Best Practices for Using Online Interactive Whiteboards

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DOI:10.59668/806.12877

Technology Online Interactions

Online collaboration tools have become a practical addition to the resources available to navigate the virtual space. Visual collaboration platforms, such as Miro, Mural, and Lucid chart, solve time and space restrictions applicable to traditional in-person group collaboration by providing a mechanism for real-time interaction without geographic limitations. This article provides five best practices for effectively utilizing interactive online whiteboards in real-world, practical applications from the perspective of an instructor-instructional designer, instructor-facilitator, researcher, mentor, and EdD program coordinator. The common themes woven throughout these best practices are collaboration and connectivity, facilitated by the functionality of online whiteboard tools/applications.

Introduction

In the 1990s, Xerox PARC's efforts to create the office of the future resulted in a new innovation: the online whiteboard (Mosina, 2019). Today's interactive online whiteboards have evolved significantly beyond Xerox PARC's original digital invention. Online whiteboards are user-manipulatable whiteboard displays that can be edited physically (i.e., a touchscreen or stylus) or digitally (i.e., the computer or attached keypad). The online whiteboard's primary classroom and online use relates to the user's ability to collaboratively view, edit, and interact with the technology (Cogill, 2002). While the interactive whiteboard and the idea of a graphical user interface originated in the 1970s, its recent use was accelerated by the 2019 COVID-19 pandemic, which required schools, universities, and businesses to utilize online learning and collaboration in unprecedented ways (Liang, 2020). More content had to be delivered in the virtual space. Active learning activities, problem-solving, debate, collaborative exercises, peer-to-peer learning activities, and instructor-led cooperative learning projects occur in the face-to-face classroom. Online whiteboards can assist with this type of instruction and help facilitate these activities in the online environment. Students can experience this interactive classroom in courses that are delivered online. The interactive whiteboard adds the ability for user interactions, collaborative discussions, and interactive guidance by instructors (Akçayır, G. & Akçayır, M., 2018).

The corporate use of whiteboards and the collaborative/collective use of whiteboard technology are not new. In the 1920s, Walt Disney had a novel idea about posting thoughts, ideas, sequential events, and other project-related data onto a wall called a storyboard. The Disney storyboard became a segue into a project-planning process that is now widely accepted to work through design processes, such as instructional design and software development (Rossberg

& Olausson, 2012). Planning, organization, communication, and idea boards have been brought into the digital world as online whiteboards. The online whiteboard platform has become valuable for educational and project-design practitioners, as well. The demand for remote learning tools has accelerated corporate and classroom use of interactive whiteboard technology during the COVID-19 pandemic (Liang, 2020).

As a university instructional design and technology professor, I use online whiteboard technology in various ways. Teaching in a 100% online program at the bachelor's, master's, and doctorate levels and serving in various roles, including instructional designer, researcher, instructor, mentor, and program coordinator, provides opportunities to view the online whiteboards through various lenses. The instructional designer and instructor role requires creating courses and teaching instructional design. As a researcher, I conduct academic research on performance improvement through instructional and non-instructional interventions. In a mentoring capacity, I work directly with doctoral students as the chair or member of their dissertation committee, guide students at all levels through their academic program, counsel students in career opportunities, and encourage participation in professional organizations. In all of these roles, the expectation and responsibility is to remain versed in current and emerging technology. One of these areas is using online whiteboards or web-based diagramming and collaborating technology.

Using Online Whiteboards for Collaboration

Online whiteboards are increasingly used in teaching and learning in the online environment. While initially intended for an in-person setting, Disney used the tool for collaboration in the context of a storyboard (Rossberg & Olausson, 2012). The original Xerox PARC concept was a digital whiteboard used in the office space to enhance the corporate environment, such as the corporate boardroom (Mosina, 2019). Digital whiteboards are used in face-to-face classrooms, corporate training rooms, and meeting areas. As the internet and the online environment have become part of our daily lives, tools and technology have been developed to maximize the utilization of this space. Visually displaying and collaborating on ideas in the face-to-face workplace is now possible in the virtual space through web-based diagramming applications.

Many types of collaboration tools exist in the online environment. The MIT-based Terrascope Learning Community developed a Field Guide to Online Collaboration Tools to identify and describe various online collaboration tools. (Allison et al., 2020). Tools include the online whiteboard, audio-video communication tools (which contain some elements of online whiteboards), task management tools, and classroom experience tools. This interactive software platform allows user interaction in various ways from a remote location. This article focuses on utilizing the online whiteboard to enhance collaboration, learning, and performance.

Online whiteboards can be an effective tool for students to collaborate, communicate, and engage with classmates and instructors (Campbell et al., 2019). In reviewing four areas of student engagement (motivation, transaction, institutional support, and active citizenship), Zepke & Leach (2010) define ten proposed actions to enhance student engagement. These ten actions are incorporated into online whiteboards in the following ways:

1. Ownership - Allow student ownership of learning through self-pacing; each student can control contributions and actual interactions;
2. Autonomy - Not always confined to a specific time frame or classroom context. Each student may work autonomously and interactively, at their discretion and preferred pace;
3. Instructor Engagement - Allow instructors to engage with students authentically through the online environment;
4. Active Learning – These are, by nature, designed for creative interaction.
5. Enriching Experience - Allow the ability to connect multiple interactive platforms to the learning process;
6. Cultural Connectivity - Enhance the nature of institutional and student cultural differences by being available to anyone with access to the Internet;
7. Support Services - Allow support services (i.e., syllabi, rubrics, institutional support services, etc.) to be accessible from the Online whiteboard platform;
8. Adaptation to Changes - Enable students, instructors, and institutions to adapt to changes in the educational environment, as well-demonstrated during the COVID-19 pandemic (Liang, 2020);
9. Citizenship in the Online Environment - Invite each student to become an active "citizen" of the learning community; and
10. Development of Cultural Capital - Enable each learner to develop "cultural capital" within their learning group.

