



Designing Discovery Learning Spaces Online

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Discovery Learning Spaces:

- Online spaces that support autonomous and learner-directed learning
- Developed with orientation, decision supports, community supports and the archival of new learning
- Promotion of learner self-efficacy and decision-making
- Alignment with relevant autonomous learning theory



Uses of Discovery Learning

- Polishing employable skills
- Training end-users of products and equipment
- Adding value to live, synchronous events
- Supporting lifelong learning
- Self-improvement (informally and formally)
- Heading off skills decay



Discovery Learners

- Independent
- High levels of image and screen literacy
- Purposive
- Self-driven, self-initiative
- Self-directed
- Active learners
- Creative and innovative
- Able to learn in *ad hoc* situations



The Phases of Self-Regulated Learning

“**Phase 1** involves planning and goal setting as well as activation of perceptions and knowledge of the task and context and the self in relation to the task. **Phase 2** concerns various monitoring processes that represent metacognitive awareness of different aspects of the self and task or context. **Phase 3** involves efforts to control and regulate different aspects of the self or task and context. Finally, **Phase 4** represents various kinds of reactions and reflections on the self and the task or context” (Pintrich, 2004, p. 389).



Four Component Skills of the Independent Learning Model

- “(1) *self selection*,
- (2) *self-determination*,
- (3) *self-modification*, and
- (4) *self-checking*” (Chen, Kao, Yu & Sheu, 2004, n.p.)



Examples of Virtual Environments

- Virtual learning environments
- Networks – or communities – of practice spaces
- 3D immersive and persistent metaworlds
- Learning / course management systems
- Interactive websites
- Data repositories or digital libraries
- Online work suites



A Fusion of Technologies

- L/CMSES (Learning / Course Management Systems)
- Web building tools
- Authoring tools (animated tutorials, screen captures, audio, video, e-books, interactive objects, games, images)
- AI: Intelligent tutoring agents, avatars
- Databases and repositories
- The Internet and WWW connectivity



