

Summer 2016

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Reflective Practice Series: Models and Theories to Guide Teaching in the Virtual Classroom

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Fall, 2016

Abstract:

This reflective practice paper utilizes the action research model to discuss the real time, virtual classroom for the “adult” learner. A brief historical context is given on distance education, followed by selective theoretical models that inform the action research. Data was provided by graduate level students in a variety of courses over several years. Educators, trainers, and adult learners might benefit by improving and transforming their instructional practice by the use of these new tools. Physical, on the ground classroom simulation was successfully achieved by the use of video conferencing software products. Empirical testing also revealed that screen sharing, streaming video clips, digital - freehand writing, and live “chats” were most beneficial for student learning.

Keywords: Virtual classroom, distance education, video conferencing, training and education

Introduction

With the technological age upon us, new tools for teaching and instruction have emerged. Due to the rapid rise of such technological tools, sparse reports of empirical testing in a real (or virtual) classroom exist. The aim of this paper is to take selective theoretical models and constructs and describe how they were placed into action in the “virtual” classroom. Several graduate level classes were used for the testing. Reflective practice is “paying critical attention to the practical values and theories which inform everyday actions, by examining practice reflectively and reflexively. This leads to developmental insight (Bolton, 2010).” Reflecting as an instructor brings together theory and practice within the context of your work. In essence you are extending your existing knowledge, with the simultaneous interaction of theory and practice, which produces a higher level of understanding.

Action Research

Over a time period, to employ technology in your instructing you are really doing *action research*. Lewin (1958) first coined the term *action research* in 1944. He claimed that action research was a “a spiral of steps, each of which is composed of a circle of planning, action and fact-finding about the result of the action.” Action research challenges traditional social science research by “moving beyond reflective knowledge created by outside experts with sampling variables, to an active moment-to-moment theorizing, data collecting and inquiry occurring in the midst of emergent structure.” *They key is emergent structure, it a work created in progress*. Lewin also stated that the goal of action research was to develop a well-informed action, not to develop a reflective science about action. Therefore, in some sense performing action research is the same as performing an experiment. Figure 1 below displays the Lewin Action Research model.

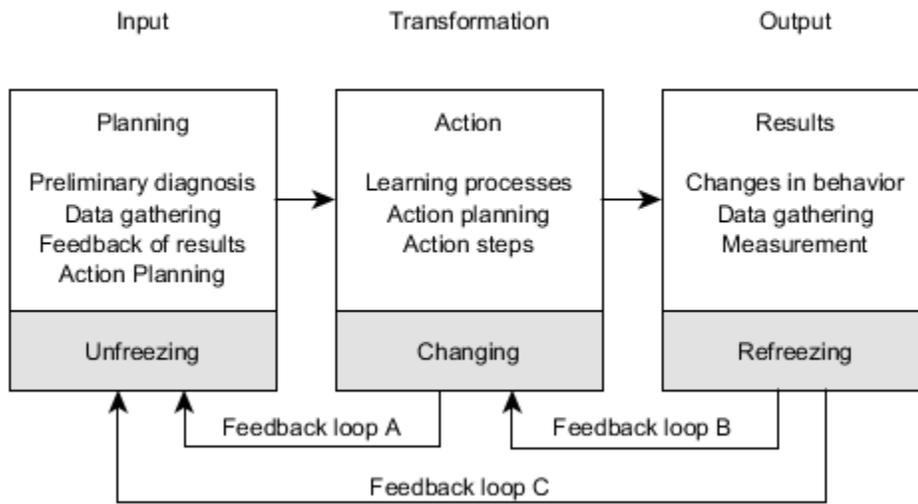


Figure 1. Lewin's Action Research Cycle. From: (Lewin, 1958).

A Brief Background of Distance Education

Distance education is the term used for the education of students who may not be on the ground physically present in a school or self-contained classroom. England's Sir Isaac Pitman was an early pioneer creating a distance education course in shorthand in the 1840s. Students sent and received shorthand messages via England's postal system and learned the shorthand messaging system. Later, due to the success of the system, The Phonographic Correspondence Society was established to formally offer more courses, and consequently, the Sir Isaac Pitman colleges spread throughout England. Here lay the roots of the correspondence course or the early "distance education" movement (Distance education, 2016).