Collaboration using online whiteboards promotes design-thinking and creative strategies in developing courses. Online whiteboards provide a context for the creative structuring of multiple elements through four critical skills needed in the design process: critical thinking, communication, collaboration, and creativity (National Education Association [NEA], 2012). Additionally, online whiteboards:

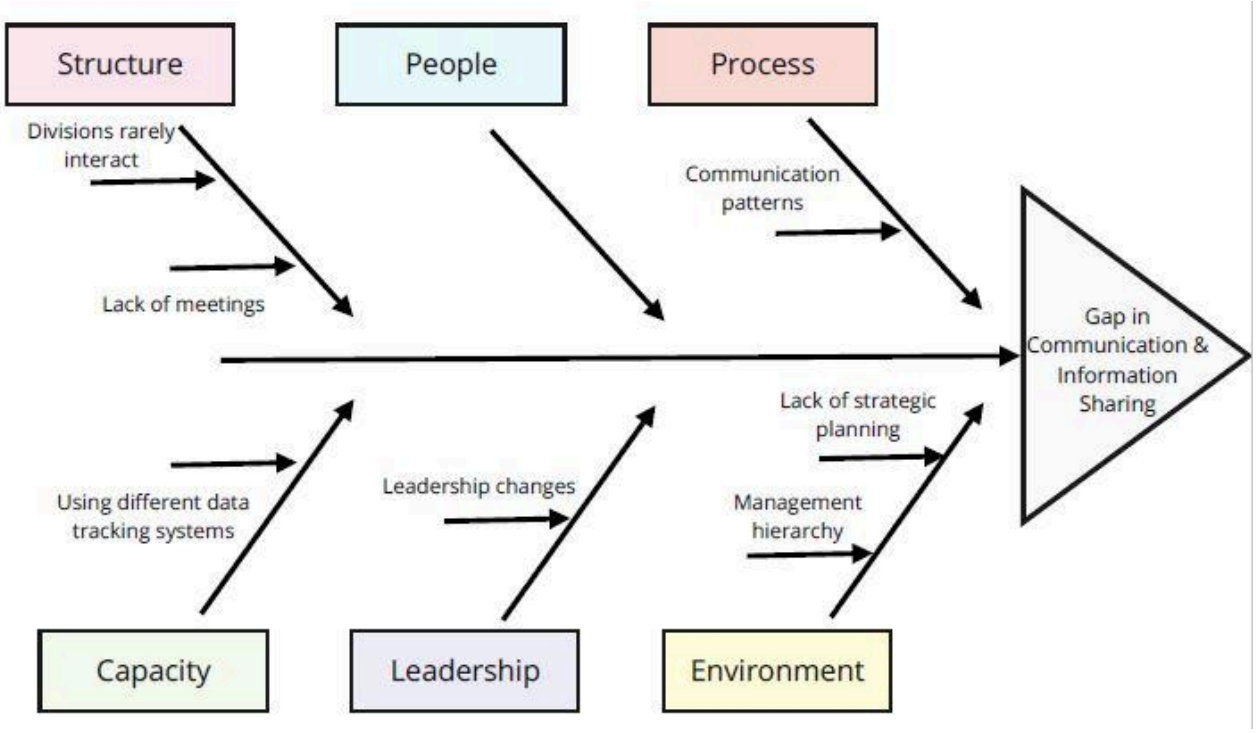
1. Present opportunities for visualization of content;
2. Allow learners to construct meaning from content jointly;
3. Reduce the transactional distance (Moore, 1993) between the learner, the instructor, and other learners within the online setting because the instructor can actively engage the student(s) either in real-time or as an exchange with students; and
4. Enhance instructor authenticity because the platform allows a synchronous setting for all parties to meet and provides an opportunity for intentional interaction, often lost in the online environment.

In the collaborative environment, online whiteboards offer individual and corporate spaces where students, instructors, and collaborators can interact and work. Each participant in the whiteboard platform has the ability to use templates, create content, bring in resources, comment, and join the work or study effort. Contributions can be shared, restricted, or kept confidential using privacy and security elements built into the whiteboard. The versatility of the online whiteboards allows individual and corporate spaces where students, instructors, and collaborators can interact and work.

The design-functionality of the whiteboard allows synchronous or asynchronous interaction in which users can control their whiteboard environment. Participants may personalize selections to construct the setting that works for their individual application. For example, a fishbone diagram can be used to identify the root cause of a performance problem. The online platform contains customizable templates such as the fishbone diagram. In this instance, a student posted a fishbone diagram to visualize and present this phase of her performance improvement project (Figure 1). Posting the fishbone diagram on the online whiteboard was one way the student, stakeholders, and instructor could collaborate on the project synchronously and asynchronously.

Figure 1

Fishbone diagram



Lauren's Fishbone Diagram created from a template

Most online whiteboard platforms can be used for scheduling, designing, and organizing. Scheduling, task-tracking, and people/project management can be presented visually and manipulated collaboratively. The scheduling tool can be used by an individual tracking a project or group to track a project. For designing, the online whiteboard can be used to generate user-created artwork, including drawings. The ability to use this artwork functions similarly to word-processing applications. Shapes and graphics can be combined with diagrams, flow charts, scheduling, and other project-management functions. The online whiteboard platform is a catalyst for user creativity. Several online whiteboard platforms allow handwriting, but only if supported by the input device. When using the online whiteboard for organizing, attaching files is an integral capability and a valuable part of the online whiteboard. Audio, video, and other media files can be embedded into the whiteboard workspace. Books, PDFs, presentations (such as PowerPoint), side notes, and links to multiple file types are permitted in most online whiteboards.

