interests. One asks students to submit reflection statements during the academic term. Several encourage learners to contact them directly with any concerns, and the interactions that follow help them engage with students as individuals. Others get student contact information directly in order to maintain contact (often via email, phone, chat, web conferencing). Another encouraged interactions between students and used icebreakers to encourage more learner interactions. Another would solicit student requests for what they wanted to learn and how they wanted to learn during the term after the students had initially read the course syllabus. One surveyed learners at the end of each course to learn more about them and their learning experiences. Several focus on using student names when communicating with them.

One respondent offered a lengthy and thoughtful response: "What is meant by the word 'personalize'? If it means face to face contact, that is impossible in an e-learning environment. I cannot see my students to read any body language. Next to that kind of personalization, in my e-learning classrooms, I try to get to know my students through their biographies and the information they give in the discussions. Human contact is critical in any situation, and even though the online format prevents some of that, I believe that it's important to get to know my students as best as possible so that I can work with the whole person, and not just a name. With my effort to get to know them better, I believe that students will be more forthcoming in the challenges of their studies which enables me to help them succeed."

eLearning instructors tapped some "salient aspects" of a student for individualizing them.

One described using a learner's past learning experiences (based on student reporting). Their self-reported age figures into several responses by eLearning instructors. Apparent learning styles communicated in online behaviors individualize learners for some. One described compiling information on learners: "Intro Assignment (I compile info into Excel spread sheet showing following categories: Name, Age, Town, Major, Family Members, Job, 1st time online. Throughout the term, I review that chart, so I if I have several students who are in nursing program, I make sure I use examples pertaining to health care fields…I make sure that I keep thinking about who the students are, what their interests are as I plan how to present various info." One focused purely on cognition: "Learning style / prior knowledge / intellect." A sense of which students are the strongest and can "help and serve as a model for the weaker ones." One wrote, "Enthusiasm for learning – preparedness, willing-

ness to learn, intellect — ability to help facilitate deeper discussion of course topics, constructive presence in the online classroom – ability to facilitate a positive learning environment"

Another combined ability with biographical information: "Learning style/personal life and obligations and self-efficacy." Student confidence played a role for yet another. One wrote, "Past learning experience/race/learning style." "Life experiences" matter for another faculty respondent.

One pointed out that online interactions may result in more substantive grounds for interactions. "Irrelevant distinctions are not visible online (age, gender, race, physical appearance, religion, cultural differences, disability status) unless students choose to disclose them. So, their ability to express themselves is the first aspect, the second is their pattern of keeping up with the material and assignments, the third is the way they interact with classmates."

In eLearning, how much of a course is standardized vs. customized?

Several suggested that central elements like syllabi, learning goals, objectives and some curricular materials are standardized, "but the rest of each class is personalized in terms of topic discussions, (and) tests, etc." Two respondents use the asynchronous discussion/message board areas for personal touches: "I add new stuff each term in the discussion area, and this is where I really focus on personal touches." Private emails also provide opportunities to customize learning. The ranges of course customization beyond the 100% customization commentary were 10%, 40-50% and 80% personalized.

For one eLearning instructor, the ratios depend on the particular course. "Some courses are self-paced learning events in which the instructor acts as grader and resource. These courses are highly standardized with personalization only occurring in students' choice of what course resources they use to learn and in email interactions with the instructor. All students are required to complete the same activities and assessments. In my highly interactive courses, the instructor functions as a guide, SME, facilitator, grader, and resource. These courses are highly personalized with student choice of curriculum, activities, and assessments, varied interactions with the instructor and other students, and student creation of course content." Another reiterated this point: Certification courses have little room for personalizing, but theory courses have "a lot of room" (for customization).

eLearning instructors use various methods for personalizing the teaching and learning.

Some ask learners to relate experiences from their own lives that pertain to the discussion topics. Another has students write weekly reflections. Learners may choose to "post their homework responses in the manner which they choose" (via different LMS tools). Student-generated curricular contents may be woven into the course structure for another instructor. Peers teach each other through "jigsaw" threaded discussions. Learners have multiple options on assignments/activities/curriculum/assessments and writing assignments. Another allows flexibility in the "length and pacing of (the) course" for learner personalizing. One observed that this is all about student-centered learning, building around learner needs.

Some instructors look to designed interactivity for customization of learning—and these would occur between learners synchronously and asynchronously. One instructor adds synchronous group chats as needed. Another only allows 3-4 hours before a response is sent regarding a student email. Students are encouraged to communicate with the instructor for special accommodations if needed.