Theoretical Perspectives of Distance Education

Transactional distance theory states that "distance education" is transactional, not spatial or temporal (Moore, 1993). When designing e-learning experiences, instructors must consider three variables that affect transactional distance: structure, dialogue, and autonomy. Structure refers to the flexibility or

rigidity of the instructional methods and strategies used in an e-learning experience. Dialogue refers to the interaction between the instructor and learner during an e-learning experience. Autonomy is the amount or degree of self-directness of the learner (Transactional distance, 2016). Moore stated that the transactional distance is “a psychological and communication space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner.” Originally, this theory was one of independent learning which Moore developed in 1972. This is pre-era of personal computers and the like, so one must gather that transactional distance can also occur in the “on the ground in the self-contained classroom.” When considering the synchronous, virtual environment the *dialogue* is quite high, there is great interaction between the learner and instructor (and peers); structure is very flexible, about the same as a on the ground classroom; and autonomy, the learner can “tune out” or not listen, watch synchronously, but can accommodate their various learning styles by personal software settings and/or viewing the class at a later date.

Gorsky and Caspi (2009) countered that the traditional Moore concept has shortcomings and is hard to empirically test, and that it is a tautology (true by its necessity or virtue of its logical form). They state to them instruction is *dialogue*. They contend that their theory of *instructional dialogue* can integrate research findings into a coherent whole increasing our understanding of how instructional systems achieve their goals. First, every element in an instructional system is either a dialogue or a resource which support the dialogue; second, certain structural and human resources correlate with dialogue, both in and out of class, and lastly, specific dialogues correlate with learning outcomes (Gorsky & Caspi, 2009). Intrapersonal dialogue mediates the learning, which is the interaction between the learner and the content (lectures, texts, etc.). Interpersonal dialogue can occur in some type of message loop between the students and instructor. They state that this can be on the ground or online. They also claim that their model for dialogue allows one to quantify students’ study/learning behaviors. For example, media choice, when, where, time on task, rates of utilization, instructional outcomes, etc. (Gorsky & Caspi, 2009).

Cognitive Science and Multimedia

When designing a real-time virtual lesson or training session it is advantageous to apply what is already been researched in the past. This will provide you with a solid foundation (and maybe theoretical) for your instruction. For the last several decades cognitive science and “multimedia” research have shown promising insights that we can apply directly to the virtual, real time, learning environment.

Miller (1956) suggested that short term memory is limited in the number of elements it can contain simultaneously calling them “chunks” of information. So short term memory has a limited capacity. Miller stated the magic number was seven chunks, plus or minus two. Sweller (1988) stated that long term memory contains contents which are sophisticated structures permitting us to perceive, think, and solve problems known as “schemas.” These knowledge structures are developed over a lifetime of learning. Experts in any field have very highly developed schemas, whereas the novice hasn’t yet acquired the schemas of the expert. If working, short term memory has a limit, then instruction should be designed to reduce working memory load (cognitive load theory). When this occurs, long term memory has a better opportunity to develop change in the schematic structures. As the learner becomes more familiar with the material, it can be handled more efficiently by working memory with the goal of changes in long term memory and subsequent schema acquisition.

The *multiple representation principle* states that it is better to present an explanation in words and pictures, than in only words. When listening as well as viewing, students generated more problem solving solutions than those who listened only in subsequent new transfer questions (Mayer & Anderson, 1991, 1992). Along these lines as well is the *split-attention principle* where words should be auditory narration rather than text. If there is too much text with animation it seems to overload the information processing system. Using the audio for verbal narration places it in the verbal information

processing system (Mayer & Valdez, 2005). This reduces the potential overload of text and animation placed together. So the “show and tell” method that some many educators have used for decades seems have solid, scientific grounding.

