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Problem-based Universal Design for Learning in Technical Communication and Rhetoric Instruction

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ABSTRACT

It is crucial for Tech Comm instructors to address challenges of audience within the artificial environment of classroom instruction. Without a distinct and specific audience, course content often remains theoretical and abstract, and students struggle both to connect the unknown to the known, and to generate meaningful and effective communication. As a consequence, teachers often ask students to create "authentic" audiences in order to provide a tangible anchor for learning. Truly authentic audiences, however, are increasingly mixed, composed of constituents who have disparate interests and needs that must be addressed with multiple sophisticated appeals, arguments, and modalities. Theories of Problem-Based Learning (PBL) and Universal Design for Learning (UDL) can be used to embrace these complexities meaningfully, strengthening students' opportunities for learning through scaffolded instruction and flexible course design.

INTRODUCTION

As on-site and on-line classroom dynamics change in the digital age, it is crucial now more than ever for instructors to address challenges of audience within the artificial environment of classroom instruction. But without a distinct and specific audience, course content often

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remains theoretical and abstract, and students struggle to connect the unknown to the known in order to generate meaningful and effective communication. As a consequence, teachers often ask students to create "authentic" audiences in order to provide a tangible anchor for learning. Truly authentic audiences, however, are increasingly mixed, composed of constituents who have disparate interests and needs that must be addressed with multiple sophisticated appeals, arguments, and modalities. A typical technical communication document on its own may have to address the expert and the non-expert as well as acknowledge the primary, secondary, and tertiary readers of the document. In a traditional classroom environment, this challenge is often augmented by the wide range of student strengths and weaknesses, and the rigidity of such traditional environments, both pedagogical and physical, makes effective adaptation difficult.

Theories of Problem-Based Learning (PBL) and Universal Design for Learning (UDL) have both been offered as means of embracing these complexities meaningfully, strengthening students' opportunities for learning through scaffolded instruction and flexible course design. A central problem, however, is that mere application of new theoretical approaches to an otherwise traditionally structured class tends to produce few substantial gains (Edyburn 2010). Furthermore, the constructive power of each approach is generally seen in isolation from the other.

Lunsford and Ede (1984) explored the role of audience in pedagogy a number of decades ago, suggesting that to *address* an audience is pedagogically useful, but to go further and truly *invoke* an audience deepens learning. PBL is especially helpful to invoke an audience. While there are many interpretations of Problem-Based Learning, according to leading educational theorists de Graaff and Kolmos (2003), PBL:

1) addresses a specific problem;
2) relies on self-guided learning;
3) includes experiential learning;
4) involves activity-based learning, including research;
5) involves inter-disciplinary learning;
6) includes exemplary practice; and
7) is principally group-based. (p. 658)

Hmelo-Silver (2004) defines PBL as “focused, experiential learning organized around the investigation, explanation, and resolution of meaningful problems” (p. 236). Because PBL is inherently student-centered, it has broad potential for classroom application. While it requires greater student investment in learning, its audience-centered approach offers profound educational returns in part by addressing the reality of the diverse classroom audience, and using the rich variety of students and student learning styles to address the comparable

complexity of a real audience in need of real solutions. Without the instructor's use of realia, it is all the more difficult to motivate learners.

In contrast to PBL, UDL, grounded in the 1997 reauthorization of the *Individuals with Disabilities Act* (Edyburn, 2010), has long been more a construct of theory. According to the Center for Applied Special Technology (CAST), because students have different perceptual and cognitive strengths, as well as different experience with various technologies and discourse communities, students must be taught how to organize content and use it in their own ways. No two brains work the same, thus, there is no one best way for a teacher to present information; and there is no one best way for students to work toward transferring knowledge. UDL refers to this as a recognition network, or the "what" of learning. UDL strategic networks include the "how" of learning, and UDL affective networks include the "why" of learning. Any given problem requires recognizing, strategizing, and affecting multiple ways to work in groups to solve problems. Because students value different extrinsic rewards, and because they develop intrinsic motivation in different ways, multiple means of engagement to solve problems through making connections to course content in different ways is essential (Rose & Gravel, 2012).