Accommodations may be made in unique circumstances. One instructor will support independent student work if learners are not comfortable sharing in a group setting.

How regularly do eLearning instructors give personalized vs. generic feedback in their online courses?

Several instructors maintain focused efforts at providing continuous personalized feedback. "Every week, every response. I try to 'get involved' in the discussion topics and interact with the students in that manner." "At a minimum of once a week. I do not use generic feedback at all. I do not believe it is conducive to a good learning environment." Another concurs: "Very often – feedback on discussions, most assignments and assessments is original." One faculty respondent writes, "Students get feedback within two days of exams and journals, and within 4 days of papers. I participate in the discussion forums, so they hear from me on a daily basis." Another provides feedback two or three times a week.

One eLearning instructor begins with plenty of initial feedback, but then lets that taper off. "I give quite a bit of feedback the first 2 or 3 weeks of class. After that I put the responsibility on the students saying that I will just enter grades on papers, and if they want more feedback, they need to ask me. I respond to those who request, which is usually about ¼ of the class."

On the other hand, one faculty member offers generic feedback daily and personalized feedback on a project or question-based basis.

Student initiative must play a role in terms of soliciting personalized feedback, for at least two instructors. One wrote: "Formal written feedback is provided every week of the term. E-mail feedback is given whenever a student requests it (for some students, that would be more than once a week; for other students, it would be once or twice a term."

ELearning Instructors and General Findings:

- The most common channels of communication between instructors and learners in eLearning are the following (in descending order): online textual responses, email, telephone responses, print written commentary, face-to-face feedback, online audio responses, in-class conversation (hybrid), and audiovisual commentary.

- The average transactional distance observed was an average of 7 on a scale of 1-to-10 with 1 as remote and 10 as very close.
- The closeness of the personal advice given to students at their request of their eLearning instructor was ranked at an average of 8.
- All of the eLearning instructors say that they respond to the "unique personalities" of their different online students. (34% "agree wholeheartedly," 44% "agree" and 22% "tend to agree.")
- All eLearning instructor respondents (100%) purposefully collected information from their online students to see their backgrounds in relation to the subject matter. (54% agree wholeheartedly; 44% agree.)
- Only 12% provided alternate assignments and evaluations for non-native English speakers. A full 44% were neutral about this, and 44% disagreed with this practice.
- Approximately 65% of instructors have alternate assignments and evaluations for learners based on their learning preferences and needs. 22% felt neutral about this, and 12% disagreed with this practice.
- 88% of the instructors who responded assert that they create assignments that "may result in different tangible outcomes for different online learners."
- In terms of having different expectations of different learners, only 22% "agreed wholeheartedly." 11% "tend to agree." 11% felt neutral, and 33% disagreed, and 11% "disagreed wholeheartedly."
- All the eLearning respondents worked to encourage and motivate their online students in "unique and different ways." Here, 56% agree wholeheartedly, 33% agree, and 11% tend to agree.
- A full 78% of eLearning instructors "agree wholeheartedly" that they consciously create a "learning environment" online, and approximately 22% tend to agree.
- Online instructors (88%) offer social networking and introductions between online learners with shared interests while 12% tend to disagree.
- Fewer than a fifth of online instructors do not work with "family, friends, potential employers, employers and others related to students' lives" even at student request. By contrast, a third will. 44% of respondents were "neutral" about working with these people related to learners.
- A full 100% of eLearning instructors collaborate with online learners to enhance their learning experience.
- The same percentage (100%) agree that they take into account "the expressed interests and needs of individual online learners" in their curricular design.
- If an online class of learners requests changes to a course curriculum, some 88% of eLearning instructors would accommodate them. 12% "tend to disagree."
- All the eLearning instructors agreed that online learners "make important choices about their own learning," reinforcing online learner empowerment.
- All the participating eLearning instructors agreed that their online students were encouraged to be "innovative and creative in their thinking and coursework," with 78% agreeing "wholeheartedly".
- 78% suggest that they use "synergies in teaching, in terms of shared instructor and learner interests, and areas of shared expertise." 22% of eLearning instructors felt "neutral" about such synergies.
- 66% of respondents consider individual online student ability in adjusting their expectations of each learner, but 33% disagree.
- All the eLearning instructors provide "housekeeping supports such as posted deadlines and reminders" to their online students. (78% agree wholeheartedly, and 22% "agree.")
- A common practice—except for 22% of respondents—is to extend deadlines or make other adjustments based on unique online learner situations.
- All but 11% help their online learners gain "extracurricular learning and experiences in their chosen profession or field".
- Only 11% of respondents used field trips to help learners connect to a larger community.
- A third of eLearning instructors help their online learners with credentialing exams, when relevant. 44% felt "neutral" about providing this support. 11% disagree. 11% "don't know."
- Approximately 66% of respondents support their students in applying for different learning or work opportunities. 22% felt "neutral" about this. 11% disagree with offering such support.
- A majority of the respondents (89%) say they "share information about the professional fields" related to their courses.
- 66% of eLearning instructors will introduce online learners to experts in the field and encourage professional connections.
- A third of eLearning instructors do not encourage their students to "conduct research, publish, showcase their work, and/or serve as apprentices in their chosen professional fields."
- 66% of eLearning instructors do not offer remediation learning to students who may need that.
- A majority (88%) of respondents advise online students differently (in a customized way) regarding their particular fields or credentials.
- Only 33% of online instructors change the course rewards structures to offer different encouragement to different online learners. 33% were neutral on this issue. A third disagree with differential rewards structures.