Mayer (2009) proposed a theory of Multimedia Learning with three main assumptions:

1. There are two separate channels, one visual, and the other auditory for processing information in the mind. This is sometimes referred to as “dual-coding theory.”
2. Each channel has a finite and limited capacity for storing information.
3. Learning is an active process of filtering, organizing, selecting, and integrating and synthesizing new information based upon prior knowledge.

Also, the theory states that the brain does not interpret words, pictures, and auditory information in some mutually exclusive fashion, but they are dynamically organized to produce logical mental constructs.

Mayer proposed three main memory stores: (1) sensory-which receives stimuli for very short time periods; (2) In working memory, where we actively process information we create these mental constructs often referred to as “schema”; and (3) the last is long-term memory where we store all things learned.

Simulation

Simulation is the imitation of the operation of a real-world process or system over time.^[1] The act of simulating something first requires that a model be developed; this model represents the key characteristics or behaviors/functions of the selected physical or abstract system or process. The model represents the system itself, whereas the simulation represents the operation of the system over time (Simulation, 2016).

However, modern usage of the term "computer simulation" may encompass virtually any computer-based representation. Virtual simulations represent a specific category of simulation that utilizes simulation equipment to create a simulated world for the user. Virtual simulations allow users to interact with a virtual world (Simulation, 2016).

If you examine your personal instructional system, you know what works the best for you and what you are most comfortable with in the traditional, self-contained on the ground classroom. Your simple aim

should be to try to “simulate” what you do in the traditional classroom in the synchronous, real time, virtual classroom. If you use PowerPoint presentations, then do the same thing online, real time in the synchronous environment. If you use a white board, Smartboard, or chalk board in your instruction with students, then do the same online, virtually. If you “show and tell” as you write on the “blackboard” in your classroom, then do the same online virtually. To perform these tasks, you have to know what hardware and software is necessary. This may involve training and/or self – directed learning. Most of the top video-conferencing software companies have made the learning curve manageable for the novice user.

The Virtual Environment

Webcasting, broadcasting, video-conferencing, webinars, web conferencing, etc. are some of the terms given to audio and video content transmitted over the Internet. A connection to the Internet through an e-device (computer, laptop, tablet, Smartphone, etc.) with compatible software will allow the participants to share and interact and save their discussions, collaborations, projects, etc. This Information Communication Technology (ICT) is usually delivered to all participants at the same time...better known as *synchronous communication*. So, even though the participants are not necessarily in the same space, the information is given at the same time through the Internet. In contrast, asynchronous transmission allows participants access to the content 24 hours a day, seven days a week, *anytime, anywhere* through the Internet with various learning management systems (Blackboard™, Moodle™, etc.) In this paper I describe how the *synchronous*, real-time, modality can be used for instruction, training, and learning.

Definitions

The following definitions and terms give various components on the synchronous environment as it is presently delivered. There certainly could be multi-mode combinations that also will work, but given here are the rudiments of synchronous communication from your desktop in the home, school, office, etc.

Web Conference

The web conference is a collaborative virtual meeting hosted by a presenter and attended by participants in some of these basic configurations: one presenter-to-one participant, one-to-many or many-to-many. Participants can swap roles (active/passive) with the presenter at any time. First time users should be able to set up quickly and be technically trouble-free from their e-device.

Webinar

The webinar is a virtual one-to-many presentation. As a rule, all participants except the presenter are muted during the presentation but may give feedback via text chat. The chat is a valuable record of the discussion and questions and answers that took place during the session. Some software solutions allow users to give feedback at the end of the session. During the session desktop and screen sharing are usually used in some form. This application allows (with restrictions set by the presenter) to view, share, analyze, process, and manipulate all content on the desktop. Privacy and restricted access are concerns, such as confidential data, but you can control these for the most part with the software (Web Conferencing Evaluation Guide, 2016).