Application of this approach has long been problematic, and thus Edyburn's "ten propositions for new directions for the second decade UDL" are of great interest. In particular, he points out that as the theory moves from the advocacy phase to the accommodation phase—and awaits the promise of the final stage of accessibility—"many early disciples of UDL find themselves struggling to achieve the potential of UDL within current limitations of instructional design and product development" (p. 36). To combat this he offers 10 new directions for the implementation of UDL:

1) UD in education is fundamentally different than UD in the built environment;
2) UDL is fundamentally about proactively valuing diversity;
3) UDL is ultimately about design;
4) UDL for learning is not just good teaching;
5) UDL for learning does not occur naturally;
6) UDL requires implementation of technology;
7) UDL is not assistive technology;
8) UDL's primary and secondary impact must be measured;
9) UDL must be evaluated on the basis of enhanced student performance; and
10) UDL is much more complex than we originally thought. (pp. 36-40)

A table comparison between the two theories highlights how the two diverge.

Traits of PBL	**Traits of UDL**
addresses a specific problem	focuses on design
relies on self-guided learning	must be evaluated on the basis of enhanced student performance
includes experiential learning	Learning does not occur naturally UD in education is fundamentally different than UD in the built environment
involves activity-based learning, including research	requires technology for successful implementation
involves inter-disciplinary learning	proactively values diversity
includes exemplary practice	requires measurement of primary and secondary impact
is principally group-based	is not assistive technology

Figure 1: PBL and UDL Comparison Chart

Let's cogitate on the two-tiered approach of PBL, considering the students as a real and complex instructional audience as well as asking the students to address another real and complex audience. It can be argued that a course that fully embraces the spirit of PBL will likewise manifest the goals of UDL. The nature of PBL demands that students connect learning directly to real situations through invoking authentic audiences and applying lessons to real contexts in highly motivating ways. When such an approach is taken, and the traditional pedagogical and physical structures of the classroom are set aside, the result is an environment that accords with UDL's flexible approaches to recognizing, engaging, and organizing problems in the classroom. It is our assertion, then, that the key goals of UDL are met by a PBL course occurring in the flexible environment of a media laboratory. In effect, PBL that embraces the profound structural changes demanded by UDL offers the pedagogical space in which students are transformed into genuine authors of their education, a transformation that is enhanced by the physical space – the *third space* of the media lab.

It must be emphasized that true implementation of UDL through PBL requires pedagogical re-envisioning, profoundly altering the traditional roles of instructor, student, syllabus, and classroom. Such repositioning demands a similar change in the space and tools of the classroom, but the authors of this article propose that this is relevant to a changing paradigm

in education, a need to shift to more dynamic, real-world mediums. This pedagogical repositioning and melding of PBL and UDL can also refresh classroom dynamics, and rewards for students, teachers, and content are well worth the challenge. A recent graduate course in New Media Rhetoric (NMR) conducted as part of Texas Tech University's Technical Communication and Rhetoric (TCR) doctoral program supports this claim. In this course and approach, the classroom instructor provided multiple means of representation as well as a meaningful forum for students, which afforded avenues of student engagement in order to facilitate a meaningful problem-based UDL experience. In effect, the implementation of UDL through PBL proved within the environment of media laboratory served to enrich those involved in NMR to an extent that it is their belief that this can be applied effectively in other courses.

BACKGROUND

Students in Texas Tech University's Technical Communication & Rhetoric online doctoral program meet onsite for a two-week, mandatory residency every summer. During this time, students take one of three courses: Usability Testing, Document Design, or New Media/Rhetoric. All three courses use PBL and UDL to explore theoretical and practical complexities of course material through providing help and support to non-profit organizations. For NMR, this approach requires students to create a suite of materials that can range from websites, instructional videos, and social media campaigns. The client for summer 2012 was the Texas Manuscripts Cultures (TxMSC) project, a digital humanities project that aims to preserve and reinvigorate Texas heritage by obtaining letters, photos, and other memorabilia dating up to 1950 and scanning and transcribing these materials into a searchable online database. TxMSC requires a large donation of time and/or materials, as ideally materials are scanned and transcribed by project participants. The class decided to produce compelling promotionals and directions. Specifically, while referencing principles of crowdsourcing, modularity, and relational bibliographic databases, the NMR class worked to create a promotional video, several viral videos, a series of "How-To" instructional pages, and a report on the research conducted on these TxMSC materials and similar digital humanities project approaches. Thus, this service-learning class created and produced five deliverables: three videos, a streamlined single webpage illustrated with step-by-step photos that show TxMSC users how to upload documents, and an analysis with suggestions for the advantageous use of social media.