Some Initial Differences between F2F and eLearning Personalization

All eLearning instructor respondents (100% vs. 72% for the F2F instructors) purposefully collected information from

their online students to see their backgrounds in relation to the subject matter—in order to personalize and tailor the learning. Online instructors consciously mitigate for the social limitations of online classrooms by creating community, and making introductions and social connections. Online learning seems to be more of a mutually created creative endeavor between instructors and learners. eLearning instructors often share decision-making with learners.

IV. Conclusion and Some Research Implications

The complex nuances of cultural sensitivity may be difficult to replicate. The nuances of a sense of "fairness" in dealing with the various contingencies and situations of learners may require human mitigation. To create nuanced customization may require information-rich databases and the work of numerous subject matter experts, including those with disparate views. Faculty members bring a much richer range of possible responses and knowledge bases that may be difficult to artificially replicate. The "personality" piece that may be so compelling to learning may be missing, even with the use of humanized pedagogical agents.

Learning ecologies online seem enhanced through relationship building and empathic human interactions. The creative brainstorming synergies of instructor-led online courses may not be as easily captured.

Some fields may not benefit from personalization, and indeed, some instructors seem to equate personalization with a slide in learning quality. Automation may work more effectively in particular learning situations—such as in formal or informal settings or possibly in limited focused learning situations. More research will need to be done here. This point has been echoed in some research. Particular topics may be taught and learned in an "instructor-free environment," but a majority of content may be delivered in a "mixed-mode, moderator-supported or face-to-face teaching style" (Bûchner and Patterson, 2004).

Learners may wish to fashion some of their own solutions for their own predicaments and challenges while learning. The learner initiative piece would be important to consider in customized automated learning.

Larger societal resources (field trips, guest speakers) should be tapped for automated eLearning. Still other resources may enhance customized automated eLearning.

The issue of customization may have ripple effects in the creation of effective learning objects for automated deployment. Thorough alpha and beta testing of automated learning environments and objects will be needed to enhance these approaches.

A trenchant question emerges with the actualization of effective personalized eLearning. Will there be a situation of haves and have-nots in higher education with real-life personalized access to experts only for those who can afford it? Will there be superstar instructors whose imprint in a classroom is solely digital? Will there be unforeseen costs to using automated customized learning in terms of social skills or innovations or synchronous human synergies?

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Appendix

Two "mirror" surveys were deployed. One focused on F2F classrooms, and the other focused on eLearning courses. These had similar questions albeit with small phrasing differences. What follows is a copy of the survey deployed for the F2F classrooms.

Personalization of Teaching / Learning in F2F Classrooms

SURVEY INSTRUMENT

Survey Participant Information

This part of the survey collects some basic information about the survey participants.

1. How many years have you been teaching PART-TIME at the college or university level?

(200 characters max)

2. How many years have you been teaching FULL-TIME at the college or university level?

(200 characters max)

3. How many years have you been teaching face-to-face (F2F) or in classrooms at the college or university level (whether full-time or part-time)?

(200 characters max)

4. How many students do you have in your courses? Please offer a low and high range. (For example, 10 - 800)

(200 characters max)

5. What is the average number of learners in your classes?

(200 characters max)

Qualitative Questions

INSTRUCTOR-MEDIATED CUSTOMIZATION, PERSONALIZATION, ADAPTIVITY

1. When do you think learning should be personalized or customized for students?
2. If you believe learning should be personalized for students, explain why you personalize your teaching/curriculum/assessments.