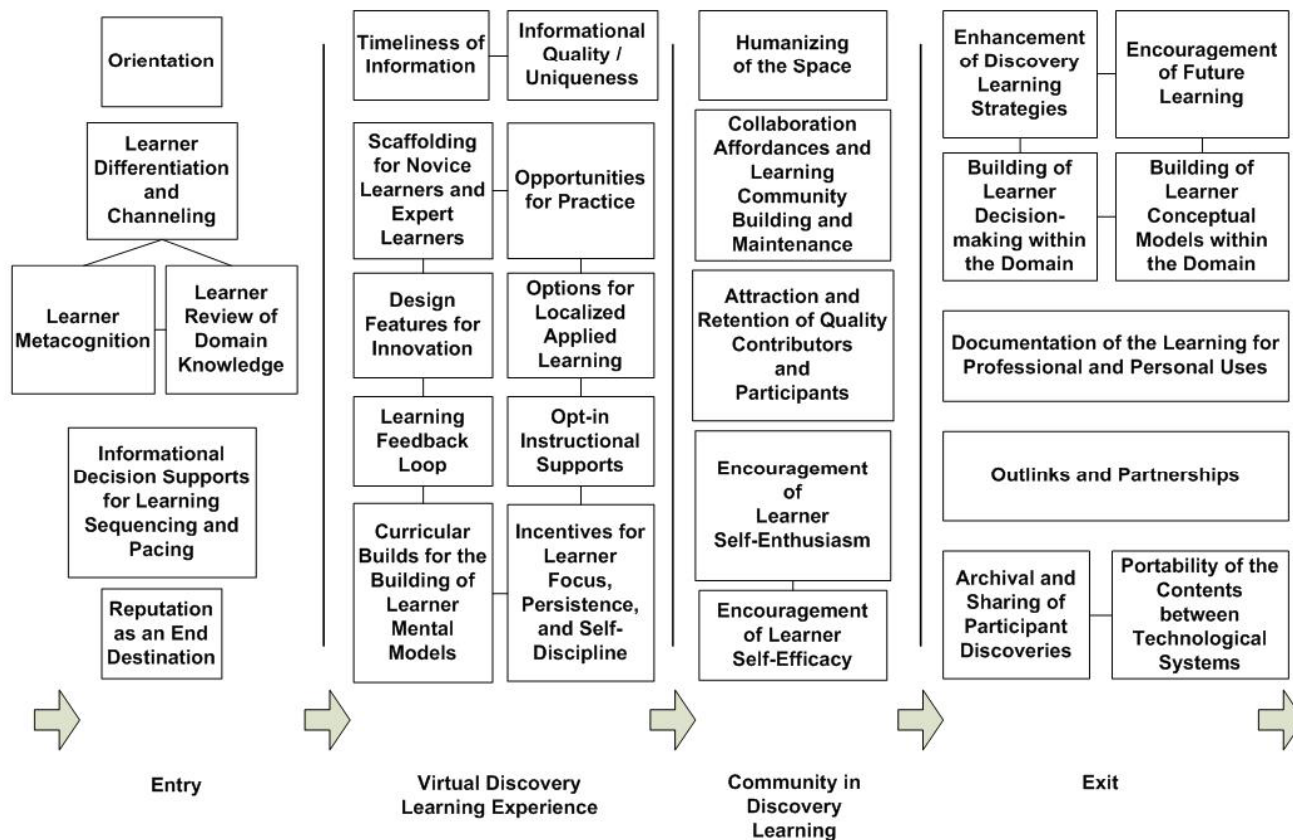
Theoretical Underpinnings

- Adult learning theories (Knowles)
- Multiple intelligences (Gardner)
- Experiential learning (Kolb)
- Cognitive load (Sweller)
- Cognitive theory of multimedia learning (Mayer & Moreno)
- Constructivism (Piaget)
- Communities of practice (Lave & Wenger)
- Zones of proximal development (Vygotsky)
- Social cognitive theory (Bandura)
- Computer-supported collaborative learning (various)

A Normative Model for Virtual Discovery Learning Spaces

A Normative Model for Virtual Discovery Learning Spaces

(Hai-Jew, 2008)





A **Normative** Model for Virtual Discovery Learning Spaces (cont.)

- **Entry:** orientation, learner differentiation and channeling, informational decision supports, site reputation as an end destination
- **Virtual Discovery Learning Experience:** information quality and timeliness, scaffolding for novices and experts, opportunities for practice, options for localized applied learning, design for innovation, learning feedback loop, opt-in instructional supports, curricular builds for learner mental models, incentives for “learner focus, persistence and self-discipline”



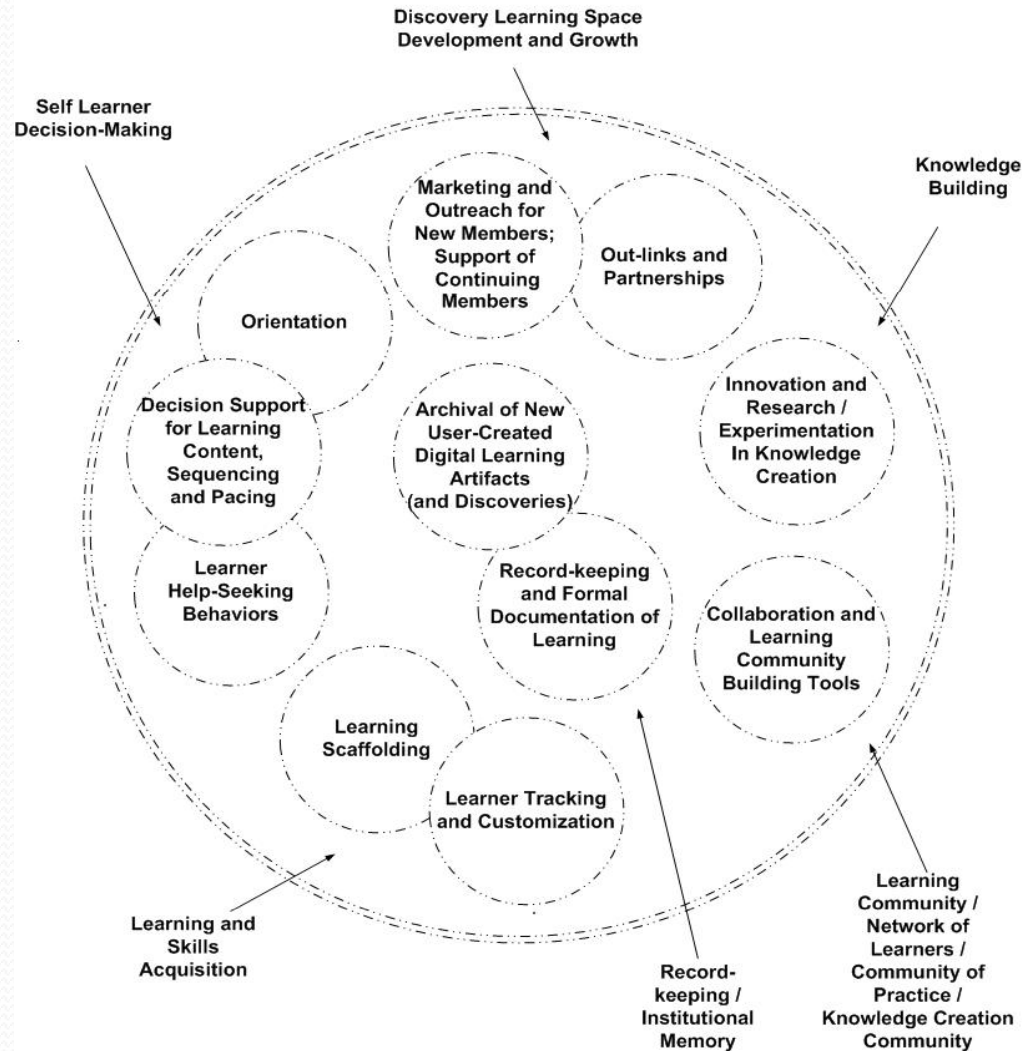
A **Normative** Model for Virtual Discovery Learning Spaces (cont.)