Problems presented by the project required flexible curriculum course design. Obstacles ranged from client expectations to time constraints to interpersonal conflicts. However, by using UDL with PBL and radically re-visioning the course, students were able to synthesize applicable knowledge obtained through self-directed learning and intrinsic motivation to meet the client's needs at the same time they fulfilled the course goals and addressed each key principle of PBL. This structure thus also adhered to the principles of UDL, which demands a

course that "provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills; and reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students" (Edyburn, 2010, p. 2). The audience "specifically" in mind for NMR's suite of products was the Texan, a formidably large demographic that considers different ages as well as multiple ethnicities with multiple languages. The NMR team worked within this framework as they designed and delivered products for their wider clientele base, a more usable website design, embedded marketing videos, and streamlined directions for participating in the project. NMR designed these products with the widest possible range of function and usability through user-friendly technologies.

APPLICATION OF THE SEVEN PBL PRINCIPLES

De Graaff and Kolmos's (2003) seven features of PBL provide a useful set of detailed guidelines. They state the first step of PBL is to address a specific problem (p. 658). Sometimes simply locating and identifying the problem itself is challenging. For instance, while it was clear that TxMSC required a suite of new media materials to promote their project and instruct potential participants, the NMR class interpreted the "problem" as one larger than just the delivery of videos and other materials to the client. Instead, the NMR students interpreted the problem as rhetorical, one where the audience is mixed and considerably diverse, finding motivation to contribute to the database from a divergent set of reasons. The TxMSC audience consists of "Texans" who possess heritage documents dating before 1950, but who are these Texans, what are their social and economic backgrounds, and how can NMR products foster and promote participation? Consequently, the NMR class framed the problem to create an appeal to the clients' stated audience of donors, educators, middle school students, and civic-minded individuals with an interest in manuscripts. In other words, the NMR class needed to appeal to and persuade those who could donate *materials* and those who could donate *time* to transcribe materials. Additionally, the client, another professor within the TCR program, was also considered a member of the audience. This is often the case with PBL and service-learning projects: The relationship between the client and the teacher and the students is often complex.

A second primary principle of PBL is that effective approaches enable students to heavily self-guide their learning. When it came to the use of video editing, sound recording, digital photography, and many other technological skills that were required to complete artifact production for TxMSC, a broad range of technological expertise was needed, from researching appropriate photographs for the website to editing to creating voiceovers to writing copy. Some in the class could be classified as experts on a given system or tool, while others had fewer technological skills in specific areas. Rather than let these discrepancies between learners' skills slow the team down, students became motivated to optimize these dynamics to maximize learning and quality project component completion. Rather than rely

on a teacher to explain how a program or a device worked, for instance, students sought out this information themselves, intrinsically. Doing so represents not just the second feature of de Graaff and Kolmos's steps, but also the third and fourth: PBL includes experiential learning and involves activity-based learning, including research.

This approach aligns well with the effects of well-implemented UDL instruction. First, the bottom-up nature of the PBL design innately values diversity, and thus also accords well with Edyburn's views. In the traditional classroom homogeneity is the goal: students are to be educated toward a common set of knowledge and skills, with uniformity of acquisition the goal, and diversity of initial knowledge an obstacle to be overcome. In the PBL-centered classroom, the diversity of the team becomes an asset rather than an obstacle, as varied strengths of students are intrinsic to the construction of the project and the diffusion of knowledge throughout the group. As de Graaff and Kolmos (2003) note, "within the same work environment theme, the group can actually work with widely different disciplines and subject methods" (p. 660).