LEARNER INDIVIDUATION: Students as Individuals

3. What actions do you take in order to see your students as individuals?
4. What are the most salient aspects of a student that individualize him / her in your mind? Please choose the top three, and add some details about why you've chosen these. (Some possibilities may include the following: intellect, past learning experiences in the field, personality, age, race, sex, gender, learning style, charisma, likeability, physical appearance, self-esteem or other factors.)

CUSTOMIZED TEACHING: Personalization of Learning

5. How much of your course is "standardized," and how much is "personalized"?
6. How do you personalize learning for your F2F students? How do you make the learning unique for each learner?

COMMUNICATIONS: Learner Feedback

7. How regularly do you give learners original (personalized vs. generic) feedback?
8. What are your most common channels of communications in your face-to-face (F2F) courses? Please rank the following in the order of most common use, with #1 as the most used, #2 as the second most commonly used, and so on in descending order.

   Print written commentary? (notes, textual comments on student work, faxes, letters)

   Face-to-face feedback? (conversations)

   Telephone responses? (conversations, voice mails)

   Online audio responses? (via online recorded or synchronous voice communications, and taped feedback)

   Audio-visual responses? (multimedia files, films)

   Online textual responses? (communications within an online classroom, threaded discussions)

   Email? (email text)

   In-class discussions (spoken interactions)

   Other
9. What is the "transactional distance" that you have between you and your learners? In other words, on a scale of 1-10 with 1 as remote and 10 as very close, how closely do you inter-relate with your learners in general?

ADVISING: Personal Advising

10. If you offer personal advice to students (whether at their initiation, a third-party initiation or yours), how personal are the contents on a scale of 1-10, with 10 being the most personal and 1 being the least personal?

This following section involves multiple-choice responses to show your degree of agreement with the statements that follow.

INSTRUCTOR-MEDIATED CUSTOMIZATION, PERSONALIZATION, ADAPTIVITY

The Likert-like scale involved the following measures:

Agree Wholeheartedly	Agree	Tend to Agree	Neutral	Tend to Disagree	Disagree	Disagree Wholeheartedly	Don't Know

LEARNER INDIVIDUALIZATION

I respond to the unique personalities of my different students.
I collect information from my students in order to see what their backgrounds are in relation to the subject matter.
I have alternate assignments and evaluations for learners who may have disabilities.
I have alternate assignments and evaluations for learners who may be non-native English speakers.
I have alternate assignments and evaluations for learners based on their learning preferences and needs.
I create assignments that may result in different tangible outcomes for different learners.
I have different expectations of different learners.

COMMUNICATION

I encourage and motivate my students in unique and different ways.

SOCIAL CONTEXT / LEARNING ENVIRONMENT

I consciously create a "learning environment" in the F2F classroom.

I offer personalized social networking and introductions between learners who have shared interests or opportunities for mutual benefits.

I work with family, friends, potential employers, employers, and others related to students' lives (if the students want me to).

LEARNER EMPOWERMENT

I collaborate with learners to enhance their learning experience.

I take into account the expressed interests and needs of individual learners in my curricular design.

I will make adjustments to the course curriculum and activities if the class requests the changes.

My students make important choices about their own learning.

My students are encouraged to be innovative and creative in their thinking and coursework.

I use synergies in teaching, in terms of shared instructor and learner interests, and areas of shared expertise.

I consider individual student ability in adjusting my expectations of each learner.

MANAGEMENT SUPPORTS

I provide housekeeping supports such as posted deadlines and reminders.

I extend deadlines or make other adjustments based on unique learner situations.

ENRICHED LEARNING: Integration into a Profession

I help learners gain extracurricular learning and experiences in their chosen profession or field.

I use field trips to help learners connect to a larger community.

When it is relevant, I help my students study for credentialing exams.

I support my students in applying for different learning or work opportunities.

I share information about the professional fields related to my courses with my students.

I introduce learners to experts in the field and encourage professional connections.

I encourage my students to conduct research, publish, showcase their work, and/or serve as apprentices in their chosen professional field(s).

I offer remediation materials for learners who are not yet at the proper level of performance for the courses.

ADVISING

I advise students differently in relation to their interests in a particular field or credential.

REWARDS STRUCTURE

I change the rewards structure in my class(es) by offering different encouragement to different learners.