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ABSTRACT

Electronic Performance Support Systems (EPSS) use computers to capture, store, and distribute knowledge in both an interactive and non-linear delivery. Using technology sources such as the Internet, Microsoft's Net Meeting, Connectix's color camera, and business software, it is possible to provide multiple site delivery and bring business education training closer to the workplace. These tools help students and business participants reach their highest potential performance quicker and with a reduced amount of faculty or training department support. In project based classes there are exciting opportunities for advanced problem solving in actual business situations that can be facilitated by advanced technology application. This paper describes a pilot project in the delivery of business training for university business students. A project-based program maximizes experiential learning and matches learning while doing. The benefits of experiential learning fall into four categories: (1) connecting theory and practice; (2) integration of learning; (3) use of knowledge and application of business concepts; and (4) learning to learn, including collecting and evaluating data, self directed learning, logical thinking, and reflection. The paper also discusses continuous improvement as the framework for the project, off-site project management, and provides a detailed description of the pilot project. Student participants have exhibited better retention of knowledge areas, higher levels of motivation, and an ability to more effectively transfer their learning to other application areas. (SWC)

Design and Implement Custom Electronic Performance Support Systems (EPSS) for Training in Project Based Classes

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Introduction

Electronic Performance Support Systems (EPSS) has been dubbed "the learning tools of the 21st century" by training experts. What is it, can education really use it to train business students, and how do we effectively integrate these systems into team project based classes? These are key questions that need to be answered as we evaluate a new delivery of business training for university business students. EPSS uses computers to capture, store, and distribute knowledge in both an interactive and non linear delivery. Using technology sources such as the Internet, Microsoft's Net Meeting, Connectix's color camera, and business software we can provide multiple site delivery and bring business education training closer to the workplace. These tools will help students, as well as business participants, to reach their highest potential performance quicker and with a reduced amount of faculty or training department support. In project based classes there are exciting opportunities for advanced problem solving in actual business situations that can be facilitated by advanced technology application. Students who are faced with unique challenges often require specific learning interventions.

Briefly, the pilot for our EPSS project includes a Quality Projects class at Ohio University in Ohio and a Managerial Accounting class at North Central College in Illinois. The pilot uses offsite project management technology to link a problem solving class (Ohio University), an accounting class in Illinois (North Central College), and a sponsoring CPA accounting firm in Ohio. The Ohio team is facilitating a continuous improvement project with the accounting team in Illinois to improve an actual CPA firm's referral system.

Rationale

Projects as the hub

Performance in the environment of preparing and educating business leaders should be described in only one context...the exact duplication of skills, knowledge, and attitudes necessary to be effective in a workplace environment. Authentic performance is the milestone. Educators in the business field (management, marketing, accounting, etc.) must structure innovative and dynamic programs and curriculum that require students to exhibit components of the exact same pool of skills, knowledge, and attitudes needed in competitive organizations. Students must have numerous opportunities to apply those skills and they must do it early in their learning not just at the tail end of their education experience (as even good internships promote). The program that can adequately fulfill that tall order is an extensive project based program, supporting curriculum, and appropriate technology. A project based program maximizes experiential learning and matches learning while doing. Applying theory and knowledge not only helps us determine how close we can get to authentic performance but actually guides educators in the determination of the relevant business knowledge and concept areas to be covered.

Experiential learning, driven by actual business projects, is fueled by both needs and benefits. Students need to be properly trained in general and specific skill, knowledge, and attitude areas. The business community needs young graduates to be able to exhibit those skills immediately upon entering an organization. Education needs a new paradigm to deliver hard to teach but needed skills and attitudes. They also need to assess knowledge in areas of authentic application and performance. The benefits of experiential learning are numerous and can be summarized in four categories. The first category involves connecting theory and practice including providing opportunities to test and refine theories, initiate new theories, and puts concepts into concrete form. The second involves the integration of learning including challenges that require more than one set of skills or knowledge, integrating several functional areas of knowledge, and provides for an opportunity for in depth study of problems while linking real world with academics. The third category involves the use of knowledge and includes the application of business concepts (critical thinking, problem solving, team building, etc.), application of communication and interpersonal skills (presentations, interviewing, team facilitation, etc.). The fourth and last category involves learning to learn and includes collecting and evaluating data, self directed learning, inquiry and logical thinking, and reflection on experienced based learning.