- **Community in Discovery Learning:** humanizing of the space, collaboration affordances, attraction and retention of quality participants, encouragement of learner self-enthusiasm, and encouragement of learner self-efficacy
- **Exit:** enhancement of discovery learning strategies, encouragement of future learning, building of learner decision-making, building of learning conceptualization models; documentation of the learning for professional and personal uses; outlinks and partnerships; archival and sharing of participant discoveries, portability of contents between technological systems

Main Opt-In Functions View of Discovery Learning Spaces

Main Opt-in Functions View of Discovery Learning Spaces

(Hai-Jew, 2008)





Main Opt-in Functions...

- Discovery learning space development and growth
- Self learner decision making
- Learning and skills acquisition
- Record-keeping / institutional memory
- Learning community / network of learners / community of practice / knowledge creation community
- Knowledge building



Orientation

- Direct teaching of self-regulated learning strategies
- Orientation and acclimation to the online discovery learning space
- Versioning a site to meet individual learner preferences and needs



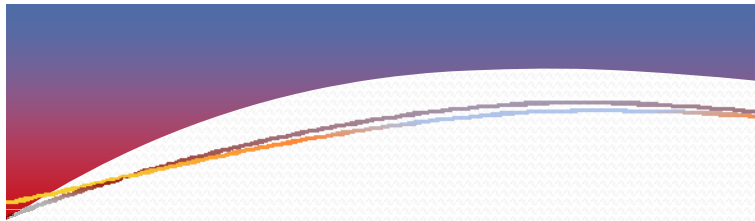
Guided Discovery Learning Tools

- Weak guidance to build internal conceptual frameworks
- Linking learning goals for individual learner self-goals
- Learner monitoring
- Guided, explanatory feedback to promote cognitive development
- Support for learner structuring of the learning space
- The encouragement of strategic help-seeking behaviors
- The maintenance of learner engagement
- Additional learning trajectory beyond the discovery learning site



Contextualizing and Sequencing

- **Contextualizing:** A meta-perspective, a culture, an employment framework, a social milieu, a knowledge domain
- **Sequencing Options:** developmental, time sequencing, problem-solving, social coordination sequencing, and mixed methods sequencing



Context and Sequence

Learning Sequencing Strategies in Discovery Learning Spaces

(Hai-Jew, 2008)

Developmental

Some knowledge domains have clear learning trajectories from easy-to-difficult, simple to complex, fundamental to esoteric; general to specific; specific to general, and so on. Discovery learning sites may use learner behavior / performance tracking, learner testing, and so on to scaffold the instruction and to place it on a certain learning sequence.

Time sequencing

Time phases may be used to move learning forward. These may be linked to external time events.

