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Facilitating Collaborative Learning among Businesses, Faculty, and Students in a Purely Online Setting

Joseph Benjamin ILAGAN*, Matthew Laurence UY, Vince Nathan KHO & Joselito OLPOC
Department of Quantitative Methods and Information Technology, Ateneo de Manila University, Philippines
*jbilagan@ateneo.edu

Abstract: Collaborative learning is a situation where two or more people attempt to learn together. We explain how we designed and facilitated collaborative learning among businesses, faculty, and students in a purely online setting during strict lockdowns during COVID-19. The design follows the four areas involving successful collaborative learning: initial conditions, collaboration roles, the scaffolding of interactions, and interaction monitoring and regulation. The course followed a blend of professional consulting engagements, student internships, and faculty externships. The primary discipline serving as the basis for the consulting engagements is business analytics, which covers various computer programming, statistics, and data visualization skills. While the overall program spans multiple academic terms, this paper focuses on the pilot term consisting of chosen business management students interested in programming and analytics. Despite logistical challenges and apprehensions among student participants in the middle of the term, the results were in line with generally expected learning outcomes based on feedback from the participants.

Keywords: Collaborative learning, asynchronous learning, online learning, COVID-19, blended learning, industry-university best practices, cognitive apprenticeship

1. Context and Motivation

Collaborative learning is when two or more people attempt to learn together (Dillenbourg, 1999). A related concept is a social aspect of learning (Vygotsky, 1997) in that learning is a consequence of social interaction. The Ateneo de Manila University in the Philippines has been pursuing opportunities for industry-university collaboration as it sees several advantages. Such partnerships are even more imperative in business analytics, where high-level competencies aligned with interdisciplinary, real-world market requirements are essential (Wang, 2015).

Like internships, the students will gain applied competencies in the real world, but with the presence of teachers and business clients working with them (Neumann & Banghart, 2001). The setup will allow the transfer of soft skills from businesses and teachers with industry experience to students and more junior faculty. Business faculty will have continuous involvement with industry, which will help contextualize lessons they teach in major business subjects. Thesis and Capstone mentoring and guidance will be richer and more up-to-date with the constant exposure to industry engagements. Neumann and Banghart (2001) refer to this setup as an externship. Businesses have access to academic (student and teacher) expertise otherwise not found in the regular job and professional consulting market. Ultimately, however, businesses will welcome collaboration with academia to achieve business impact—how the newfound knowledge from the collaboration affects company performance rather than activity output (Greitzer et al., 2010). This paper will interchange the terms business, company, client, business partner, data partner, and data client.

The industry-university collaborative learning setup takes advantage of the benefits of social learning (Vygotsky, 1997), this time across three groups: students, faculty, and industry. Neumann and Banghart (2001) describe the concept of consulternships, which reflect a blend of professional consulting engagements, student internships, and faculty externships. Another term for this type of collaboration setup with corporations of various sizes is Knowledge Transfer Partnerships (KTP)

(Roulston & McCrindle, 2018). In traditional internships, most interns or apprentices are often entry-level appointments involving menial tasks. Businesses prefer to place people already with experience in more critical positions. The task is often perceived as "boring" and can leave the students isolated and discouraged (Neumann & Banghart, 2001).

This paper tackles two research questions: 1) What class structure is needed for this type of collaborative setup? 2) What roles do faculty, students, and business partners need to play to make this setup successful? This paper describes the researchers' steps in designing and facilitating an online course on business analytics with collaborative learning (Dillenbourg, 1999) as the primary theoretical framework to increase the probabilities of interactions for positive learning outcomes. Complementary structural support in designing the remote and online course comes from the theory of Transactional Distance (Moore & Kearsley, 2011). Cognitive apprenticeship (Bransford, Brown, & Cocking, 2000, as cited in Ghefaili, 2003) also comes into play in shaping instruction design for this collaboration setup. Last, Self-Efficacy (Bandura, 1977), scaffolding, and learning involving social interaction (Vygotsky, 1997) help address gaps in what students could not learn if left on their own and what roles faculty need to play. Lastly, where applicable, concepts from cooperative learning (Johnson & Johnson, 2002; Gillies, 2016) will support learning independently, sharing of resources, and in small groups.

2. Program and Course Design

This paper focuses on a pilot class under a larger data partnership collaboration initiative by the Ateneo de Manila University (ADMU) in the Philippines. The course, Applied Business Analytics, involved two sections. One section had 28 students, while the other had 35 students. All students were from the Bachelor of Science in Management Engineering Program from the John Gokongwei School of Management of the ADMU, ranging from 18 to 21 years old. There were 33 male and 30 female students. All the students already took the required math and programming subjects before the class and some majors in strategy and decision science. The study works with a sample representing the whole batch of BS Management Engineering Students at the Ateneo de Manila University as the population. The faculty picked the students to attend this pilot class based on past interactions and observations of skills and attitudes. The criteria were based on past grades in programming classes and extra-curricular activities related to programming and analytics. Based on informal and anonymous surveys conducted, most of the students did not have previous analytics-related experiences or engage directly with business clients or employers. The class ran for eight (8) weeks, but the first week was spent on introductions and class administrative matters.

