Shih, J. L. et al. (Eds.) (2019). Proceedings of the 27th International Conference on Computers in Education.
Taiwan: Asia-Pacific Society for Computers in Education

# Mining Student Experience and Feedback in Social and Professional Issues in IT: Basis for Understanding Blended Learning

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**Abstract:** In most organizations, surveys are conducted for copious objectives. Surveys are traditions of collecting data that has become the voice of the customer relayed and conveyed anonymously or blatantly. Various learning institutions, mostly universities at large, has made it customary to allow students answer surveys intended to collect views on their overall assessment covering their satisfaction in the entire course as the semester concludes. In Jose Rizal University, student feedback is collected in various survey formats. One of which is called the Canvas Learning Experience survey that provides opportunity to the learners to comment on the proficiency of the implementation of the blended learning course. It seeks student comments on specific areas for improvement in the teaching and learning process. The conveyance of whether these students are immensely satisfied with their learning environment and experience matters mostly to the university treating them as customers and partners. One of the significant objectives of this research is to develop a blended learning feedback mining system that empowers the educational institution administration to inspect at the reproaches of their clients' learning experience in the blended learning course and thus upgrade them accordingly. The conceptual framework of this research centers on catching and investigating criticism information from students' perceptions basing from their qualitative comments using text mining. In turn, the framework will give the fundamental structure in the implementation of the feedback mining system that the university may utilize for addressing the results of the Canvas Experience survey.

**Keywords:** feedback mining system, student feedback, student learning experience, text mining, blended learning experience

## 1. Introduction

In most organizations, surveys are conducted for copious objectives. Surveys are traditions of collecting data that has become the voice of the customer relayed and conveyed anonymously or blatantly. In universities and learning institutions, it has become a practice that students answer surveys intended to collect their views of their overall assessment covering their satisfaction as customer in the entire course that has concluded or is about to conclude. Likely, the conveyance of whether these students are immensely satisfied with their learning environment and experience, treating them as customers of the university has always been of vital importance to the academic division of the university following on the mission and vision of the institution. These surveys contain Likert-scale questions considered to be quantitative as well as qualitative ones. In its likelihood, the results of these surveys are measured and analyzed. Items with low results are then subjected to an action plan for addressing and progressive disposition.

One of the significant objectives of this research is to develop a blended learning feedback mining system that empowers the educational institution administration to inspect at the reproaches of their clients' learning experience in the blended learning course and thus upgrade them accordingly. As many educational institutions pay a ton of consideration to quantitative input, measurable correlations are processed and presented to school administrators. In any case, the subjective remarks given by students are not completely intercepted. In this paper, the conceptual framework of the study centers on catching and investigating criticism information from students' perceptions basing from their

qualitative comments using text mining. In turn, the framework will give the fundamental structure in the implementation of the feedback mining system that the university may utilize for addressing the results of the Canvas Experience survey.

### *1.1 Blended Learning*

According to Thorne et al. (2003) as mentioned by Irawan et al. (2017), blended learning gives an opportunity to integrate the innovative and technological advances in online learning with the interaction and participation toward traditional learning. Blended Learning is a learning that combines the technology and traditional instructor-led training in the room (Bersin, 2004, p. 56). Blended Learning has four characteristics, namely: (1) learning which combines technology; (2) combination of face-to-face learning, independent, and online; (3) the combination of effective learning, and (4) teachers and parents as facilitators and supporters (Husamah, 2014, p. 16).

Jose Rizal University has long since ventured the utilization of blended learning. The institution has coined the term Course Redesign Program (CRP) to selected courses under the General Education curriculum. In the CRP, face-to-face class meetings were reduced, and online interactive set of learning activities awaited the enrolled students from the various general education courses. Learners enjoy the independence of accomplishing their online activities and assignments in their own free time inside or outside the campus. For the time being, the university has set a separate institute, called the Institute of Technology-Based Learning (ITBL) who is responsible for the management of blended learning courses. ITBL is under the authority of the University Vice President for Quality, Linkages, and Technology Enabled Learning. At present, ITBL caters courses from the different colleges in the university. JRU students have long been owning to the benefits of blended learning to their advantage and the academic divisions have increased the learning outcomes through this deployment. ITBL utilizes the Canvas Learning Management System as the medium in catering distance learning mode for the courses.