Problem-solving

Learning may be sequenced based on the challenges of simple-to-difficult problem solving. Certain problems have pre-requisite knowledge and skills needed to solve the challenges; those may be defined by the discovery site builders. It may be helpful for learners to run up against something they can't solve because this leads to self-directed learning (Hmelo and Côté, n.d., p. 421).

Focusing on a problem may lead to a gaps analysis where current knowledge is assessed in relation to the problems being faced. This analysis may lead to decisions about what learning is necessary. There's also potential learning value in determining whether goals have been met or not (or whether the problem has been solved or not) (Hmelo and Côté, n.d., p. 422).

Another way of viewing this is through the task-discovery relationship: "Gagné provides us with a hierarchy of problem contexts that incorporates the role of discovery as a function of task complexity. An analysis of his hierarchy reveals different functions of discovery for different varieties of problem-solving scenarios. His conceptualization is in keeping with Mechner's position on the task-discovery relationship" (Marakas, 1995, p. 75).

Social coordination sequencing

There may also be suggested sequences of activities such as between individual work and group work, asynchronous and synchronous interactivity, and interactive modalities (text, voice, image, and other). "It is not self-evident that learners know how to collaborate constructively. Several studies have shown that collaboration without instruction or support on how to collaborate does not lead automatically to effective knowledge construction (Webb & Farivar, 1994; Ross & Cousins, 1995; Mercer, 1996; Chan, 2001)" (Saab, Van Joolingen and Van Hout-Wolters, 2006, pp. 73 - 74).

Mixed methods sequencing

There may be mixed methods sequencing—the ordering of various learning activities (from brainstorming to reflection), and any range of other complex methods depending on the learning objectives. Generally, this complexity would suggest live human interaction instead of a machine-determined programmed sequence. Part of this sequencing may also involve the choice of particular online tools.



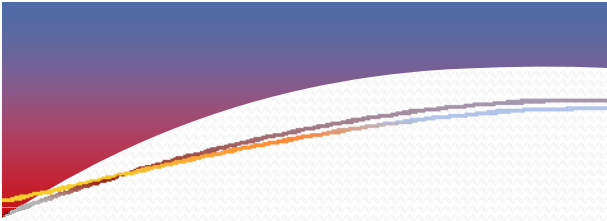
Communications, Collaborations and Communities

- Authenticated telepresences
- Meeting spaces for those with shared interests, backgrounds or levels of expertise
- Creation of partnerships for shared learning and problem-solving (short-term and long-term)
- The organization of individuals into strategic virtual teams
- The support of frequent communications, including informal backchannel ones