Online whiteboards were intentionally created for individual and collective brainstorming (Rossberg & Olausson, 2012). Using whiteboards has historically been done in person, but now the online whiteboard has shirted this activity to the digital realm, enabling multiple users to engage in synchronous and asynchronous interactions. As a result, online whiteboards have emerged as a highly effective tool for collaboration. The process of utilizing whiteboards traditionally occurred in a face-to-face environment. The online whiteboard moved from the face-to-face to the online context, allowing multiple users to interact synchronously and asynchronously. Thus, online whiteboards have become a powerful collaborative tool.

Multiple Applications

The versatile online whiteboard has become valuable and usable in many applications. Sobko et al. (2019) observed that students involved in the whiteboard environment were motivated and encouraged by the platform's various uses,

resources, and options. In addition, the online whiteboard tools provide avenues to authentic learning and promote student engagement in the learning process (Reguera & Lopez, 2021). Online whiteboard platforms have capabilities that can help connection, collaboration, and communication in several ways:

1. The learner and the instructor can regulate/monitor the pace of learning in real time;
2. Various materials and platforms can be utilized in the online whiteboard environment, adding to the versatility of distance learning;
3. Most online whiteboard platforms allow personalized/creative input by allowing drawing and handwriting;
4. Online whiteboard platforms can integrate other interactive platforms, such as Zoom, enabling the instructor to augment lecture-by-video with additional interactive tools;
5. User interaction can be monitored in real-time by the instructor; therefore, the student is encouraged and motivated to participate in the online whiteboard process;
6. Availability and accessibility are part of online whiteboard design; the user or institution can enhance these attributes; and
7. Since online whiteboards are visual and computer-based, they are not limited to virtual environments. They can be utilized in hybrid classroom settings where students, remote learners/presenters, and an in-class instructor interact with each other.

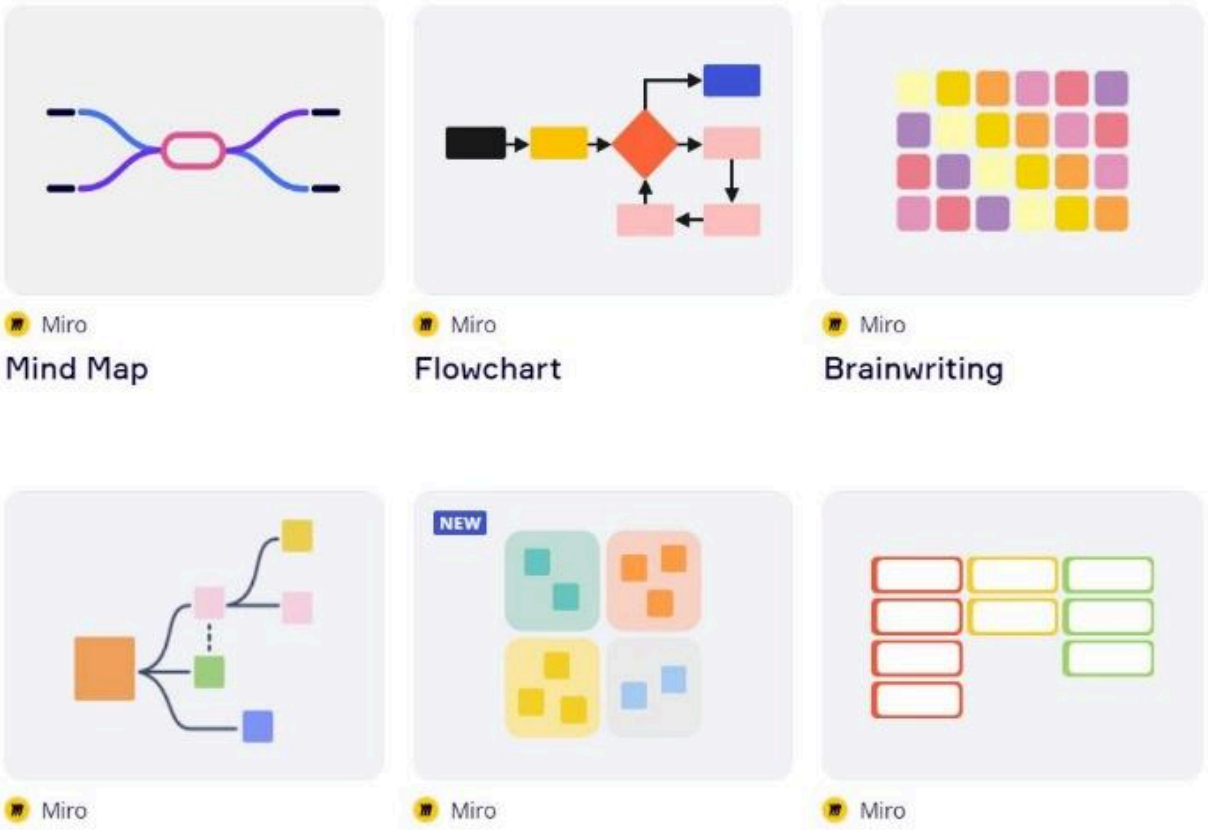
Instructional design can be enhanced by the online whiteboard's visual, collaborative, and holistic nature. The entire course, as well as its components, can be viewed simultaneously on this platform. This design process can occur by utilizing online whiteboards as an organizational tool to facilitate interaction with other designers. Several examples of how students, instructors, and online templates expand creativity and effectiveness in education are provided in this article. As my students have immersed themselves in the online whiteboard, they have learned ways to use these tools to enhance their knowledge and present their work. Ideally, the online whiteboard tool can become instructional by using multiple interactive options in the course plan.