This paper focuses on one of the most recent additions of blended courses from the Information Technology department under the College of Computer Science and Engineering, it is called ITC C203, Social and Professional Issues in IT. This course is offered to Bachelor of Science in Information Technology majors in their second-year level. ITC C203 as a blended learning course allows a once a week 1.5 hours face-to-face meeting with an instructor. The rest of their learning activities are done online in the convenience of both students and faculty. The learning experience and feedback of the students enrolled in this course are the focal points of this study as these comments will be mined using text analytics.

## 2. Conceptual Framework

The target of this proposal paper is grounded in gaging the student qualitative feedback and stage a range of topics exhibited affirmative and adverse. The core of the data collection is the student experience in the course redesign program of the university, the conduct of the blended learning course. The most recent addition from the Information Technology department is the course, Social and Professional Issues in IT. This blended learning course includes 1.5 weekly face to face meetings.

In the blended learning approach, Alontaga et al (2013) has mentioned the community of inquiry framework (CoI) as applied in the same university's course redesign program. The CoI framework served as the evaluation framework for the study to determine the blended learning experience of the students and to improve the blended learning program. For the course as the nub of the student learning experience, ascertained in the teaching, social, and cognitive presence allows the course to progress accordingly. The student feedback will then substantiate the community of inquiry framework (CoI) applied to the course.

The conceptual framework of the study is depicted in Figure 1. The comments of the students in ITC C203 (Social and Professional Issues in IT) serves as input to the architectural concept of the framework. The comments will be grouped based on a common topic, using a clustering algorithm. The sentiment of the topic shall then be obtained. The topics along with the sentiment polarity score will then be amassed to be reported visually.

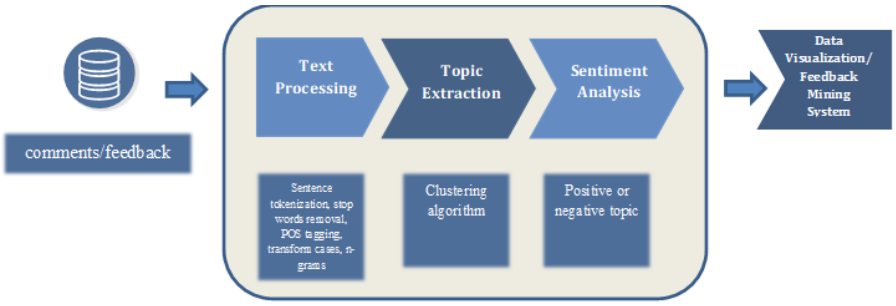


*Figure 10.* Conceptual Framework of the Study

The summative report will include a demonstration on the significant clusters of the comments and words for the topic extraction task. The topics along with its sentiment polarity scores will be depicted. The negative topic result will be paralleled to an aligned business rule presented through key result areas with regards to course improvement.

## 3. Problem Statement and Objectives

With the aim to reckon numerous comment feedback from students in a blended learning course, the faculty must read unstructured comments and act upon these to improve the student learning experience. In this lieu, this paper intends to examine and unravel the research question of how unstructured student feedback comments be mined to prescribe course improvements in a blended learning course. The qualitative feedback process shall aid the ITBL in making decisions in the aspects of teaching and learning course improvement to shove the continuance of providing the student stakeholders in caring about good education. Further, the research will develop a business intelligence feedback mining system with a user-interface that implements the conceptual framework of the study. The research question individualizes sub-questions as follows:

- Research Question 1: How the blended learning course student feedback via numerous unstructured comments be identified and categorized?
- Research Question 2: Identify a data mining technique to group the comments based on key topics.
- Research Question 3: How can clustered topics be classified into the nature of its positivity or negativity?
- Research Question 4: How can the clustered group be aligned leading to course improvement suggestions and be presented into a web interface?