Knowledge Management Systems

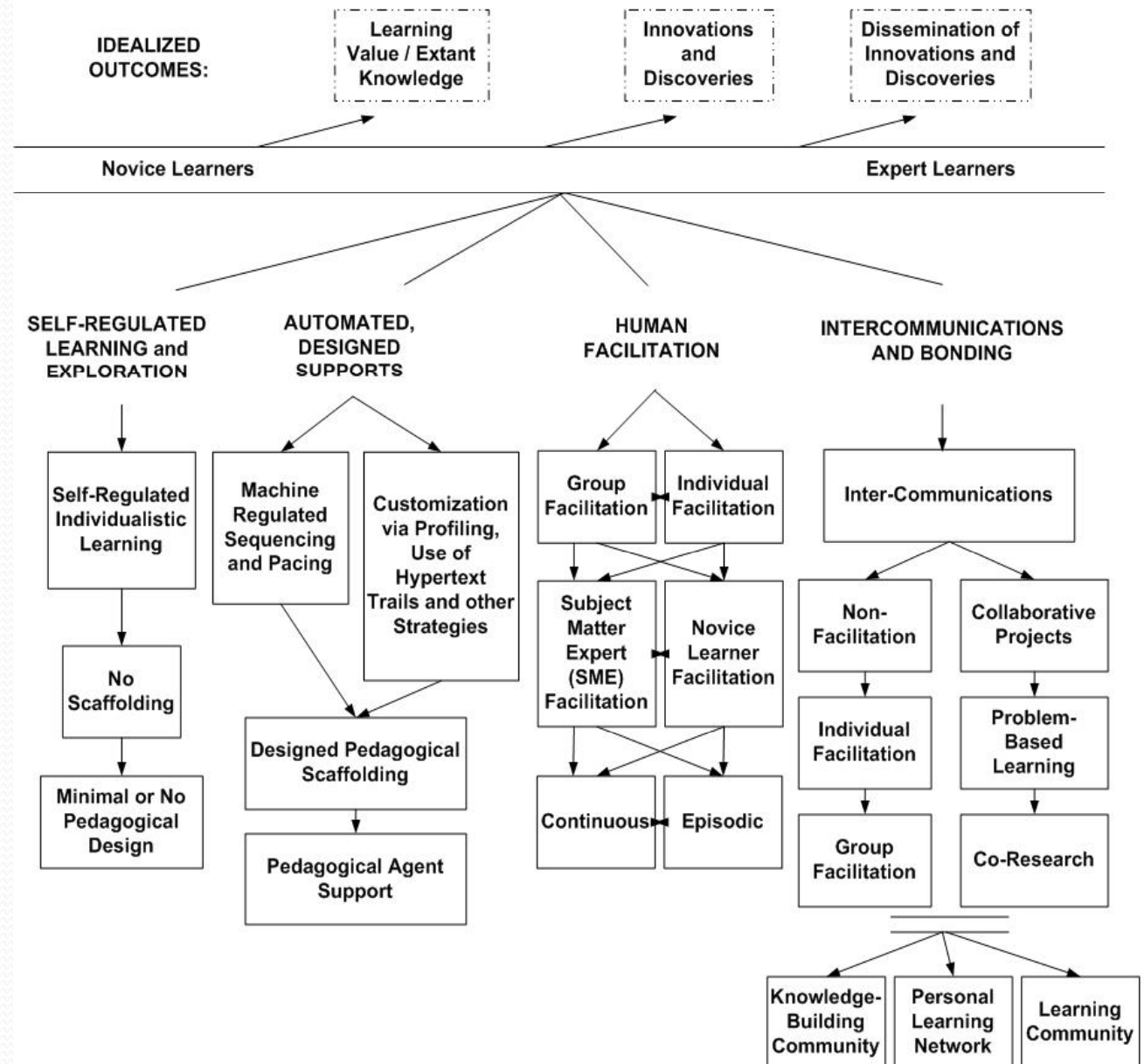
- For the application, generation, distribution and storage of knowledge (via digital artifacts labeled with metadata)
- Organization of knowledge via ontologies, taxonomies and collections
- Support to participants to “amplify, transform, and extend their work to new or additional outcomes”
(Dimitracopoulou, n.d., p. 122)



A Continuum of Discovery Learning Spaces Online

A Continuum of Discovery Learning Spaces Online (from Self-Regulated Learning to Learning Communities)

(Hai-Jew, 2008)





A **Continuum** of Discovery Learning Spaces Online

Novice to experts

1. Self-regulated learning and exploration, with minimal pedagogical design
2. Automated, designed supports, with designed scaffolding and agent support
3. Human facilitation, with individual and group facilitation
4. Intercommunications and bonding, with collaborations, problem-based learning, and co-research



A **Continuum** of Discovery Learning Spaces Online (cont.)

Idealized Outcomes: learning value / extant knowledge, innovations and discoveries, and dissemination of innovations and discoveries



Scaffolding: High End Learning for Experts

- Filling in knowledge gaps
- Seeking new research threads
- Sharing ideas
- Engaging in reinforcement learning



The **Social Aspects** of Self-Learning

- Independent learning \neq learning alone
- The reconciling of multiple perspectives through dialogue (Bakhtin)
- Networks and communities of practice (NoP, CoP)



Adding **New Knowledge** to the Domain

- Updates to the knowledge bases
- Group-decided standards of relevance of new discoveries



The Future

- Mobile learning spaces
- Persistence of online learner identity through multiple discovery learning spaces
- Interoperability between discovery learning systems
- New pedagogical strategies and approaches



References

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- Merriam, S.B., & Caffarella, R.S. (1999). *Learning in Adulthood: A Comprehensive Guide*. 2nd Ed. San Francisco: Jossey Bass Publishers. 36, 289, 293 and 296.
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Live Analysis

Designed Discovery Learning Spaces

Virtual Learning Environments

Back-end Designed Progression of Learning through Contents:
Responsiveness to learner actions and level-of-learning

Open-source Learning Management System (LMS)-Enabled Interactivity:
Community building through computer-mediated communications; synchronous and asynchronous