Break-out Rooms

Break – out rooms allow participants to “share” within their own virtual rooms. Software allows presenters to assign participants to rooms or with an automatic feature the participants are randomly

assigned to a room. With a grand total of 30 participants you might have six groups of five members in each group. Given a task(s) the presenter can assign duties/responsibilities to each group and let them work at the given task within their group. The presenter can monitor each group's progress virtually by going group to group. Consensus building, brain storming, and problem-based solving are greatly facilitated by this tool. After a designated period of time the presenter can bring the entire group back together (N=30 in this case) for reporting, discussion, and action. Unless all your participants have headsets (to speak and hear), it is not recommended to use the audio within each room. It may be very unproductive due to background "noise" and distortion. The chat feature is preferred within the room by the groups of participants.

Sample Procedural Overview

To carry out an online session you need to prepare properly. First, develop a simple lesson plan for the session including start-stop times (including any breaks) for the session, include the overall suggested time duration for the session. Next, include a brief topical outline of what will be covered during the session (and maybe how long on each sub-topic). If it is appropriate, state who the clientele will be for the session. Include, how they (clients, students, trainees) are to access the session, usually a hyper link supplied by the software. Next, what to do when they "click" the link, and follow the directions on the screen. If they experience problems..., what to do to try to recover and progress in the session. Lastly, an overview of your "rules of on-line etiquette" such as appropriate ways to respond, what is and what is not allowed and so forth. This web-site contains a good overview of the basics: (Netiquette, 2014, <http://blogs.onlineeducation.touro.edu/15-rules-netiquette-online-discussion-boards/>).

With the webinar format, muting all participants upon entry is a wise idea. The same goes for video unless you have a small group of five or less participants. The chat area is the main area for communication with the participants during the session; this can be with instructor-participant and/or

participant to participant. Most software chats allow for private messages as well as to “everyone.” Empirical testing has shown that the chat area is invaluable for interaction and provides a vehicle for everyone to “speak” if they so desire. The chat can be saved for future use or review of the meeting/class. However, in some venues it would be wise to obtain “consent” to be recorded from each participant (same goes for video recording).

To deliver the content of the session, you must determine beforehand what the electronic form is, for example, none (just discussion), PowerPoint (with audio narration and annotation), whiteboard (chalk-talk), and maybe streaming video (with or without narration and stop-start). They are the more commonly used sources (any combination as well) and of course there are more options. Most software provides annotation tools for the presenter, if you are going to use these tools make sure to practice with them prior to your session. Testing has revealed that simple pointing tools such as an arrow and/or highlighting icon work well together with an audio description. Along these lines is a simple low cost digital tablet which can be plugged into your USB port of a computer. For whiteboard session you might find this extremely helpful in that you can handwrite and draw using the tablet free form and in certain disciplines and applications this is critical to understanding (procedural knowledge acquisition).

Screen sharing is basically taking what is visible on your computer screen (presenter) and sharing it with your participants, this is the “one to many” application. Common sense would tell you what to share what not to share for privacy reasons, and you can turn the sharing on and off. In advanced deliveries other participants can share their screen with other participants as well, and you can give them rights to use the annotation tools if you wish. So let’s say a team is working on a project, they could annotate and discuss on the whiteboard and share their thoughts and ideas... and of course save the entire session. Streaming video is another popular share whereas you share a video presentation with your participants, for example a YouTube video. This is an advanced application which may or may not be problematic.

Sometimes screen resolution and the audio of the video may not function correctly. Over the last few years many of the companies have overcome this problem, but it can be an issue, so the key is to test first before a larger scale session is attempted.

One to One Instruction

Tutoring, training, instruction, advising, etc. sometimes requires one to one communication. When on the ground, physical face to face meeting is not possible and/or feasible; the virtual meeting space is a good choice. If you want the face to face meeting virtually, then you have audio and video via your Webcam. This adds to the overall communication, and sometimes because of distance, time, and travel this is the best alternative.

