

Jigsaw Technique in Social Media for Collaborative Learning to Enhance Intellectual Skills of Dropout Students

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Abstract— Students dropping out is influenced by both individual and institutional factors. The people also suffer costs since a scarcity of competent workers may jeopardize the nation's economic capability, and dropout students are more likely to be frequent beneficiaries of welfare and unemployment benefits. Due to these negative implications, educators, academics, and politicians have long regarded student's dropout to be a severe educational problem. A dropout early warning method can assist schools in proactively identifying and responding to students who are at the danger of dropping out. Such students are more likely to do so without properly evaluating the negative ramifications of their actions or without having the opportunity to speak with specialists. Collaboration is a method of engagement and a personal attitude in which people take responsibility for their own actions, learning, and talents, including the contributions of their peers. This project aims to prevent student's dropout by using mobile devices and social media to transmit resources in addition to connect with academics in college over the boundary wall, which has been a previously unexplored field of research. The objective of these strategies is to develop interest of students through cooperation and collaboration. Along with the Collaborative Learning (CL) strategies, jigsaw learning pattern has been found to be highly effective. In this study, 15 lecturers, 20 staffs and 593 students in different disciplines at an education faculty of a university in Tamil Nadu have involved in this research. Interactivity with professors, classmates, and online information sharing behavior have also been shown to have a major influence on students' event engagement activity, and that has created a major influence on academic success of students. Based on this research, it is worth noting that using online social media for CL has helped students gain confidence and improve cognitive skills, which has helped them avoid dropping school.

Keyword: *Collaborative Learning (CL), social media, Jigsaw learning pattern, Student's dropout, Cognitive skills, Event engagement*

1. INTRODUCTION

The high percentage of student failure is a big and serious problem in academic institutions. Several studies have been conducted to show that failure of students is driven by a complex communication of numerous important elements all over the academic process. This might suggest that rather than a single factor, a collection of variables determines the likelihood of students dropping out. As a result, the issues surrounding higher education attrition has been thoroughly investigated [1]. Many European countries do not keep regular records of higher education performance rates. Only 12 of 35 European nations regularly provide completion metrics, according to a research. Even fewer nations provide data on dropout, time and retention to degree. Owing to variances in fundamental terminology, framework and institutional structures among higher education structures, cross-country relative data must be used with caution [2].

A Virtual Learning Environment (VLE) is an online tutorial room wherein students and teachers may connect with one another. Assignments, class information, and learning resources are given by the Internet. The number and complexity of data acquired by educational database technology is continuously expanding, allowing for data mining, statistical analysis, and predictive actions. Education Data Mining (EDM) has arisen as a novel subject in the last 10 years, concentrating on the application of statistics, Machine Learning (ML) and Data Mining (DM) to data generated in educational setup [1], with the knowledge gained potentially helping to enhance

teaching/learning processes. Collaborative Learning (CL) is an assortment of learning and teaching practices that inspire students to collaborate and work together in small groups (2 to 5 students) to make the most of each other's learning and their own. Teachers have sought to incorporate dissimilar sorts of cooperative activities into their classroom curriculum to attain this goal. In this work, a report on student and teacher impressions of cooperative events provided by instructors to increase student collaboration is given. Until date, studies on the use of CL have only looked at the issues faced by either instructors or students [3, 4]. By concentrating merely on students or teachers, the core reasons and issues that students and instructors confront during CL, as well as the ramifications of such concerns, is not adequately investigated.

Aronson [5] invented the Jigsaw educational approach, which is a highly organized cooperative learning method. An instructor presents a topic including its subtopics while using Jigsaw method. The pupils are then separated into 'home' groups, each of which is assigned to a particular subtopic. After that, the students must divide up into 'expert' groups, wherein they will emphasis on only one subtopic, study it, and discuss it and consequently, students become experts in the subtopics that have been allocated to them. Students from all of the 'expert' groups must then return to their 'home' groups and teach their classmates based on what they learned and discussed. All members of the 'home' groups will have gained information from each expert group discussion and will have benefitted from one another at the conclusion of the process. Students in this digital era are increasingly exposed to a variety of rapidly evolving technologies, as the cyber world of modern technology offers them unparalleled opportunities for study, cross-cultural contact, and self-exploration. Teachers can use these resources to get students to work on a Jigsaw project that they've already planned. The tools are not intended to take the place of students' face-to-face classroom work. Instead, they are meant to help with a variety of teaching and learning activities. The tools are particularly important for allowing the instructor to keep track of activities. This monitoring may be used by the instructor to refine his or her method and, eventually, to conduct successful CL exercises in a short period of time.