To that end, the two-week experience provided the perfect arena for experiential learning, de Graaff and Kolmos's third PBL component. Liaising with clients, proposing countless product ideas, editing digital footage, collaborating on an entire real-world suite of digital media: For many team members, it was their first time to encounter any of these tasks, and it was oftentimes within a confounding situation. Touching base with the class professor, bouncing ideas off of team members via the team Facebook page, and conducting discount usability tests enhanced the experience and provided solid grounds for members to build upon necessary schemata. Moreover, as will be covered more extensively later in this paper, students discussed theory and practices on a daily basis with their professor within TTU's Multiliteracy Lab (MuLL) setting and were able to immediately experiment and apply what was learned. Impractical solutions were quickly discarded as the team built upon more solid foundations of theory and practice.

Activity-based learning, de Graaff and Kolmos's fourth PBL component, was very real-world for the team: frenetic, dynamic, and inspired. Various strengths of individual team members became more apparent. Some were more comfortable with leadership duties while others showed prowess at organizing deliverables and firming realistic deadlines. Still others worked well behind the scenes, perfecting the ideas that had been accepted and honing final products. The multiple centers of activity, as well as their ultimate convergence on a common set of final products, is central to UDL, and was facilitated not merely by the pedagogical structure of the course, but by the physical environment of the MuLL, which itself offers the same flexibility and potential for customized restructuring as does UDL itself. Team members experienced various stages of each process as well. The deliverables themselves comprised the activities, and the team learned by doing, developing dexterity at jumping into various stages of processes, oftentimes assisting whenever a new need arose. This also reflects the

world outside of the MuLL's walls, since processes in professional situations can quickly start, stall, and stop, and overall team function necessitates individual flexibility and efficiency. This was experiential learning compressed into two concentrated weeks, and every minute counted.

A fifth principle of PBL is that it involves inter-disciplinary learning. While there were two Texans within the NMR student team, the learning curve was quite steep; for instance, questions about the specific meaning of "Texas heritage," what makes an effective sound bite, which thematic approaches would attract the largest number of possible users, and which types of background music would appeal to a wider base of Texan website users were considered, discussed, and debated. Problem-based UDL involves trial and error, and the team tested all of its media type usage multiple times in order to hone its set of deliverables before the final due date. The work was collaborative and interdisciplinary, demanding a variety of literacies, which made the differing skill sets of the team members a vital asset rather than an instructional liability.

PBL also includes exemplary practice. Incorporating Lev Manovich's (2001) principles of new media from *The Language of New Media* within a problem-based UDL framework, the NMR team worked to design rhetorically-sound artifacts for the client while embedding these new media definitions and concepts:

1. *Numerical representation*: Media can be expressed in numerical representation.
2. *Modularity*: There are components to every NMR objective, which will build upon one another.
3. *Automation*: Replication can be produced automatically. There is no need to code HTML content if NMR content has some sort of replicability.
4. *Variability*: Information is exchangeable. Different content can be triangulated.
5. *Transcoding*: There are two layers to every NMR product: the digital layer and the cultural layer. It is crucial to learn how one layer exonerates the other. (Manovich)

Incorporating Manovich's five principles provided a strategy, a tacit agreement, in order to ensure detailed objectives were met and on par with student benefits. Team members learned to execute professional products efficiently, to cope with failure, and to provide alternative solutions in order to meet rigorous deadlines and maintain quality of the client's original vision. The team comprised of students whose ultimate goal was to learn theory, transfer specific knowledge, and apply methods within a flexible environment that demanded high achievement. After all, what happens in real-world situations when the client expectations are not met? The TxMSC project was the vessel used to reach this goal, and after the two weeks finished, team members could apply this new knowledge to their own academic and professional goals.