For this paper, I will focus on a specific experience with one of the online whiteboard tools, Miro. Various online whiteboard tools are available. Such tools include Miro, Mural, Limnu, Stormboard, Lucidcharts, and Padlet. In the Field Guide to Online Collaboration (Allison et al., 2020), Miro is described as an online whiteboard that allows simultaneous user interaction, free-hand drawing, linking documents and videos, instantaneous messaging, tagging people and ideas, and assigning tasks. When incorporating online whiteboards into my courses and in other roles as faculty, I tested several different platforms. Miro became my whiteboard of choice because of the various tools associated with Miro, the variety of templates, accessibility features, and friendliness for first-time users. Another reason for choosing Miro is customer support. Obtaining an educational trial with Miro was seamless as well as the ongoing technical support for me and my students. When comparing online whiteboards, the other platforms have similar features and functions; therefore, when learning to use online whiteboards, learning one platform translates to the other applications.

Some templates available in the Miro online whiteboard environment are shown below (Figure 2). Each design is usable in an "infinite" whiteboard in which PDFs, word-processing documents, textbooks, spreadsheets, links to videos, connections to social media, discussion boards, online communication platforms such as zoom, and many other possibilities exist.

Figure 2

Miro Templates (samples)



These images are reproduced from Miro (2023). Miro online whiteboard (no version provided). RealTimeBoard, Inc. www.miro.com.

Interactive online whiteboards have unlimited space with which to work. If you can dream it, you can represent it on the online whiteboard. For instructors and students, using online whiteboards can be profoundly positive. These platforms can be productive for all participants in learning environments, including instructional designers, instructors, researchers, mentors, and program coordinators.

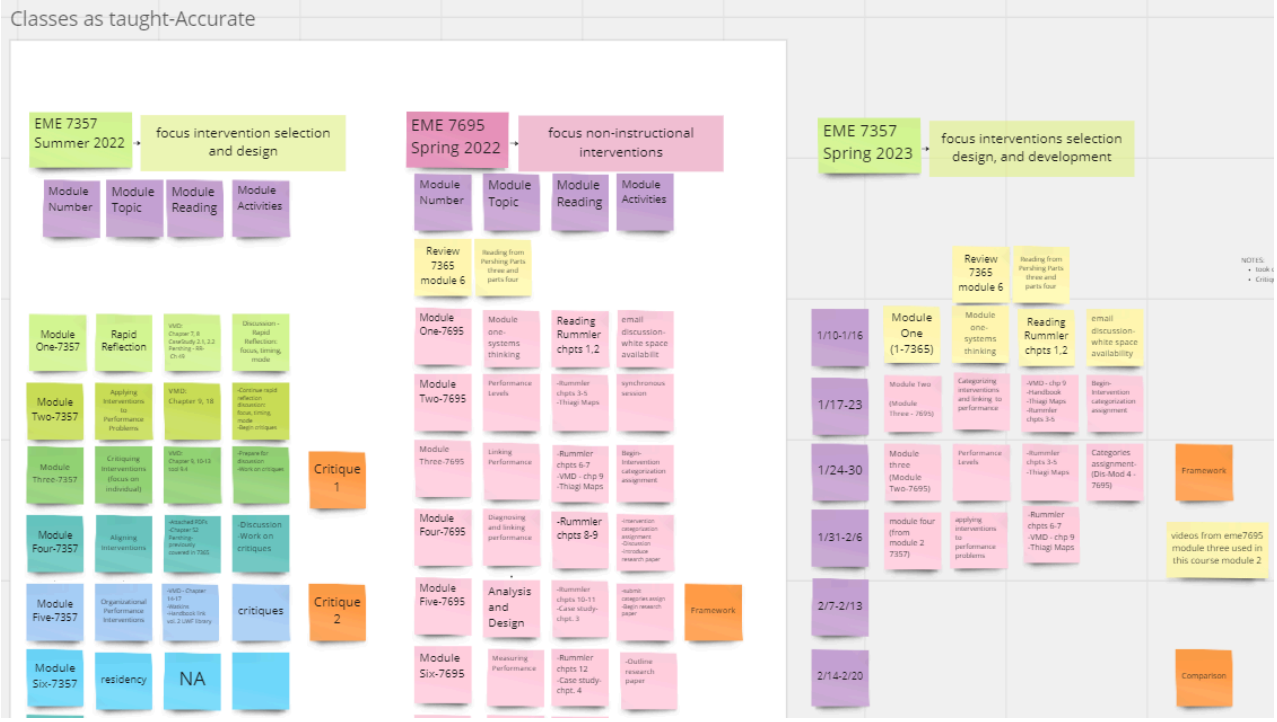
Instructional Designer

Online whiteboards are natural tools for the instructional designer. The basic idea of online whiteboards evolved from storyboarding and in-office collaborative design. The instructional designer is taught to think in design terms (Rossberg & Olausson, 2012). Rossberg & Olausson (2012) describe the design process as using abduction (producing the idea), deduction (assessing the result of the idea), and induction (teasing and producing the idea). Designers use online whiteboards to design courses and instruction to connect the student and instructor with the content being taught (Johansson-Sköldberg et al., 2013).