2.1 Challenges

The undertaking of an industry-university collaboration at this time presents many unknowns. All parties (students, teachers, and business clients) will have to fill specific learning gaps.

The University continues to conduct learning activities remotely and online due to the worsening COVID-19 situation. Traditional collaborative learning involves being at the same physical location (Dillenbourg, 1999), but the hope is that technologies available for online collaboration will make this physical distance less of an issue.

Transactional distance (Moore & Kearsley, 2011) refers to physical (especially in distance learning), pedagogical and psychological gaps, particularly between instructor and student and among students. The wider the gap, the more negative the impact on learning. In this class, transactional distance also includes gaps with industry contacts. Transactional distance involves three dimensions: structure, dialogue, and autonomy (Moore & Kearsley, 2011). Since not all students will have the same level of capacity for self-management, the overall design of the course needs the right amount of structure and dialogue. And, because it is impossible to provide a predefined structure in this setup, a lot of dialogue is an integral part of the course design. Teachers play a key role in guidance and constant assurance.

Even with the handpicked students, not all of them have a sufficient level of self-autonomy (Moore & Kearsley, 2011) and self-efficacy (Bandura, 1977). Overcoming transactional distance is

nothing new in the university (Ilagan, 2020). However, this new program introduces unprecedented situations involving teachers, students, and business partners in a class setting.

Teachers and students had gaps in skills and experience in a natural business setting. Due to this uncertainty, the students had difficulty gauging whether or not they were on the right track regarding their work. Some teachers were more familiar with the hard math and technology required, while others would have the industry exposure. There is a need for more than one teacher in any meeting with a client due to the interdisciplinary and diverse nature of business problems tackled, thus leading to potential faculty exhaustion and burnout. Due to this uncertainty, the students had difficulty gauging whether or not they were on the right track regarding their work.

The business clients, too, don't have all the skills needed to help make this collaborative learning setup succeed. One serious gap is the understanding of their business requirements, though this varies across businesses. The clients generally know what data they have, but they don't know what they can do.

Unlike in a classroom setting, there is ambiguity in this new setup. With students, teachers, and business clients having skills and expectations gaps, there will inevitably be confusion and struggle in coming up with the expected insights. A mitigating strategy should follow an iterative process, starting with exploratory data analysis and prototyping (Wirth & Hipp, 2000), complemented with constant feedback from the clients.

2.2 Expected Learning Outcomes

Unlike regular classes, assessment and grading follow a rubric based on specific behaviors rather than students getting the correct answer. To ease students' fear of teachers' subjectivity in grading, the students will submit a self-assessment report, but the teachers still provide the final grade.

Given the skills gaps among all the participants, the lack of clarity in business goals for the engagements, and the free-form nature of the collaboration, there is the need for emotional support from all participants throughout the process. Because of many unknown aspects, students have to do self-study, research, data gathering, and inquiry independently (Roulston & McCrindle, 2018). Applications of theoretical material in real-life scenarios make content easier to understand, while the real-life application demonstrates the relevance of content (Roulston & McCrindle, 2018).

2.3 Class Design and Management

This subsection addresses the first research question of this paper: What class structure is needed for this type of collaborative setup? Dillenbourg (1999) offers four classifications of ways to increase the probability that some types of learning interactions occur: initial conditions, collaboration roles, the scaffolding of interactions, and interaction monitoring and regulation.

The skills gaps described earlier involve inert knowledge, and cognitive apprenticeship (Collins, Brown, and Newman, 1989, p. 453) is one way to address this. One of the goals of cognitive apprenticeship is to make the thinking processes of a learning activity visible to both the students and the teacher. The teacher can then employ the methods of traditional apprenticeship (modeling, coaching, scaffolding, and fading) to effectively guide student learning (Collins et al., 1991).

The design of this class touches on factors of successful Business Analytics programs (Wang, 2015). These factors include interdisciplinary collaboration with other departments or industries, aligning courses with the practice's needs, exposing students to real-world projects and industry professionals, blending statistics and quantitative methods, and strengthening the faculty's expertise.
The first three factors directly benefit from collaborative learning with industry participants. However, coordination with other departments did not happen for the pilot class due to lack of time.

2.3.1 Initial Conditions

Seven (7) business clients signed up for the data analytics partnership with the University. The recruitment and invitation of the business partners proceeded organically, with contacts of teachers from the alumni and business network becoming prime candidates. In searching for business partners, the program planners considered the challenges related to data availability and the feasibility of the

expected scope of work, which became the basis for targeting appropriate businesses. Some partners had internal data privacy and information security policies that limited the data that they could provide for this project. Other times, partners or students did not have the means to collect the data needed for the project.

Teachers and students playing the roles of account manager and lead consultant would have to set expectations with business clients and avoid overpromising. One way of preventing overcommitment is to focus on impactful but not necessarily urgent or business-critical work.
After finalizing the data partners for the course, planning class content followed their business needs. Some business requirements needed not previously taken by the students in their earlier classes.