The aim of this work is to examine the student comments relating to their experience in a blended learning course. It aims to utilize various types of actionable information called topic sentiment to facilitate the improvement of the course in the teaching and learning process and provide students with a more buildable learning experience. The research objectives in alignment to the research questions are as described:

- Research Objective 1: Perform a feedback mining process to extract topics based on top frequency words from the comments.
- Research Objective 2: Run a clustering technique that generates the key topics into clusters.
- Research Objective 3: Implementing a sentiment analysis technique to suggest target solutions in the improvement of the blended learning course.
- Research Objective 4: Develop a business intelligence feedback mining system that prescribes key components of the blended learning course in terms of its improvements in the teaching and learning process.

## 4. Scope, Delimitation, and Significance of the Study

The focus of this research is to employ a text mining approach to mine student comments from a blended learning course that highlights their learning experience. It shall develop a blended learning feedback mining system that implements its conceptual framework. The proposal is demarcated in one blended learning course under ITBL managed by the office of the vice president for quality, linkages, and technology enabled learning. Data from the students enrolled in the blended learning course shall

be the source of input. The location of this intended study is under the IT department of the institution. The Canvas experience survey contains Likert-scale questions and qualitative questions for the from which the commentary part of students' suggestions for improvement is. It shall provide the necessary structure for implementing a prototype tool to be tested for mining student comments from the qualitative responses of the students. As the relationship between quantitative and qualitative feedback may provide further results, the presentation of the correlational aspects of both feedbacks and the quantification of the qualitative comments will remain a recommendation. In the text analytics approach, comments with multiple topic generation will be left for future work.

JRU has been at par in the maintenance quality standards as to institutional and program accreditations. The research goals allow the university administrators to adjust to necessary improvements from which suggested by one of their most important customers, the students. Leckey, J., & Neill, N. (2001) signified that student feedback is not only important for course improvement. In this case, student learning experiences are not an exception. To maintain the accreditation level in the areas of faculty, instruction and laboratories (FIL), student feedback must be taken in serious context.

## 5. Research Design and Methodology

The university's Canvas learning experience survey is the tool to be used in the data collection of this study. The manner from which students will answer the survey is through an anonymized online survey. The students' input data will come from one blended learning course in the university's ITBL managed courses. In the first phase, data collection is executed. Comments function as the input as the pre-processed data. The second phase is to extract individual sentences and phrases using tokenizers. Tokenization deals with the splitting of text into units during data preprocessing. Text can be tokenized into paragraphs, sentences, phrases and single words. The delimiters used in this process vary with data sets (GI Nitin et al, 2015). In the stop word removal, the most frequently used words in English are useless in text mining as they will be removed. Stop words are language specific functional words which carry no information and therefore removed from the documents during data preprocessing stage (GI Nitin et al, 2015). POS tagging, transform cases, n-grams will also be applied to the process. The third phase will be extracting topics and their sentiments using clustering techniques. The last stage is the visualization. The goal of text analytics is to derive high-quality information from text. Typical text mining tasks include; text categorization, text clustering, concept or entity extraction, production of granular taxonomies, sentiment analysis, document summarization, correlations, and entity relation modelling (Gottipati, S., Shankararaman, V. & Gan, S, 2017).

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Shih, J. L. et al. (Eds.) (2019). Proceedings of the 27th International Conference on Computers in Education.
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# Promoting Students' Self-Direction Skills through Scaffolding with Learning and Physical Activity Data

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## 1. Introduction

With the growing trend of preparing students for lifelong learning, the theories of self-directed learning have been increasingly applied in the context of K12 and higher education. Being self-directed would help students to prepare them for success in their future careers, and enables them to engage in lifelong learning. Since it is a cognitively and behaviorally complex task to execute self-direction, it's crucial to create a data-rich environment where students are given more opportunities to engage in self-direction.