The real distinction between project based programs and traditional programs are in their application, its focus on real time problem solving involving actual business projects and activities. The traditional classroom format (including more progressive technology usage and collaborative

teaching methods) is not equipped to teach newly identified skills which businesses require (risk taking, project management, change management). Current efforts are largely limited to case studies, simulations, and one time internships. while these help in exposing students to business situations, each has serious application flaws.

Developing team projects focus on five key foundation principles: 1) project based curriculum; 2) multiple problem solving iterations at varying and increasing levels of expertise; 3) large numbers of students are handled within program; 4) projects driven by continuous improvement quality skills and strategy; 5) business skills and business software are introduced by Just in Time technique for project application.

Continuous Improvement as the framework

If the hub adequately provides an opportunity to explore a business problem or issue then there must be a framework to effectively demonstrate the mastering of skills, concepts, and attitudes. One successful framework is the Continuous Improvement Process. This well known and applied process is not the only problem solving/opportunity assessment process that could be used to demonstrate key business skills. It is, however, an effective application of diverse analysis, decision making, consensus, prioritizing, and data stratification.

The strength of the Continuous Improvement Process is in the standardized approach and simultaneous flexibility in applied business situations. The process can be learned by individuals and teams and consistently applied to various business situations. It supports the key project hub concept by facilitating multiple iterations of problem solving. Teams will be able to use these skills of problem solving and focus on the new experience which each business project will bring to student teams. A useful analogy might be the learning of rules for a new game before you actually play. If the rules are known then individuals can focus on the necessary skills required to compete in the game. For teams, the learning of rules occurs during multiple practice sessions where they emulate game conditions or components of the game to prepare for actual competition. In both cases knowing the rules, including strategies, allows the effort and focus to be on skills and performance.

The Continuous Improvement Process has three elements; Theory, Process, and Tools. The Theory, as canonized by Deming, Shewart, and others is demonstrated by the Plan, Do, Study, Act improvement wheel. The success indicators concentrate on effective planning of change (including what areas of a system need improvement and what are interfering causes, act on an improvement change, measuring whether the attempted change has made an improvement, standardizing the improvement and planning for continuing improvements. The Process is a standard problem solving sequence that requires a team or individual to, step by step, initiate and complete an improvement project. The discrete 7 phases of that process are 1) Defining the Process, 2) Assessing the Current Situation, 3) Analyze Causes, 4) Try an Improvement Theory, 5) Study the Improvement, 6) Standardize Improvement, 7) Plan for Continuous Improvement. The following outline is a more detailed description of the improvement process.

I. Alignment
- A. Identify system to improve/where are problems occurring
- B. Know how the system operates now!
- C. Make the system consistent
- D. Prepare for improvement

II. Improvement
- A. Define the system that needs to be improved
- B. Identify the system's performance right now
- C. Analyze causes that keeps the system being studied from performing as desired
- D. Identify improvement ideas that will eliminate cause(s)
- E. Try out your improvement idea
- F. Measure whether your idea actually improved system
- G. Standardize the idea so that everyone does it the same way all the time
- H. Find / Plan for other improvement areas

The final element is the tools component. This component is the facilitator between the concept and process application. The tools provide teams with a means to work through complex problems, information, and issues. The tool categories are group consensus seeking tools (brainstorming, nominal group technique), data gathering tools (check sheet, run chart, sampling), data analysis tools (histogram, control charts, chart interpretation, cause and effect diagram, pareto diagram, scatter diagram, capability analysis), standardization tools (flow charts, operational definition), planning tools (affinity diagram, relations diagram, systematic diagram, force field analysis).