The assessment inherent in this aspect of PBL is also inherently aligned with UDL principles. As Edyburn (2010) states, "UDL outcome measurement needs to focus on the benefits that result from access and sustained engagement: expertise and expert performance" (p. 40). PBL is "expert" in nature, particularly within a genuinely PBL-centered course such as NMR, where the client/team interaction and the project delivery serve as true measures of "expert performance." As team members learned client expectations and experimented with software, they developed techniques and short-cuts conducive to quicker product iterations – in short, expertise. Solutions were derived quicker. Building upon each other's expertise developed a deeper pool of knowledge in order to launch further, develop faster, think deeper, and ultimately build better products due to learned dexterity and more solid concepts. At the end of the 2-week period, both expertise and expert performance increased exponentially within the group.

Finally, PBL is principally group-based. Every team member brought different schemata and professional experience, and debate and discussion were vital in discovering the best solutions for client needs. The team deliberated over every tactical decision from selection of images all the way to the final organization of NMR product presentation to the client. The team also met before and after hours in order to discuss crucial points, to sharpen the final iteration of deliverables; product implementation challenges facilitated this, as well as sought as many alternatives as possible for client satisfaction. Finally, they inspired each other via related and non-related media in order to explore as much as possible before delivering the final product suite.

RESTRUCTURING TEACHING, LEARNING, AND THE CLASSROOM SPACE

UDL naturally complemented the PBL-centered goals of the NMR course, specifically Edyburn's (2010) propositions for UDL directions (p. 36). Edyburn's first proposition notes that UDL in built environments is not the same as universal design in education, suggesting that in education, "much more attention must be devoted to the complex interactions between learning objectives, learner characteristics, performance support strategies, technology, and outcomes" (p. 36). This comparison of education with the "built" environment invites a similar comparison between the design of the PBL-centered classroom and the traditional classroom, and ultimately supports Edyburn's suggestion that the essence of UDL is design (p. 38). Indeed, the traditional classroom is a built environment in which the physical structure of the space enforces the pedagogical hierarchy, with power concentrated in the instructor and the syllabus, and the course itself constructed according to set principles and without any detailed knowledge of specific learner characteristics. In contrast, the PBL classroom distributes power to the learners, and in so doing creates a sort of self-structuring environment that inevitably takes into account learner characteristics, performance support strategies, technologies, and outcomes. This change is course focus leads naturally to a

change in learning and assessment, but it is also a change that must be accompanied by a physical transformation of the learning space.

First, UDL demands a restructuring of the power center of the classroom, eliminating the centrality of the instructor, who ceases to design and "run" the course and instead becomes more of a mentor and a resource, existing, in PBL, to "facilitate the group's work and internal communication" (de Graaff & Kolmos, 2003, p. 659). This is perhaps a more profound shift than the move to a focus on differentiated instruction envisioned by Edyburn (p. 38). Part of this move away from instructor-centered design is a comparable move away from syllabus-centered design—a move that is key to full implementation of PBL, and accords with de Graaff & Kolmos's "problem project" model (p. 660). Accordingly, the TTU New Media course was organized purposefully without a static syllabus; without a complete set list of readings; and with flexible timelines determined by project needs, by students' skills and knowledge and interactions, and by instructor guidance. In what seems from the traditional perspective an odd turn of events, the syllabus was ultimately a retrospective document provided after the completion of the course, created by all participants in class, as it logically should be, describing rather than controlling the learning and assessment. Indeed, the degree to which the NMR course diverged from other courses, even other graduate courses within the same program, seems sufficient proof of Edyburn's assertion that UDL does not occur naturally (p. 38), and is not simply good teaching, as noted above. The power of problem-based UDL structure is in its design, and the "good teaching" that it demands is so profoundly different from the traditional concept of instruction that it is likely never to occur "naturally" but only by deep reflection that makes many complexities seem simple and purposeful.

Additionally, as Edyburn notes, UDL must be measured by both primary and secondary effects. He argues that good design often assists a wide range of groups who continue to use it in a non-assistive way (p. 39). As such, it is reasonable to consider PBL, which is designed to be a fundamental change benefitting all learners, as one key to UDL. Indeed, Edyburn asserts that UDL is not assistive technology because it is "given to everyone with the understanding that those who need specialized support will use the tools when they need them (i.e. embedded, just-in-time supports)" (p. 39). However, this idea of specialized support is precisely the consequence of the distributed power structure of the PBL course, where all students are not only afforded the opportunity to seek the support systems of fellow team members and the instructor, but are placed in a situation that offers the innately motivating force to do so. In this sense we see that PBL is a means of increasing accessibility in the broadest terms and fulfilling the "universal" element of UDL.