As an instructor, I use online whiteboards in course design and development. The design concept for the course can be displayed visually from the beginning of course development to the end product. Course maps can be visually displayed on the online whiteboard design space (Baran, 2010). Course, module, and student-level outcomes can be viewed holistically and individually. The designer can see and edit on one platform a course overview, the activities for each module, due dates, assignments, discussion topics, and assessment activities. Figure 3 shows an example of course planning along with a course redesign.

Figure 3

Sample Course Redesign Plan



The online whiteboard can be used to manage course content and structure effectively. It enables the simultaneous viewing of all or specific parts of the course content, allowing for logical modifications that align with the course objectives. This intentional approach to structuring and managing content promotes student engagement in online learning (Reguera & Lopez, 2021). By utilizing the organizational features of the online whiteboard, courses can be structured in a way that ensures students have a clear understanding of the materials to be learned, participation requirements, available resources, methods of communication for questions, assignments, and participation, as well as other relevant course guidelines. Overall, the use of the online whiteboard as an organizational tool offers a cohesive and easily comprehensible learning experience.

Educators seek methods to utilize time, energy, creativity, and collaboration more effectively within the course design process. The use, dissemination, presentation, sharing, and exchange of information have become vital to the educational process at all levels (Sobko et al., 2019). The structuring and logical organization of resources help facilitate course design that is engaging, creative, and open/adaptable to new technologies. Online whiteboards are an innovative tool to allow students and instructors access to the information for each course or degree program.

When designing courses, designers collect resources from sources including YouTube, the institution's online library, Google Scholar, personal and other images, and recorded audio and video materials. The list of available tools is only limited by the designer's time, experience, or expertise. While organizing and structuring these materials into the course content is challenging, applying available tools (e.g., Zoom, Google Meet, YouTube, Canvas, Google Classroom, and Blackboard) can provide a clear structure for learning (Reguera & Lopez, 2021). Multiple platforms can be integrated in the design process and the online classroom when integrating online whiteboards.

The online whiteboard can be utilized to map and design each course. Syllabus-related information is posted to ensure alignment with the course description and college requirements. Resources needed to create the learning environment are collected and posted on the online whiteboard. These resources can include audio, video, articles, pictures, conference presentations, and expert presentations. Necessary textbook excerpts relevant to a particular course module are posted or linked to the online whiteboard. Expected participation requirements and outcomes are listed, and due dates are provided. Recorded modules are created at course inception or during the semester, allowing each

module to reflect a real-time picture of student needs and instructor requirements. New resource material and content can be added, modified, or deleted in real time. All of this enhances the flexibility of the learning process (Gladys, 2022).

During each semester, materials can be introduced to the online whiteboard platform individually or in a collaborative setting. Discussions, social media connections, and individual student communications can happen at arranged intervals. Zoom sessions (or other face-to-face interactions) can be arranged/scheduled. Synchronous or asynchronous feedback can be provided either publicly or privately. Course materials can be created and posted within a module or with the ability to view the course as a whole. Liang (2020) refers to this flexibility as the diversification of communication. Other instructors, instructional designers, or additional subject-matter experts can be invited to review and improve course design and content during the course-creation process.

Since many online whiteboards are infinite, the module, comments about what does or does not work, and materials that will allow the course to be improved can be kept for any designer who will work on the course in the future. The lead instructor can share the online whiteboard with future instructors or designers, allowing access to each course iteration over time. Changes can be made according to the abilities and preferences of that instructor.

Instructor-Facilitator

One exciting application for using online whiteboards is facilitating and creating discussion groups. Within the online whiteboard, discussions related to various topic areas can be created. These can be real-time in a group setting or allow students to participate at their own pace. The online whiteboard enables multiple types of discussions to be created as separate rooms or boxes within the online whiteboard. Students can post and respond to available discussions, and the instructor can interact directly with the discussion. Text and video can be posted simultaneously, and live discussions can happen via video-conferencing platforms within the online whiteboard.

The visual organization of the workspace can create direct engagement with instructors and between students, classmates, and guest instructors. This can enhance learning and improve participation by graduate-level students taking courses while working in their chosen profession, for example. Such students can engage in the learning process quickly, effectively, and within their time constraints (Poston, 2020).