Self-direction Skills (SDS) are acquired through experience, training, and effort. The benefits of experience and training will depend on the degree to which people engage through volitionally initiated thought processes. It is becoming a trend to utilize technologies in education, and students' learning behaviors in an online learning environment can be automatically recorded by learning systems. Such learning records provide new opportunities to model students' learning process. On the other hand, the increased availability of the activity tracking data gives individuals more opportunities for establishing benchmarks in objective metrics and improving achievements through the experience of reality (Swan, 2013). The research and design of data quantification have grown as an interest area in information and learning sciences (Lee, 2019).

Therefore, this research focuses on developing a seamless technology platform that supports SDS in students' day to day context, especially building an adaptive scaffolding in the execution and acquisition of SDS. Students' learning and physical activities are chosen as context and the interactions between students and the platform are also recorded as indicators of the development of SDS.

## 2. Research Goals

This research aims to build an adaptive scaffolding in the execution and acquisition of SDS themselves under the context of learning and physical activities. Three major areas must be investigated for the research.

- What is SDS and its sub-skills acquisition in a data-rich environment?
- How to leverage learning and physical activity data to develop SDS?
- How to design an adaptive scaffolding for the acquisition of SDS in a data-rich environment?

To achieve the research goal, the Goal Oriented Active Learner (GOAL) system is designed and implemented to integrate learning and physical activity data, concretize the process of self-direction and embed the adaptive scaffolding. Students are expected to gradually enhance their SDS in the GOAL system during the daily cycle of data collection, self-analysis, self-planning, monitoring, and self-reflection.

## 3. Related Work

### *3.1 Self-Direction Skills*

According to P21 (Partnership for 21st Century Skills, 2016) framework, Initiative and Self-Direction requires monitoring one's understanding and learning needs, demonstrating initiative to advance professional skill levels, defining, prioritizing and completing tasks without direct oversight and

demonstrating commitment to lifelong learning. It requires learners to handle multiple environments, goals, tasks, and inputs while understanding and adhering to organizational or technological constraints of time, resources, and systems. The conceptual framework gives a general criterion for a self-directed learner.

Self-directed learning (SDL) and self-regulated learning (SRL) are two most frequently used terms in today's educational discourse on the learning process (Brockett & Hiemstra, 2018; Candy, 1991; Winne et al., 2006; Zimmerman, 2008). Literature highlights their commonality and differences (Saks & Leijen, 2014). Both SDL and SRL have 4 key phases: Task definition – Setting goals and Planning – Enacting strategies – Monitoring and Reflecting. SDL due to its adult education roots is mostly used for describing the learning activities outside the traditional school environment. SRL, on the other hand, is mostly studied in the school environment.

Technological innovation in the field of data logging and rapidly increasing digital world have expanded the intersection of SDL and SRL. The processes of executing and developing SDL and SRL can be captured. For this research, I adopted a five-phase process model, DAPER which synthesizes the SDL and SRL models to conceptualize data-driven SDS execution and acquisition (Majumdar et al., 2018). It has five phases, the initial phase of data collection which gives learners the initiative, followed by the other four phases: data analysis, planning, execution monitoring, and reflection. Figure 1 provides an overview of the DAPER phases with example from the context of learning and physical activities.