The shift away from teacher-centered classrooms requires physical environments that can support and empower such teaching approaches; such a shift is ultimately enabled by technology, which naturally lends itself through a mélange of mediums in our Digital age. As Edyburn (2010) states, "to suggest that the potential of UDL can be achieved without

technology is simply another way to maintain the status quo" (p. 38). In NMR, the shift toward a decentralized classroom occurred in MuLL, a place that supports the teaching, research, and service of faculty and students (Crane & Beaudin, 2011; Lauren, 2011; Rice, 2011). The lab is designed to support various levels of technological competency, but also to serve as a thinking and collaboration environment. Gone from this environment was the traditional teacher podium and student desks arranged neatly in rows. Instead, the team sat around a table in the middle of the room to discuss the project in length, and often retreated to computers to develop more ideas to bring to the group. The course moved through the project's varied details, as if the project was the thesis and continued direction over theory and practice supported the claims. The team also had a number of technologies available to them, including desktop computers, digital still and video cameras, and high-end printers and scanners. Even more reflective of the decentralized learning space, students volunteered their own resources such as iPhones and props to be used in the development of the final deliverables, all for the overall benefit of the group. The space design is focused on working together to solve communication problems.

The MuLL represents an ideological shift in teaching and learning. Dobrin (2011) explains how "space is the site of ideological struggle; place the result of that struggle" (p. 42). The ideological struggle that PBL embodies in classroom environments is empowering students to guide their own learning in authentic ways. After all, there are many voices in the classroom. Gutierez, Rymes, and Larsen (1995) explain these voices are often scripted by teachers and then counter-scripted by disenfranchised students. Further, the authors reason "nevertheless, in the face of a rigidly monologic teacher script, the relevance of students' counterscript to the processes or topics discussed in this classroom has little influence on the teacher's script. The only space where a true interaction or communication between teacher and student can occur in this classroom is the middle ground, or 'third space,' in which a Bahktinian social heteroglossia is possible" (p. 447). In essence, in third space social lines are redrawn to provide an authentic exchange of ideas and decentralize those who create and distribute knowledge—especially culturally informed or localized knowledge. A media lab space, such as the MuLL, can act as a sort of third space in lieu of traditional teacher-centered learning environments for productive problem-based learning teaching models.

Grego and Thompson (2008) recently adapted the term *third space* in *Teaching/Writing in Thirdspaces: The Studio Approach.* Grego's and Thompson's ideas are largely based on Soja's (1996) and Lefebvre's (1992) exploration of the production of urban spaces. Soja argues that there is a first space (what we concretely conceive in the material world) and second space (what we can imagine in a theoretical world). Third space, on the other hand, "can be described as a creative recombination and extension, one that builds on a first space perspective that is focused on the 'real' material world and a second space perspective that interprets this reality through 'imagined' representations of spatiality" (Soja, 1996, pg. 6).

Grego and Thompson adapt third space to represent a space outside of the classroom, where small groups of students meet to focus only on their writing.

The "third space" was further developed by the use of a closed Facebook group in which ideas could be stored, sorted, prioritized, and commented upon. This digital workspace was a fluid space where products could be viewed throughout iterations, where memorable music videos could be posted, and where inspiring catch phrases could be considered and enjoyed. Team members relied on this space for updates as well as immediately critical communication and information sharing, but the space this project created explored what Clark and Young (2005) discuss when they talk about service-learning as "work that goes beyond the transformation of individual students through service experiences" (p. 85). Facebook, as well as the media lab space in which the team worked, became a purposeful think-tank, as previous student teams and the instructor have reflected on in more detail (Crane & Beaudin, 2011; Lauren, 2011; Rice, 2011). Accordingly, tensions emerge and help us better understand that courses which reproduce "thick places" and complex rhetorical workplace situations authentically enable students to inhabit community spaces in their learning (Clark & Young, 2005).