Accessible Multimedia: The uses of metadata, alt text, captioning and design for accessibility

Multi-lingual Functionality:
Infrastructure for foreign language translation

Scenario Building for Realism and Far Transfer Learning: Using from-life scenarios for realism

Photo-realism for Applicability: In-field applicability for identification and analysis

Modular Sequencing: Offering modules in development sequence; offering modules as opt-in and topical-based

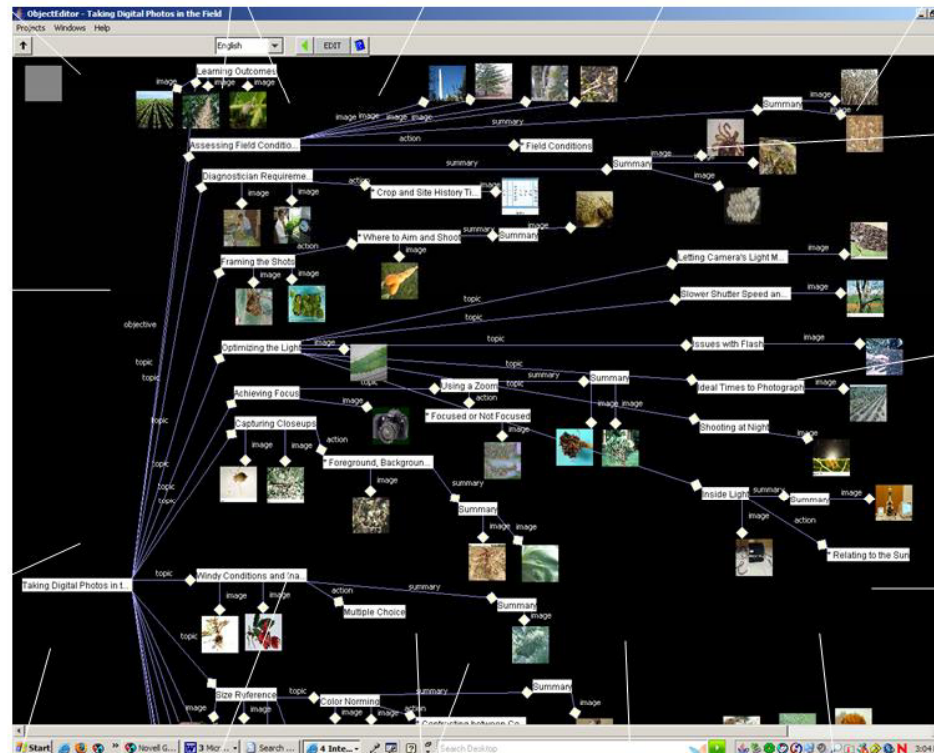
Learner Orientation: Introductions, learning objectives defined per each module

Learner Control of Progress:
Learner pacing

"Memory" of Learner Performance for Continuing Learning through the Modules:
Ability to continue learning at varying intervals

Live Capture of Information:
From-field insights from learners captured and used in the network

Human-Vetted Asynchronous Capture of Information:
Refreshing information stores with regional contributions of information and digital imagery



Simple English:
Accessibility through direct and clear English

Definition of Terms: Field-specific definition of terms

Visual Appeal:
Front-end visual appeal

Opt-in Help-seeking:
Additional rich learning by choice

Designed Interval Practices: Review and memory retention practices available

Networks /Communities of Practice

Credit or Prestige Affordance:
Status building mechanisms to encourage participation

Asynchronous Communications:
Discussion boards, voice or auditory boards, and captured video boards

Synchronous Communications:
Chat, live video, live audio, live whiteboard, and others

Persistent Virtual Spaces: Public and private

Group Collaboration:
Shared live and asynchronous interactivity; creativity tools

Creativity Tools:
Brainstorming tools and idea capture tools

Informational Storage and Access: Data-centered knowledge-building

New Information Capture: User-created contents for value-added to the networks or communities of practice

Novices to Experts:
Accommodation of a range of potential users; defined / undefined / self-defined roles