In contrast to traditional teacher-centered pedagogical approaches, the new generation of educators is rapidly moving toward a learner-centered pedagogy model built on cooperation. By enabling users with new methods to access, connect,

communicate, and concrete with one another, part of this transformation process has been aided by social networking sites that give current Internet resources. These web-based technologies encourage the response procedure as an important aspect of CL by serving as a vital vehicle for association and communication amid students [6]. Active contact with things and others in a social setting is required for the production of meaning, learning, and knowledge acquisition. Social media and new technology, on the other hand, are proving to be excellent CL mediators by giving educational assistance to students in the areas of material sharing, creative thinking, and expertise in a virtual network [7]. Therefore, this research focus on CL through social media using Jigsaw learning pattern which assist each students to participate in the individual group. Thus, each student are involved in assigning task who take charge of the small portion of the project and understand the event engagement assigned to their individual team. Moreover, the cognitive skills and attitude of students gets improved due to this CL, and build confidence in students who participated in this event engagement. This event engagement assists in building student confident as well as reduces the dropout students.

2. LITERATURE REVIEW

Some studies [8, 9] have offered general models and frameworks, as well as examined the challenges in these fields. They demand a more thorough examination of the datasets utilized and their intended use in these articles. There is, however, no more comprehensive and systematic research on how these resources are used in accordance with institutional regulations, whether they are tied to management decisions or to educational interventions. This paper highlights the options offered to decrease dropout using predictive ML algorithms in this research. Helal and Yang, on the other hand, believed that forecasts made in the initial stages pertaining to educational process are erroneous, thus multiple models should be built and used at different educational levels [10, 11]. This is clear when comparing the classification accuracy of the ANN model employed (0.768) to the results of [12], who used multilayer perceptrons (a more advanced kind of ANN) to predict dropout in the pre-registration, first semester, and first year phases. The classification accuracy of the model used during the pre-registration stage was 0.667, which is equivalent to the application stage of the ANN model produced; however, the classification accuracy of the models used throughout the first semester and year was better than 0.95. It implies that the study's

model might be modified and deployed at other phases to incorporate more elements that impact dropout rates. In spite of the fact that ANN model utilized made forecasts when students are still in their first year of university, its use was advantageous for making primary educational interferences because dropout rates are greater through these years [13].

The usage of mobile devices and social media in higher education is a recent sensation has garnered very little consideration. Mirela Mabi, 2014 conducted a study among students at Faculty of Economics at the University of Mortar, and determined that social media is already being used to share materials and communicate data, and students are keen to utilize social networking sites like SlideShare for the purpose of education, particularly communication in addition to e-learning [14]. According to a report published by the US Department of Education, the majority of faculty members use various forms of social media for professional purposes, such as using social media to teach international business, utilization of social media and mobile devices to share content with far-flung students, sharing, and at the global level, the participatory nature of internet and mobile technology creates a better learning environment. A Saudi Arabian institution found a connection amongst conversing, file and information sharing, online discussion, as well as pleasure and enjoyment, and student learning in a survey of 308 graduate and postgraduate students [15].

Another research is a case study of first year and second year college students at Thau nichu Institute of Generation, by Kittinan Limsathitwong, Thai-Nichi, and Kanda Tiwatthanont. They are evaluated to determine the dropout rate and the projected grades of the students. To increase the prediction methodologies' performance, Decision Tree algorithms and Random Forest Algorithms were applied, and a decision was made. The tree classifier's accuracy, recall, and F1-degree were 0.80, 0.92, and 0.85, respectively. The findings indicated that the predictor's typical effects were acceptable. Dropout college students may be able to understand the application and identify pupils who require special care. This is quite useful for supporting students in fine-tuning their studying method and rigorously screening their overall performance [16]. The authors of [17] provided a self-directed learning-based strategy for analyzing dropout rates, establishing a causal link between intention and obligation, and defining behavioral commitment as a criterion for an "active learner".

In [18], the authors recommended a learner typology consisting of "inclined actors," "inclined abstainers," "disinclined actors," and "disinclined abstainers," with an actor being a learner who acts or shows behavioral commitment and an abstainer being the polar opposite, whereas the word "inclined" demonstrating a learner's original intention and "disinclined" signifying the polar opposite. Although previous study has indicated a variety of challenges that instructors confront when utilizing CL, these studies have not adequately addressed the fundamental reasons or precursors of such difficulties [19]. Furthermore, the problems that instructors are dealing with are likely to damage students who collaborate. On the other hand, previous research has paid little attention to the relationship between teacher and student issues. If instructors, for example, are unable to observe students' group discussions and respond appropriately when required, or demonstrate acceptable collaborative behavior, the collaborative process' quality as perceived by students is likely to decrease [20].