The designated project manager must update the business partners from time to time to make them feel involved and know about any team task problems. Regular updates done iteratively would avoid significant surprises in the end.

2.3.2 Set Collaboration Contracts Based on Roles

This subsection addresses the second research question of this paper: What roles do faculty, students, and business partners need to play to make this setup successful? The University team prepared a generic client engagement framework that outlined roles and responsibilities on both sides of the client and the University in more detail. For the primary roles, a person may assume one or more of these. Faculty act as account managers, project managers, and lead consultants. The students act as associate consultants, data engineers, and analysts. The business client serves as the subject matter expert and the recipient of any recommendations and actionable insights from faculty and students.

The business client's needs may force faculty and students to focus on consultant and project management roles. However, students still expect teachers to perform content delivery-related tasks.

2.3.3 Scaffolding Productive Interactions

In learning, a study (Smith and Ragan, 2004) defines scaffolding as cognitive processing support that the instruction provides learners. This concept originated from Vygotsky's sociocultural theory (Vygotsky, 1978, as cited by Schutt, 2003) and the notion of the zone of proximal development (ZPD). The ZPD is the gap between the learner's accomplishment versus what would have been possible with an expert, teacher, or a more competent person present.

Sample programming code comes in the form of work already created by teachers and the student core technical team. Other code snippets are carefully curated from multiple sources from the Internet. One class had weekly lectures on how to apply data science around different problems. For client interaction scaffolding, one faculty member acts as the lead consultant to facilitate meetings with the clients for client interactions. Students get to observe how to handle real-world client interactions. These observations will serve as models in the future (Bandura, 1977, as cited by Hodges, 2008).

2.3.4 Monitoring and Regulation of Interactions

With the online setting, monitoring and project management could only be possible through technologies already available to all parties. Internal online chat and audio meetings took place through Discord, and its use is nothing new (Kruglyk, Bukreiev, Chornyi, Kupchak, & Sender, 2020). For recorded video meetings and ad-hoc lectures, the teachers offered their Zoom accounts. For external meetings, the default preference of all parties (including the business partners) was Zoom. However, some organizations have standardized the use of Microsoft Teams.

Informal pulse checks with the classes and across project groups continued throughout the pilot period via Discord. In addition, the teachers prepared a more structured pulse check in the form of a survey mid-way through the term. A final survey was conducted a few weeks after the end of the class.

3. Results

Before the class, students were generally happy but fearful of not doing well because they lacked the business analytics and customer engagement experience. This was also the time when teams were still determining what outputs would make sense to the business clients. While the class covered general analytics frameworks, the content was also motivated by the project requests of the clients. The students enriched their knowledge through research and self-study on specialized topics.

During the class, the students felt overwhelmed because they realized how much they still need to learn, but they were satisfied with the flexibility of the structure and the guidance they received from the faculty. The students were also satisfied with the ad-hoc workshops, and heavy lifting is done by faculty and the student core technical team. For soft skills in handling general client communication, scheduling meetings, business presentation, and account management, faculty managed most client-facing activities at the start. Teachers worked on programming examples through Python Jupyter notebooks. A large part of the learning experience involved regular personalized consultations with project teams about approaching their specific projects.

After the class, the students were surprised by what they had been able to do. They were also happy that they were able to satisfy the business partners they served. Some said that this had been the best class in their stay in college but that the class should have been done in a regular (16-week) semester instead of the short eight-week quarter. And, because of the short time allocated, the students felt they didn't have enough opportunities to fill particular skills gaps. Despite everything, they acknowledged that it is normal to have these knowledge gaps. They understand that how to address such gaps is part of the intended learning outcomes. In general, students had also expressed feeling more confident in applying different analytics tools after the course compared to how they felt before the course. Teachers had to exert more effort to deliver additional classroom material, manage project groups, and communicate with the business clients, thus making them feel exhausted. However, the teachers also were satisfied with the learning outcomes exhibited in the real-life business impact of the projects. Finally, business clients expressed how much they learned from the engagement. They shared that the students' recommendations were presented to upper management as well.

4. Discussion

Since everything has been experimental, the collaboration program will benefit from documenting the journey. Documentation may initially be done informally through Discord conversations and then come up with a reflection towards the end of the class. One goal is to produce artifacts (templates, reusable code, video tutorials, and others) to benefit future batches taking this class. Teachers and business partners do not have to re-establish business objectives from scratch if prospective students can reference the outputs from before. This paper may serve as the basis for a more generic model involving longer-running thesis projects and more impactful internship and externship arrangements with business partners. However, the exhaustion experienced by faculty is a significant risk that needs to be taken into account as this initiative scales up to similar but larger collaborative projects. Finally, the University needs to find ways to quantify the success of the collaboration effort with industry partners. Success metrics will relate to learning outcomes for the University. It will align with business impact for industry partners (Greitzer, Pertuze, Calder & Lucas, 2010).

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