Digital Libraries and Information Repositories

Necessary Information Access: Role-based access to specific information

Emails and Listservs

Conversation
Connections
Context
Content

Multimedia – Rich Spaces: Multi-media enabled sharing for multi-sensory channels

User Selected Level of Participation:
Opt-in / opt-out functionalities

Prominence of Timely Information:
Surfacing of the most timely information

Historical Archival:
Relevant record-keeping for a sense of shared history

Learning / Course Management System

Public Work Spaces: Sharable visualizations and textual contents

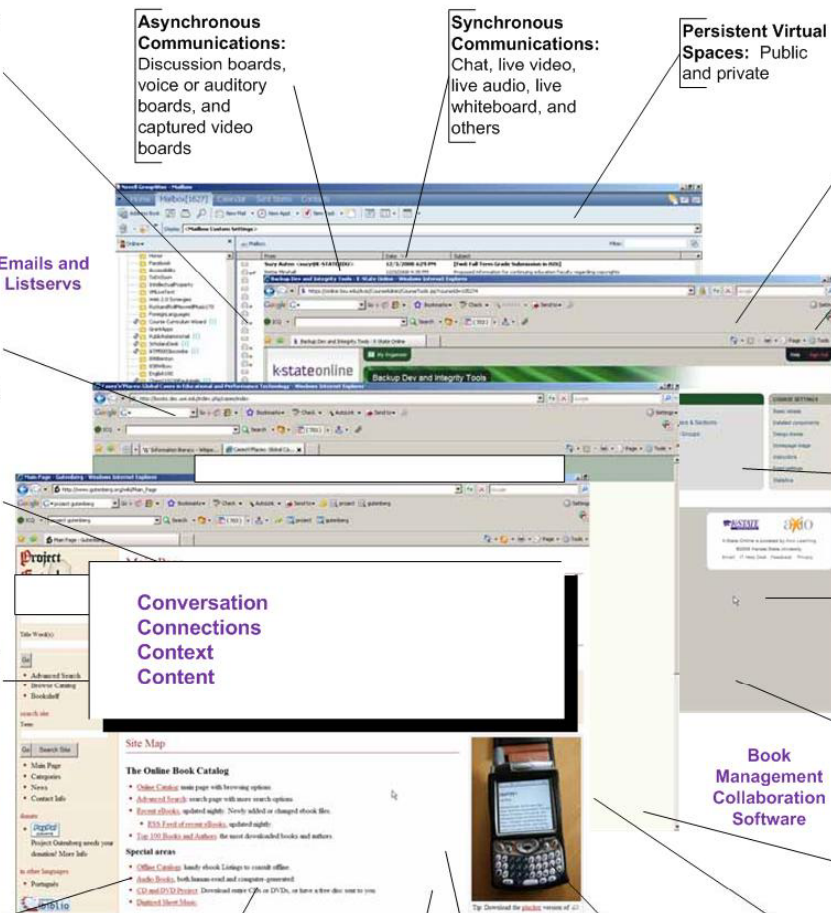
Private Work Spaces: Secure locations for virtual work and content development

Access to Peer Feedback: Ways to version information and share ideas and critiques in relation to discrete files

File Versioning:
The ability to revise and evolve files

Understanding of Shared Interests with other Peers:
Abilities to seek and share with those with like-minded interests

Book
Management
Collaboration
Software



3D Immersive, Persistent Metaworlds

Points of Attention:

Designing spaces with clear areas and places of attentional focus and congregation

Natural Movement:

Blowing trees, moving clouds, drifting snow

Realistic Audio:

Natural sounds, background noises, focused sound in "ambient" virtual environments

Consistency in-World: Regularity, clear expectations, defined physics engines

Accessibility Builds:

Digital builds and channels for various types of sensing

Controlled Interactivity: Opt-in information and actions

Live Human Intercommunications and Interactions: Technology mediated socializing; human-created events

User Control and Decision-making: User choices and "modding"

Full Sensory Experience:

Related to physical space, sight and sound experiences

Human Representation by Avatar: Self and group representations

Mapping: Giving users a sense of where they are in relation to others and to locations