Time

The duration of the session is a large consideration. Empirical testing with feedback from participants has revealed that “about an hour” is optimum. If you need more time, then break the overall session into 45 to 50 minute blocks with a break in between each block. You might change your activities during the blocks, say first block PowerPoint and the second block a streaming video presentation. If you record your sessions, the longer your session, the more storage space needed, which might be a problem in some computer/electronic environments.

Assessment

Most instructors want to know if their instruction is effective and need to make periodic assessments of student learning. Over the last several years many “e-assessment” products have emerged on the scene, such ExamView™, TestGen™, Respondus™, etc. Depending on your need and textbooks you use in

courses or training your options maybe very limited. Over the last several years I have used Respondus™ almost exclusively. The big advantage Respondus has over other products is that exams and tests can be directly imported into course management software such as Blackboard. Respondus also has expanded coverage of many of the academic publishing companies, so there is a greater probability that you can find your discipline-textbook-Respondus match. E-assessment and testing allows for little instructor intervention (if set up properly). In concert with “chunking” and the “multimedia” principles, frequent assessment after “chunks” should not only assist in short-term memory recall, but long term memory as well. Many shorter assessments (quizzes, tests, etc.) can prepare students for more comprehensive exams such as midterm and final examinations. In these shorter assessments you can usually give feedback to the student as to wrong or correct answers, rationale for the correct answer, section in the book in which it was covered, etc. There is less test anxiety, students are “conditioned” to the testing environment and perform satisfactorily. As for academic dishonesty, you will never eliminate it totally whether in the classroom on the ground or on the computer in the home. Most testing software allows you to set up the testing conditions, such as duration of the test, number of attempts, force completion, “backtracking”, randomizing questions, etc. In my empirical testing I have found that “about one hour” is a maximum time for test or assessment online. A word of advice is to dry run the test yourself before you give it to students or trainees.

“Paperless” or electronic papers/assignments/documents are also part of my personal assessment tools. Over time you will accustom yourself to this process. Most course management software systems have some method to upload and download documents. Usually there is a central repository for the upload that a student merely “clicks” and follows the on screen directions. This is how students “pass in” their assignments. Some systems allow the grading of papers one by one, and the grade system will keep track of all student averages, grades, etc. They will also tell you if papers are late, etc. There are numerous plagiarism checkers that work well in the electronic environment and can assist you in this process (if this

is a concern). The digital process of “inking” can help as well if you like to write extensive comments on student papers. “Inking” allows you to digitally write on an electronic paper as you would on a physical pencil/pen – paper. I prefer a digital pen (such as Bamboo Company’s), but you can also use your finger if you have touch screen technology.

Delimitations

The action research model was chosen over other research methods. The virtual, online environment is dynamic, changing, and emerging. Therefore, seeking to describe, predict, and control variables (in reality) may be very difficult to achieve. Gorsky and Caspi (2009) state that their Theory of Instructional Dialogue can be quantified and operationalized, where dialogue is an independent variable and “learning outcomes” serves as a dependent variable. They go on to say that this common frame of reference with a common set of variables can be used for analyzing, designing, and evaluating both online and on the ground instructional systems. However, contrasting viewpoints claim that there exists moderator, extraneous and intervening variables (and the third variable problem) that affect any given dependent variable. For example, a mediator variable is said to explain the relationship between an independent and dependent variable. These variable types can confound the results in any given study and are not easily controlled for (initially) or sometimes are not identified.

Sampling with random assignment (or random selection in some cases) controls for initial differences to some degree; many studies do not employ any true “random” sampling methods. The researchers use *convenience samples* which may or may not be truly representative of a population one wants to generalize to, so there is sampling bias. Sample size or statistical power is rarely given mention in many studies where hypothesis testing is used, and may be a limiting factor in the results. With all this being said, action research seems to fit the synchronous, real time, virtual environment in a more effective

fashion. There is nothing wrong with quantitative and/or hypothesis testing studies, however all components should be addressed such as: sampling method(s), sample size, rationale for the research design, instrument(s) validity and reliability estimates, the scope and limitations of the study, rationale for statistical treatment of data, and careful control and selection of all variables contained in the study. The (APA, 2009, p.33) has recommended that “estimates of effect sizes and confidence intervals are the minimum expectations for all APA journals.” However, they go on to state that null hypothesis and significance testing are a controversial issues.