Off Site Project Management

Technology has changed the way we work, changed the way we communicate and now it is poised to change the way we learn. After several years of initial pilots then the integration of actual business projects as hubs into university business curriculum we took the opportunity to reflect on key successes and failures. We surveyed participating students, businesses, and faculty. The projects were performing as anticipated in several areas; the projects were dynamic, retention was higher, and motivation was measurable higher. In addition students demonstrated skills in project management, team building, problem solving, and situationally applied industry skills including statistical analysis, market survey designs, and promotion planning. Some of the of barriers to successful project completion for business student teams included limited access to information after the project began, limited access to key employees of the participating business, and the sensitivity of dealing with local proprietary company information. For business participants there has been an increased emphasis and disappointment with the actual financial impact, the degree to which there has been new skill transfer of their employees, the degree to which their has been individual and organization improvement, and the one dimensional nature of our project work (marketing and marketing research emphasis). The transition from local projects to off site projects was a direct response to our previous efforts and yielded several specific objectives; broaden our scope of problem solving expertise, provide training to the business team as well as our student teams, reduce proprietary information as criteria for information sharing, increase actual team time with participating business representatives, and more directly work on, as well as, measure bottom line improvements in business processes.

In general, the offsite projects function the same as a local project. There is a project hub represented by a business problem area, a facilitation component represented by the university project team, and a business information source represented by the business client. The significant differentiation is the location of the business client, the level of interaction between student facilitation team and business client, and the communication medium. The differences are slight, the impact and potential are tremendous

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Offsite Project Pilot Description

The Participants and their roles

Ohio University
Brian R. Hoyt, Assistant Professor Business Management - Team Project Manager
Jodi Hewitt, Business Management Student - team member
Jodi Poling, Business Management Student - team member
Mark Stockman, Coordinator of Computer Services & Instructional Technology - Technology Support Leader

The Ohio University team is providing the problem solving facilitation, moving the other participants through the continuous improvement process. The facilitation includes the introduction of each improvement phase, selection of tools, instruction of tool usage, integration of project information, and business software prompts and training.

North Central College
Jerry Thalmann, Associate Professor Accounting - Team Project Leader
Britt Calstrom, Accounting Student - team member
Sergio Marino, Accounting Student - team member

The North Central College team is providing the accounting expertise, working within the continuous improvement framework, providing information gathering activities, data analysis activities, improvement theories, and generate specific output.

Oatney & Wasem CPA's, Inc.
Penny Wasem, Partner - business client contact

Oatney Wasem provided the initial business opportunity, provides access to company information, and participates in the problem solving process.

Project Background:

The Client company is a diversified public accounting firm with experience in comprehensive taxation, estate taxation, financial and tax consulting, retirement and estate planning, profit share administration, business development consultation, accounting software support, and payroll reporting. After the Ohio University team facilitated the project selection (including brainstorming, affinity diagram, project criteria selection) with our business client they began the problem solving process with the Illinois college accounting team. The Ohio team prepares for each session by

communicating to Illinois via e-mail using a project schedule (on Microsoft Project Management). The schedule has the summary tasks, sub tasks, work activities, assignment of responsibilities, projected duration to complete tasks, and the sequencing of tasks. This alerts the accounting team to areas that they need to study, activities to do before the offsite meeting, and what activities will be performed during the next active offsite project management session. When the session begins (all participants are logged on to Net Meeting at pre arranged meeting time) the video and audio are set up, the chat line is used to start meeting (and document minutes, etc.) and provide reminder of session's agenda and activities. The Ohio facilitation team loads up any software needed during that session and establishes sharing and collaboration "rights" and begins the session. A typical session would introduce the continuous improvement phase, introduce possible tools to be used to move through problem solving activity, and provide an example of the output that the accounting team will be delivering. If any information is needed from the business client to clarify, add to, or change their activities then the business sponsor is included in the day's session. Whatever brainstorming, analysis, decision making, consensus, or data stratification is needed is performed on line with the necessary software applications. Each session's output is printed out and saved for each participant. Assignments are given out to do for the next session and a review of the project schedule takes place to verify that the project is on time. If any adjustments are needed they are made by the Ohio facilitation team in conjunction with the business client. As the teams move through the problem solving framework of continuous improvement they are exposed to and have opportunities to exhibit levels of expertise in various business software applications. Students may be using the software to demonstrate (Ohio team) or to analyze data (Illinois team). A typical selection of software used on a project includes presentation software (i.e. PowerPoint), analysis software (Excel, Statistical Process Control, SPSS, Flowcharting, Cause and Effect), planning software (Project Management), and word processing software. In addition students raise their level of proficiency in using a wider breadth of e-mail capabilities (attachments, etc.). A final presentation of the project's activities, findings, and recommendations is included in the offsite project management plan.