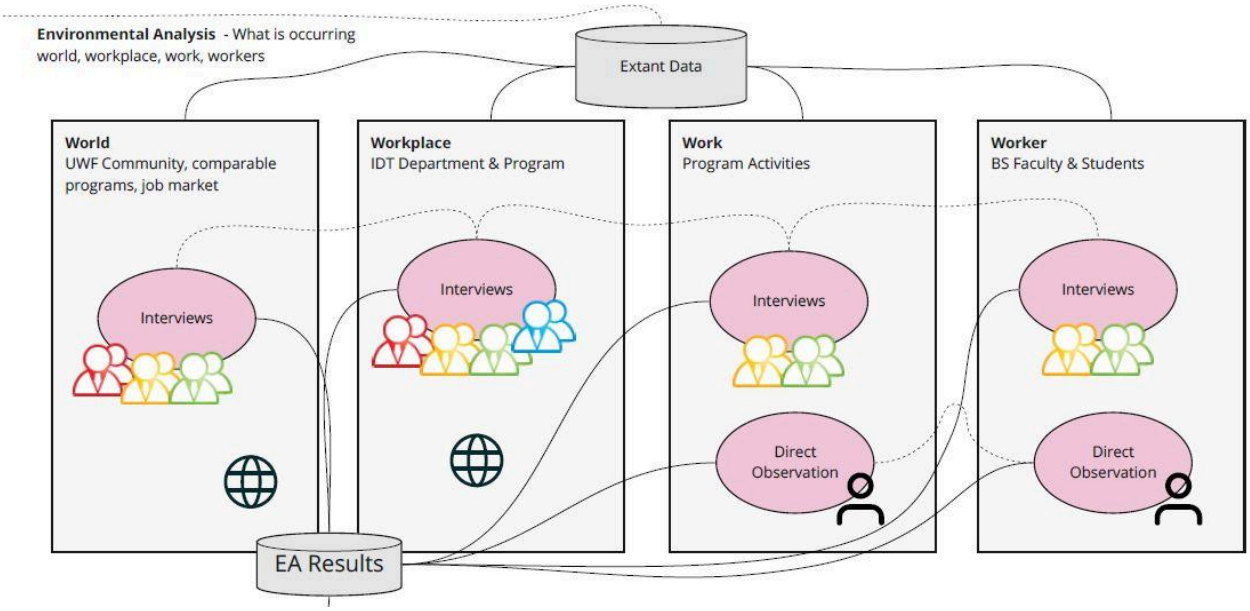
There is an enhanced learning authenticity for students since the online whiteboard allows students to respond in real time with questions, comments, or other related interactions. The instructor can be responsive to students as they desire in an online whiteboard environment. For instructors that teach 100% online, this added connective authenticity brings the instructor/facilitator closer to each student and each student's educational needs. Because of this connectivity, online whiteboards are a way to create/nurture community and instructor responsiveness. The online whiteboard is a bridge between the isolation of the online environment and the community of learning desired by the institution. This is important to online teachers/learners since student isolation contributes to student attrition (Stone & Springer, 2019).

Students use the online whiteboard in various collaborative ways. Materials posted by the instructor can be viewed, read, and engaged with or without comment. Student groups can meet and work in connection with other students. A student can set up collaborative sessions with the instructor that allow interaction and instruction.

One way the online whiteboard has improved the online classroom is by creating enhanced collaborative classroom space. Online instructors are equipped with varied and differing levels of knowledge of online tools, platforms, and the digital environment. Students bring varying skill sets and abilities into the classroom as well. Online instructors have observed students becoming experienced, creative, and adept at many online whiteboard online tools. This collaborative classroom results in the instructor learning new applications, tools, and techniques from students and students learning from each other. In a sense, the expert becomes the student. A beautifully presented and creatively designed project allows the teacher and other students to learn from each other and discover new ways to visualize a complex process. Figure 4 shows one student's visualization of an environmental analysis following the Human Performance Technology model (HPT) (Van Tiem et al., 2012).

Figure 4

Johnny's Environmental Analysis



As an instructor, it was exciting to see this phase of a complex process presented in such a visual, logical, and creative way. This lens (as viewed by the students) became a way to present the components of the HPT model in a different way that appealed to many of the other students in the class. Both students and their instructors learned something new. Exceptionally creative students can enhance teachers' proficiency, innovation, and effectiveness in the online whiteboard atmosphere. While this reversal of the student-instructor relationship was unexpected, it brings the educational process full circle.

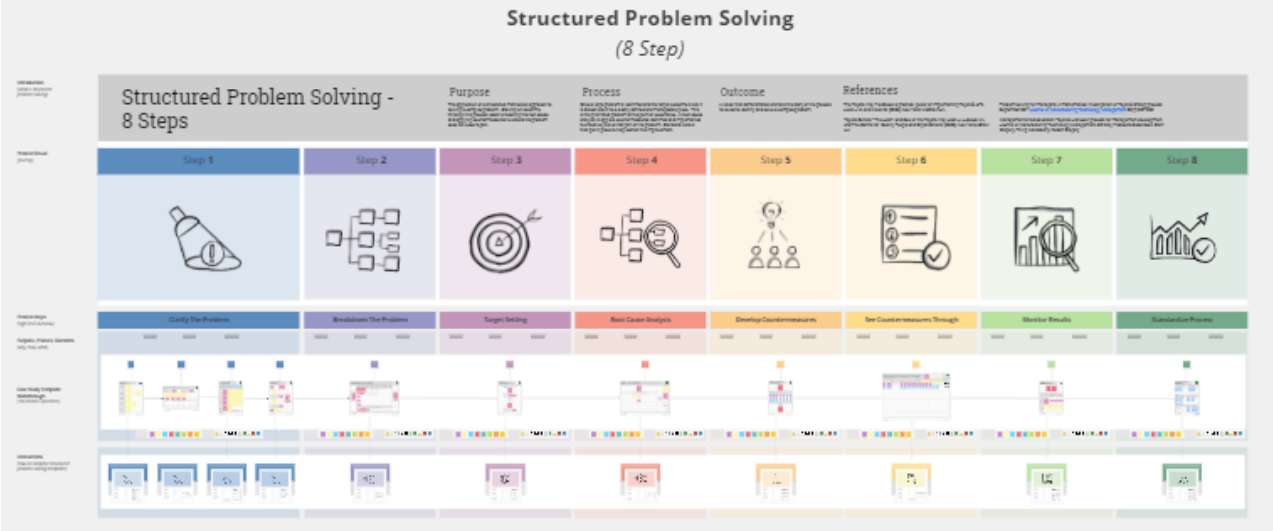
Researcher

Whiteboards are effective and powerful research tools, especially in collaborative research. Research projects and research-related writing can be outlined, planned, scheduled, and monitored on a single online whiteboard platform. One distinct advantage is that the researcher can place the entire research project on one online "wall," allowing the project to be viewed and reviewed in its entirety. The alignment of materials, references, methodology, and conclusions can be mapped out for a consistent and logical process. This complete view improves riffling through papers, articles, data tables, and references.