Recommendations for Further Research

Moving from action research to another research method which might be appropriate for the real time synchronous environment is the case study method. Yin (2003) states that case studies can be single or multiple; they can be exploratory, descriptive, or explanatory (causal). Single case studies focus on a single case only whereas a multiple case study focuses on two or more case studies within the same study. The cases should be selected so they replicate each other, either predicting similar results (literal replication) or contrasting results for predictable reasons (theoretical replication). The exploratory case study might be a vehicle to start research with online, virtual classrooms. Whether you use a single or multiple case study approach, Yin (2003, p.5) states “the exploratory case study is aimed at defining questions and hypotheses for a subsequent study (not necessarily a case study) or to determine the feasibility of desired research procedures.” Similar classes replicating your own approaches in the online virtual environment might pave the way for different research methods and greater understanding.

Conclusions

The virtual, real time, synchronous environment offers great opportunities for new frontiers in learning. With a sound and reliable Internet connection with appropriate software you can transform your teaching

and instruction. Creating instructional dialogue and structure would provide a solid foundation. Use of multimedia principles in the design of your virtual classroom and lessons would be advantageous as well. Test your simulated classroom with one or two trusted students first and get their impressions and feedback (pilot test). Next try one or two sessions with a larger group and once again get their impressions and criticisms. Take action from the feedback and revise as needed (see Appendix A). With any technology it is not foolproof and there might be technical difficulties, plan a backup procedure or process for immediate implementation if needed. This medium has the advantages of no travel, no traffic, no physical classroom (if desired), bad weather alternatives, illness and sickness alternatives, and so on. In the near future (2020 or before), 5G mobile cellular service is promised to become available with projected speeds up to 200 times faster than the 4G LTE (4th Generation, Long Term Evolution). Advanced printing and holographic imaging might become a reality with these new speeds of data transfer. Who knows..., instructors might be a 3-D holographic image?

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Appendix A

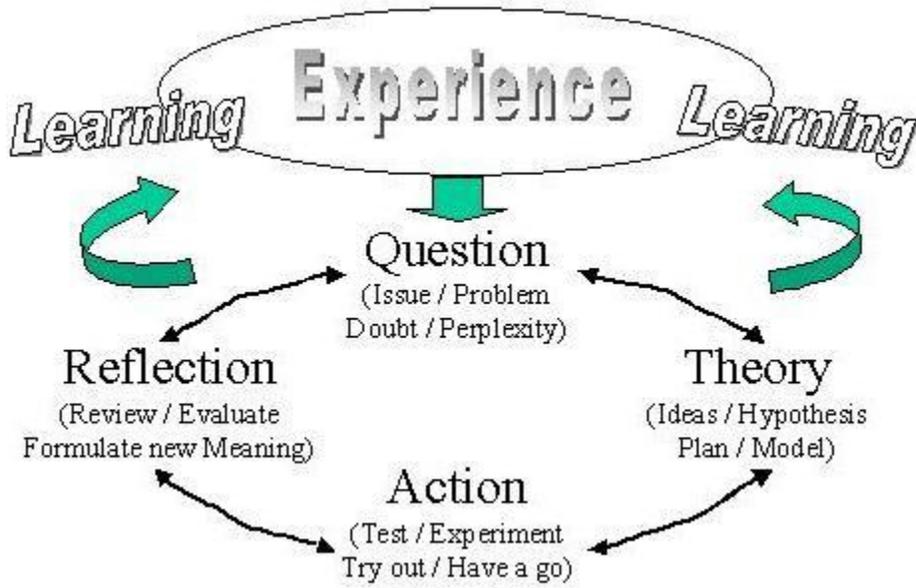


Figure 2. The Action - Research-Experimentation Cycle, source: Internet, unknown author, n.d.

Figure 2 displays the overall model used to guide the action research.