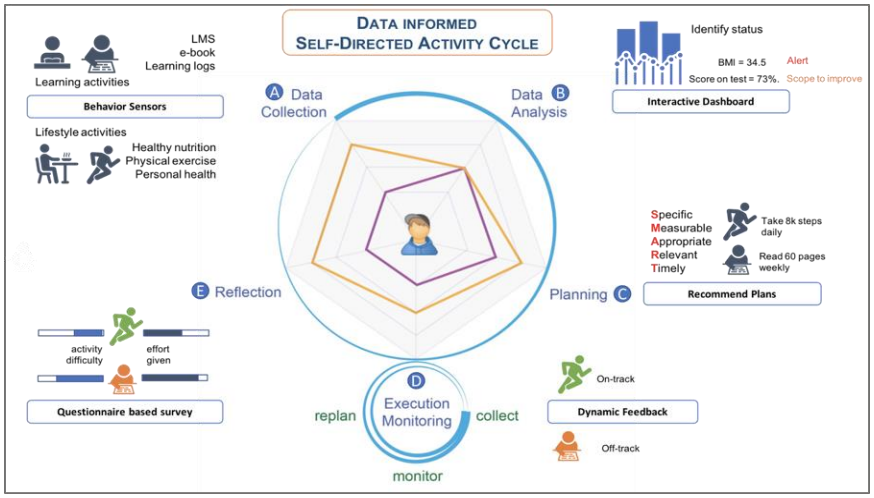


*Figure 1.* DAPER Model of Self-Direction Skills Execution (Majumdar et al., 2018)

### *3.2 Quantified-Self*

Quantified-Self movement emphasizes the importance of the regular collection, processing, and presentation of data on behavioral indicators, environmental indicators or biological indicators as measures to evaluate personal performance so that individuals can better achieve progress in their areas of interest (Choe et al., 2014). Individuals with focus on the setting process-oriented goals are often interested in the stream of data regarding their own activities during that process to monitor goal accomplishment and if necessary re-plan. The research and design of quantified-self have grown as an interest area in information and learning sciences (Lee, 2019). The quantified resources and technology begin to be used for educational purposes. But keeping track of variables of interest is often time-consuming as data collection is not unified in one application.

### *3.3 Adaptive Scaffolding*

Scaffolds are tools, strategies, and guides that can be designed to support students in directing their learning. Scaffolds can be provided by human and computer tutors, teachers, peers, and animated pedagogical agents during learning to enable students to develop understandings beyond their immediate grasp (Chi et al., 2001). Adaptive scaffolding requires a teacher or tutor to continuously diagnose the student's emerging understanding and provide timely support during learning (Azevedo et

al., 2004). Adaptive scaffolding may be more beneficial for supporting students' self-directed learning because it adjusts to meet students' learning needs. However, there is a lack of empirical evidence regarding the effectiveness of adaptive scaffolding to support the acquisition of SDS.

## 4. Methods

The Design and implementation of GOAL system is shown in Figure 2. The GOAL system integrates data during learners' learning and physical activities, tracks the interactions between learners and system, and implements the DAPER model with the functionalities required in each phase. Learners can link automatically their learning activity data from the LMS and other linked e-learning tools. For physical activity data, students authenticate to synchronize that data directly from mobile health apps or platforms for wearable devices. This system grounds the theory of SDS and enables learners to develop the skills in the context of learning and physical activities, like e-book reading, walking, running.