One student's research approach is depicted below (Figure 5). Her performance improvement research project involved many phases and processes, as depicted on her Miro board. This visual representation allowed her to interact with her stakeholders and proceed through the convoluted research process with structure and organization.

Figure 5

Lauren's Structured Problem Solving



Also, research is kept on track because of the global view of the entire project. The problem or hypothesis is always before the individual or team. The literature review is part of the whiteboard, making it accessible to the individual or team conducting the research. Data collection tools, methodologies, and researcher comments all become part of the mural of the research project. The use of online whiteboards in the team research capacity is being applied in various projects. Because agricultural systems have become precision-oriented in viewing weather, climate change, and resource availability, the industry has chosen the Map Whiteboard as a collaborative research tool (Charvat, 2022). The agricultural application is directly applicable to other research possibilities. Each step in the research process can be posted and reviewed in the context of the overall project. In the case of academic research projects that are part of a post-graduate degree program, required rubrics are embedded in the whiteboard so that the researcher/student is assured they have checked the required boxes. Peer review, editing, and other tools used to maintain research consistency are available for review, making the review process effective and efficient. Edits are passed back and forth, and multiple editing/word-processing tools can be housed simultaneously.

Progression of the work is tracked and scheduled through whiteboard tools. Deadlines, time management, data tables, individual assignments, and other process-related tools are integrated into the platform allowing visual monitoring of the research process. Using the whiteboard means fewer opportunities to let project pieces “slip through the cracks.”

Finally, data collection can be facilitated through online whiteboards. For example, focus groups can be assembled on Zoom. During the Zoom session, notes and ideas can be simultaneously collected, discussed, and organized on the online whiteboard. The ideas captured during the focus group can be validated simultaneously as notes and comments are captured within the online whiteboard.

Mentor

The value of mentoring as a teaching tool is demonstrated by research (Kraiger, 2022). Mullen & Klimaitis (2019) define modern mentoring as a personal and professional relationship that enhances the education process and builds student confidence. In an online context, e-mentoring is the norm. Office hours and instructor availability are expanded. Because a mentor must authentically connect to the student in a way that allows the student to learn better, faculty must adapt and thrive in the current online environment and strive to create an atmosphere as effective as in-person mentoring (Mullen & Klimaitis, 2019, p.10).

As a mentor, online whiteboards allow a myriad of possibilities. The online whiteboard is a platform to introduce audio, video, internet links, readings, and instructional material worldwide. The mentor and the mentee can interactively converse online in a hybrid environment (such as using the whiteboard inside an in-person mentoring session) and simultaneously respond to posted materials.

The online whiteboard environment is beneficial in a setting such as a doctoral program. The doctoral student must balance several rigorous tasks simultaneously. In a study of over 50,000 Ph.D. students from various disciplines, the 10-year completion rates ranged from 49% to 64% based on the area of study (Young et al., 2019). The two primary reasons driving the non-completion of doctoral degrees are the teaching institution's lack of training/programming/mentoring and a student's lack of understanding of the doctoral process.

While using an online whiteboard is not a panacea that addresses all aspects of doctoral non-completion, the whiteboard presents a valuable tool to help postgraduate students. Lack of mentoring and advising directly contributes to doctoral non-completion (Young et al., 2019). The whiteboard can be a powerful mentoring tool. Both transactional distance and authenticity can be enhanced by using the synchronous and interactive tools of the online whiteboard.

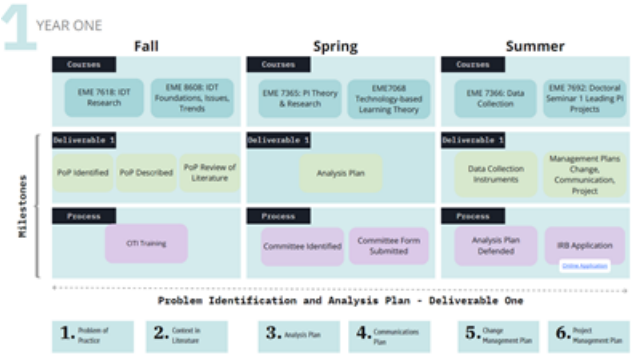
In addition to providing a structure for visually representing the degree program, the platform can be utilized to provide links to recourses supporting a student's mental health. Third-party resources can be introduced into the online whiteboard environment. Available resources include contacts with professional counselors or other valuable experts.

EdD Program Coordinator/Instructor

In addition to addressing individual student needs, online whiteboards can be used at the program level. The entire degree program can be organized and presented on the online whiteboard platform, improving communication and reducing unanswered questions. The institution can place rubrics and requirements in a single place to be viewed, processed, questioned, and assimilated. Rubrics and other requirements can be placed on a student's personal or course-related whiteboard. The student can notate for their understanding or post questions about the requirements or the rubrics. An example of this plan is provided in Figure 6.

Figure 6

EDD Program Overview



In completing doctoral work, structure, organization, scheduling, and planning are all essential to student success. Doctoral timelines can be placed in a document that can be seen as one unit, not many isolated units. Checklists, review requirements, required permission documents, and resource lists (and associated links) can be posted on the online whiteboard.

One of the factors affecting doctoral non-completion is the perception of isolation (Young et al., 2019). online whiteboards can foster interactive connections for students to interact with other students, instructors, and administrators. These connections can help reduce the transactional distance (Moore, 1993) students may experience. In addition to providing support to the student through networking, the online whiteboard can become an avenue for connecting the student to mental health resources offered by the institution.