The Technology

The Internet is fast becoming a great leveler within education and society. With access to the net a person or organization is immediately given exposure of the world. An organization with a limited budget but Internet access will have the same information and resource base as its wealthy counterpart. The net can actually become a more significant attribute to the smaller organization by providing access to information or specialists that the larger organization may already have in-house.

Although the smaller organization may not be able to afford the high powered tools for extreme use of computing networks, alternatives are available that will provide similar outcomes. This is the ideology used in these methods of curriculum development and team building. The technology we are employing is very simple yet produce the desired results.

In this situation we are utilizing WAN (wide area network) tools to enhance the learning outcomes for business students. Because of the relatively small size of Ohio University-Lancaster, the class size does not properly reflect the diversity of the workforce. To simulate this diversity and to get the students familiar with the usage of the Internet, virtual project teams were established with students at North Central College. These teams will use the Internet to work together on business projects.

This project will use Microsoft's Netmeeting software to accomplish a number of tasks. Version 2.0 encompasses three important variables that could be accomplished with other software but the one package makes the job much less confusing for the students.

Real-time Internet Chat

The virtual project teams will use text based chat to work together on class projects. Netmeeting utilizes text based, real-time communication where any number of individuals can participate, and from anywhere in the world. These meetings are easily logged and can be used by the teams to keep a concrete itinerary of their work.

Application Sharing

The teams will work together on document preparation and editing for their projects. For example, using this technology, the entire team will be able to work on its project plan in a real-time mode. The document being worked on will appear on all participants' screens and anyone can make changes. When the plan is complete each of the team members can save the work locally to retain a copy.

Videoconferencing

The teams will use small computer video cameras to provide a visual image of each other while the project meetings are taking place by sending video streams through the Internet. Although the quality and refresh rate of this technology isn't perfect, the idea behind it is to give the teams an image of their virtual teammates reducing any bias some may have against the electronic medium.

All of these capabilities are accomplished with a PC with Internet access. Additional hardware and software include:

Connectix Color Quickcam $200
The video camera used for video conferencing.

Microsoft Netmeeting Shareware
The software which allows for video conferencing, application sharing, and text based communication.

With an understanding of the Internet and its capabilities, this is the type of project and learning that can be accomplished, even within the small university or organization.

Summary:

The opportunities that this technology support system has provided has exceeded even our expectations. In a short amount of time students are exhibiting better retention of knowledge areas, higher levels of motivation, and an ability to more effectively transfer their learning to other application areas. We have been able to address two key issues in team problem solving and project management. One key issue is the speed of teams finishing projects and the other is the stamina of

team members to stay both focused and energized during the whole project experience. Both teams experienced several benefits of interdisciplinary projects and demonstrated skill development in team building, decision making, critical thinking and problem solving, conflict resolution, various business software applications. The accounting firm will not only have solutions for there opportunity area but have had opportunities to receive training during the project. The offsite project management is more than video conferencing, it has enabled students to participate in actual business problem solving that could not have been accomplished without this electronic support. Students, faculty, and business clients legally receive exposure and usage of business software not readily available to them. We are driving change in the delivery of business education, using advanced technologies, but not losing sight of our sole purpose; provide effective training to business students that exactly mirrors the skill, knowledge, experiences, and attitudes expected of successful business people in the workplace.

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