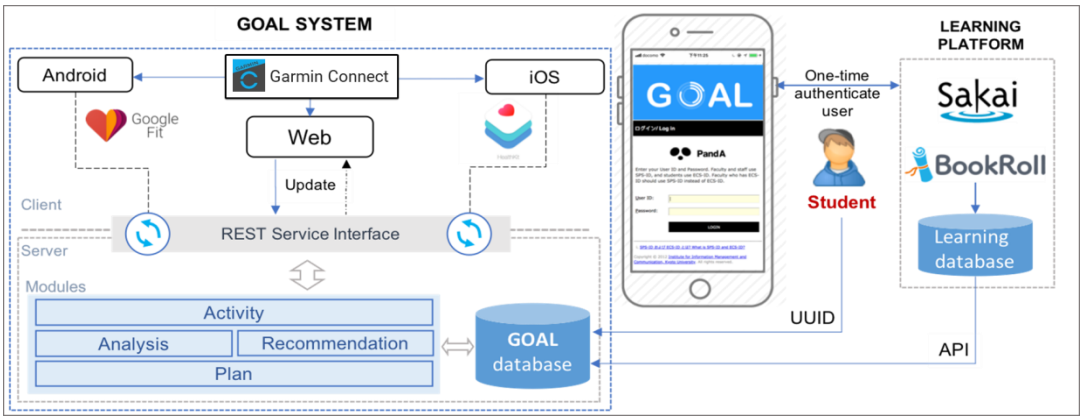


*Figure 2.* The Design and Implementation of GOAL System

The framework of scaffolding for self-direction skills acquisition in a data-rich environment is given in Figure 3. It contains activities, scaffolding in GOAL, and self-direction skills. The learners' activity data is the records of learning systems and physical activity platforms. During the learners execute their own learning or physical activity, the scaffolding will be provided to execute and acquire SDS. Two components of scaffolding are required: tasks and interface features. The tasks would be given to demonstrate the SDS sub-skills and the interface features are used to execute these tasks. Finally, five SDS sub-skills are measured and promoted based on the interactions between the learners and GOAL system: data sufficiency in data collection phase, status identification in data analysis phase, SMART (Specific, Measurable, Appropriate, Relevant, Timely) planning in planning phase, regular tracking in execution monitoring phase, and self-evaluation in reflection phase.

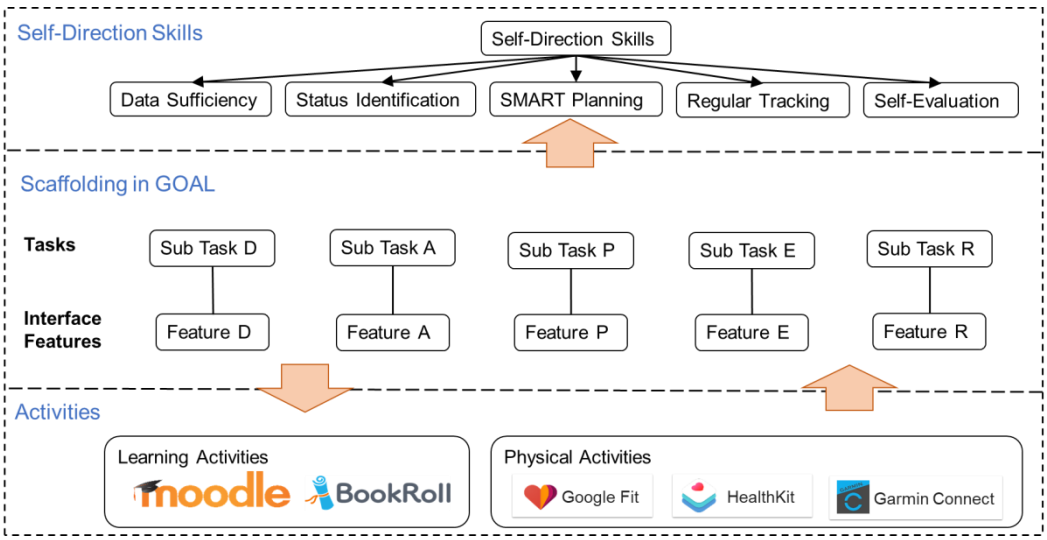


*Figure 3.* Scaffolding for Self-Direction Skills Acquisition in a Data-Rich Environment

## 5. Expected Academic Contributions

SDS are considered as a necessary 21st century skills (Partnership for 21st Century Skills, 2016). For learners, SDS is crucial to maintain academic performance as well as a healthy lifestyle while they have multiple activities to carry out. There is limited work which connects both the learning and physical data of learners and provides a holistic perspective to develop their SDS. Hence, this research explores to leverage learning and physical activity data to develop SDS in learners' day to day context.

Furthermore, there is a lack of empirical evidence of scaffolding for the acquisition of SDS. This research attempts to support learners being self-directed through adaptive scaffolding in a data-rich environment. The scaffolding is triggered in a data-driven manner and decomposed into actionable sub-tasks, which contributes to exploring a data-driven paradigm to develop such meta-cognitive skills in the current data-informed world.

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