Also, UDL can provide impetus for project completion strategy. For instance, the Facebook group offered tremendous insight into thought processes of team members, and assisted in developing working plans and a timeline of deliverables for artifacts produced. Music video clips, intercultural connections, as well as iterations of deliverables almost created a mosaic effect on the Facebook page so that each member could hunt for his or her own needs, be it inspiration or an in-depth review of product statuses. Manovich (2001, p. 60-61) mentions "What before had been a mental process now became part of the public sphere. Unobservable and interior processes and representations were taken out of individual heads and placed outside. What was private became public." This reflects the brilliance about new media technology. Manovich (p. xxv) also mentions that "new media objects contain a hierarchy of levels" such as interface (content), operating system (application), assembly and machine language. These components needn't lose their individual identities as various parts to the product suite puzzle are addressed; however, they do need to be seamless and liquid, complementing and playing upon each other. "Individual layers can retain their separate identities rather than being merged into a single space; different worlds can clash semantically rather than form a single universe" (p. xix). A quick update on the Facebook page would assure team members' progress for component artifact production. Furthermore, different team members worked with the instructor to develop different specialties in order to streamline work.

UDL networks can elucidate the metacognitive "why" of learning. Ultimately, the situation was a real-world situation in which members could make connections and observe in real-time why they were doing what they were doing. In spite of occasional team conflicts, goals

were clear and each member took up slack in order to meet deadlines and contribute effectively. The image below features the team's Facebook page, a team members-only environment in order to share ideas and encourage progress. Examples of dialogue include culturally-telling Facebook profile images; client audio for embedded video; subtitling program for video accessibility; inspiring digital humanities projects; iterations of logos; and final products. All team work was accessible by simply logging into Facebook accounts.

Figure 2: NMR Team Facebook Page

When a class focuses its reading, writing, thinking, and deliverables on an authentic client's needs, its audience becomes mixed and complex and the content it produces useful and real rhetorical situations. This rhetorical situation calls for NMR students to use the "power of persuading" (Quintilian, p. 385, 2001).

CONCLUSION

In the case of the NMR students, the merging of PBL and UDL within the context of the media lab was a success. A high-quality suite of deliverables was provided to TxMSC on time and in a professional manner, yet the journey took more center stage. NMR students learned how to learn from each other, how to develop key skills, and how to negotiate the production of deliverables via a radically restructured PBL course in a media lab. It wasn't an easy process, yet employing new thought processes seldom is. It is our hope that our experience

can lead to continued improvement in the implementation of UDL principles in different courses.

While there is much evidence suggesting that PBL and UDL are productive techniques for teachers and students alike to meet educational goals, in many ways using these approaches can conflict with traditional pedagogical methods. The operative word is "traditional." We needn't shy away from risk-taking in terms of Digital age classroom practices, and in order to reach student populations and expansive audience bases, it is vital to explore new options, new alternatives. A UDL inspired PBL course in a media lab is one solution for the university to maintain relevance in an ever-changing contemporary world. Indeed, as was depicted in the case of TTU's NMR students, using this approach can render the lecture, the syllabus, and, even the typical classroom space as mutable, maybe even unnecessary, components of the course. Not surprisingly, this can cause apprehension on the part of both the instructor and the student.

Then again, this could provide an organic solution to the modern day classroom. It is already accepted that classroom pedagogy is in dire need of an overhaul to reflect the Digital age, as we have well outgrown classroom dynamics of previous decades. It's time: The combination of new media technology within PBL, UDL, and Manovich's principles can facilitate real-world dynamics as well as real-world solutions. Team members learn theory, build upon that theory, and apply their new knowledge for future working situations after they leave the classroom and join the workforce. Given the possibility of a mutually rewarding outcome, it is important that instructors consider the benefits of using a hybrid model; employing UDL within a framework of PBL can offer more dynamic solutions to embrace the changes that doing so engenders.

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