Multilingual Affordances: Multilingual communications

Easy Locomotion and Navigation: Comfortable movement through virtual spaces



Interactive Websites

Branding and Design: Site logo, "chrome" and branding

Gallery: User-submitted artwork, writing, and multimedia

The Blog: A user-participative space

Events: On-campus and near-campus events submitted by users

Updated Information: Timely updates of site contents

Content Organization: Tagging by type

Authenticating Entry: User authentication

User Control: User controls and accessibility features

Easier Searching: Metadata labeling for easier searching

Bookshelf: Modules, downloadables, and more official contents

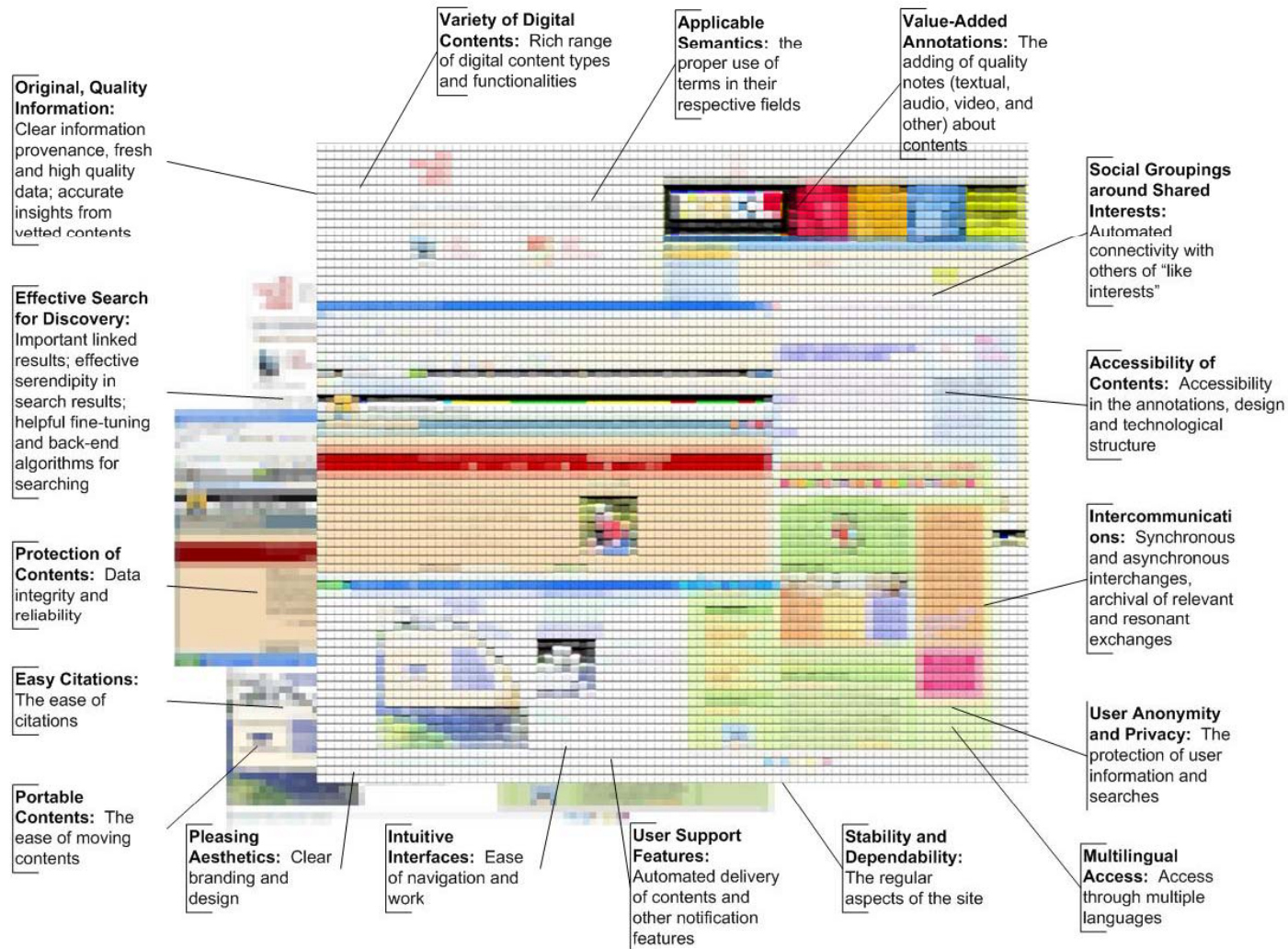
Discover Yourself: Self-assessment heuristics

Multimedia Options: Multimedia functionality throughout the site

User Social Controls: A "report abuse" factor to enable some user site management



Data Repositories / Digital Libraries



Conclusion and Contact

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