While the above tools are ways the institution can bring information, requirements, rubrics, and other helpful information to the student, online whiteboards, by nature, are a two-way street. The student has an avenue to ask questions and

interact with various individuals. The student can connect with advising/counseling and gain management and control over a program that is, in fact, the education for which they are paying.

In addition to the macro-uses of whiteboards, whiteboards are also beneficial at the micro level. Students are currently utilizing online whiteboards to:

1. Manage performance improvement projects;
2. Facilitate and implement projects through online whiteboard mapping, planning, scheduling, and project management;
3. Design workflow processes that utilize the platform's project management templates and tools;
4. Design, organize, and present complex materials in collaboration with other students and professional organizations;
5. Present instructor-facilitated discussion boards; and
6. Organize and conduct research, for example, facilitating focus groups.

To elaborate on the first bullet point, the online whiteboard helps facilitate the coordination and collaboration between doctoral students and their doctoral committee members. The International Society of Performance Improvement (ISPI) Human Performance Technology model (Van Tiem et al., 2012) is the methodology used as the structure for the doctorate in Instructional Design and Technology at this regional comprehensive university in the southeast. The IDT doctorate is an educational doctorate based on performance improvement. Students utilize the performance improvement model to guide the process of performance analysis, gap analysis, cause analysis, solution selection, design, and implementation and evaluation phases.

Change management permeates this entire process. Students and committee members visually see the representation of the overall structure and the plan for the analysis phase. Students can visually present their analysis plan and invite committee members to the shared space. Committee members consist of university faculty and individuals within the student's workplace. The individuals serving on the student's committee are subject-matter experts. Since the EdD program is online and most students are not local to the university, meetings are conducted mostly through online platforms. Brainstorming, collaboration, reporting, and feedback can occur in the shared online space. Visual collaboration within the online whiteboard can occur simultaneously while participating in online meetings such as Zoom. Individuals access the online whiteboard and join in the Zoom session synchronously. The committee can discuss the plan and give feedback in real time.

The performance, gap, and cause analysis can also occur within this collaborative space as the project continues through the performance improvement process. Templates used during these phases are available on the online whiteboard. Tools commonly used in performance analysis projects are available on the online whiteboard, including fishbone diagrams, SWOT analysis, flow diagrams, mapping and diagramming, customer touchpoints, 2X2 matrix, Johari windows, and project organizational charts. Students can collaborate within the online whiteboard space for project and change management as they design, develop, and create their implementation plans. Students may use project and change-management custom-designed frameworks or templates available on the online whiteboard, including Fibonacci scales, outcome mapping, Kanbans, and Gantt charts. They can collaborate with their committee members synchronously and asynchronously to define the work breakdown structure and proposed changes. The shared online whiteboard can be accessed at the committee's leisure for review and comments.

Limitations

While these web-based digital visualization applications have developed as innovations in response to environmental demands, they have limitations. Even with the simplest of online whiteboards, a learning curve exists. Depending on the

user's background, the learning curve may differ for different users. The effectiveness of collaboration is dependent on the team's ability to use the platform and work in that space. Using online whiteboards may require training. Online whiteboards can be used in the face-to-face environment but are designed to be used in the virtual space. While the whiteboard platforms have infinite visual space, these platforms can have limitations with file sizes and types. The platforms offer free versions, but for maximum functionality, most platforms charge a usage fee.

Conclusion

Many shareholders use online whiteboards in the educational process: instructors, students, instructional designers, administrators, researchers, mentors, and doctoral students. Students and administrators benefit from efficient and effective tools for holistically displaying educational resources and processes. If the student understands the educational process, all academic shareholders benefit. Seeing this process in a holistic view through the online whiteboard brings clarity.

In the potentially isolating environment of online instruction, online whiteboards can offer instructors and students ways to become more interactive and, thereby, more authentic. Online whiteboards allow multiple user interaction methods, reducing the transactional distance between students and instructors. Since isolation is a defined negative to the online learning process, Online whiteboards improve this aspect of the online teaching/learning environment (Stone & Springer, 2019).

Online whiteboards, being visual, enable the user to view and integrate multiple resource types (i.e., audio, video, PDFs, live, recorded, virtual in-person [for example, Zoom], interactive meetings, etc.) on one platform and in a user-accessible format. The online whiteboard platform is an open canvas for presenting accessible material in multiple ways. Tools that organize and structure complexity have value in the complex world of online education. Bound only by the user's imagination, whiteboards thrive on complexity. Online whiteboard platforms are designed and structured to organize this complexity.

Another exciting corollary when using online whiteboards is the student and instructor learning and growing within these platforms. In any profession, there is a limited ability to know all there is to know. In this age of rapidly developing technology and the exponential development of innovative methods, exploring new learning tools such as online whiteboards, can be a rewarding experience. Active knowledge-sharing and group dynamics facilitated by the online whiteboard platform can develop under the instructor's view. Each learning community will learn and expand the online whiteboard together, adding to the sense of culture and community. As discoveries are made, and the platform developer creates new additions and shares new applications, the collaboration and sharing of knowledge reach both student and instructor and the educational process comes full circle.

Disclaimer/Conflicts Statement

The author certifies that she has no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject or materials discussed in this manuscript.

Acknowledgments

I am profoundly grateful and would like to express my deepest appreciation to Johnny Fortune for his exceptional inspiration and expertise in the realm of online whiteboarding. His contributions have had a significant impact on various aspects of my role as a university professor, as well as on the overall experience of our students. I would also like to extend my gratitude to Lynne MacBain and Lauren Adlof for their insightful feedback and willingness to share their expertise. Their dedication to enhancing the teaching and learning process has greatly enriched the overall effectiveness of incorporating online whiteboarding into our program

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