Sulisworo, Ishafit & Firdausy, 2016 described that, when the Jigsaw technique is used, students are pulled from their own groups and placed in new groups with other students who are working on the same subject as them. Those organizations have been referred to as "expert teams." Those groups attempt to collaborate with the other students community in order to assist them comprehend the subject. Methods were also designed for passing on their expertise to their coworkers and a final report can be submitted. As a consequence, they come back to their own teams with a plethora of experiences and reports from earlier groups. Jigsaw group students is not only able to absorb the teachings more rapidly, but they is also in a great position to share what they was learned with their prior group members since they has the opportunity to share their expertise with their peers. The experimental group students grew as a result of their experiences working with their partners, expressing their learning challenges with them, and fulfilling their particular tasks. As a result, having many opportunities for engagement aided their learning of mathematics abilities. These findings were also consistent with prior research findings [22, 23]. Students in the experimental group have a more favorable attitude about mathematics lessons than students in the control group when it came to student attitudes toward the Jigsaw teaching style. This might be explained by the experimental students' excitement at the possibility of studying mathematics for the first time utilizing the Jigsaw teaching method. Because of their passion, they also outperformed the control group. Prior research [24, 25] supported

these findings. Most students said "this strategy boosts learning," "improves self-assurance," "provides teamwork and commitment," "allows learners to be much more active," and "it works like teaching to learn," according to the research. Identical points of view have been documented in previous research [26, 27].

Subarna Shakya [28] addressed the privacy issue, and proposed an offloading method that can be used in smart city to strengthen the privacy, promote edge utility and improve offloading efficiency. In order to establish balance between the collaborative service and privacy preservation, edge computing is integrated with information entropy. The performance is further verified using simulation analysis in appropriate environment. Pasumponpandian [29] addressed this issue and further optimized E-Projects Portfolio Selection (EPPS) probe on social media. The work focused on building a hybrid algorithm known as NSGA-II-MOIWO. This algorithm makes use of the positive aspects of MOIWO algorithm and NSGA-II algorithm in order to develop an efficient one. The experimental results were recorded and analysed in order to determine the most optimal algorithm based on the return and risk of investment.

3. RESEARCH METHODOLOGY

The goal of the study is to reduce dropout rates by meeting students' needs while adhering to the regulations and procedures of the research organization. Interactivity with classmates and teachers, components of student involvement, this research includes a statement on the use of social media for cooperative learning as well as factors of student academic performance. Contact with peers is measured, and the sample of students who use social media in class and at home has facilitated peer interaction. However, the interaction with professors is quantified in which the students are supported to speak with the lecturer and carefully monitored with supervisor or mentor utilizing jigsaw pattern teaching in social media. As a result, supervisors and lecturers at the school use social media to monitor and analyze student involvement in events. As a result, four measures are used to assess Jigsaw pattern teaching in social media for collaborative learning, demonstrating that social media learning is superior to face-to-face learning.

3.1 Data collection

After the collection of the dropout reasons and number of the students, they are segregated and interacted with top ranked students as the volunteers of the institute. There are 593 students involved in the CL with Jigsaw pattern teaching whereas, there are 451 members who have interest to dropout and 142 students as leaders who are top ranked as well as not interested to dropout. Based on the academic year 2017-2018, there are 28 groups in which 2 members are allotted for each leaders. Similarly for the academic years 2018-19 and 2019-20 there are 59 and 55 groups correspondingly, and 3 members for each group in 2018-19 and 4 members for each group in 2019-20 academic year respectively. Hence, teaching staffs are involved to monitor as well as act as a mentor, and lecturers have been involved to validate the performance of the both dropout interested and non-interested students. There are 50 male and 33 female students from 2017-18, 147 male and 89 female students from 2018-19 academic year and in the case of 2019-20 there are 172 male and 102 female students respectively. The involvement of CL through social media with Jigsaw pattern teaching is done. Therefore, this dataset includes the analyzed CL skill interacted students through social media as CL.

3.2 Jigsaw teaching Pattern

The pattern of Jigsaw teaching is done through social media as a CL is involved in this research. The Jigsaw pattern is involved with four major processes namely

- Planning and preparation process
- Implementation process
- Observation process
- Reflection process

1. Planning and Preparation process

The dropout students are made into groups whereas the lecturers are selected and admitted to evaluate the performance of all participated students, in this methodology. The mentor or supervisors are utilized for monitoring the student's activities who participated in the events initiated by the lecturer. The students participated are grouped and each group has a non-dropout student as the leader and dropout students as members, and studies are conducted through social media as CL. The activities involved in these studies are academic and also cognitive skills that are executed by students. However, the students are monitored by the supervisor and evaluated by the lecturer, which helps to analyze the students' performance. Therefore, the students' performance and cognizant skills are

evaluated in term of scores and simultaneously, the satisfactions of students are defined in the status. The figure 1 illustrates the Jigsaw pattern for CL using social media.

2. Implementation process

The academic performance of students is assessed using five indicators. Utilizing social media for building a student-lecturer relationship with professors, helps perform better in class. The usage of five symbols to assess online knowledge sharing behavior, and the guidance received from other colleagues who utilize social media has enhanced the experience of students.

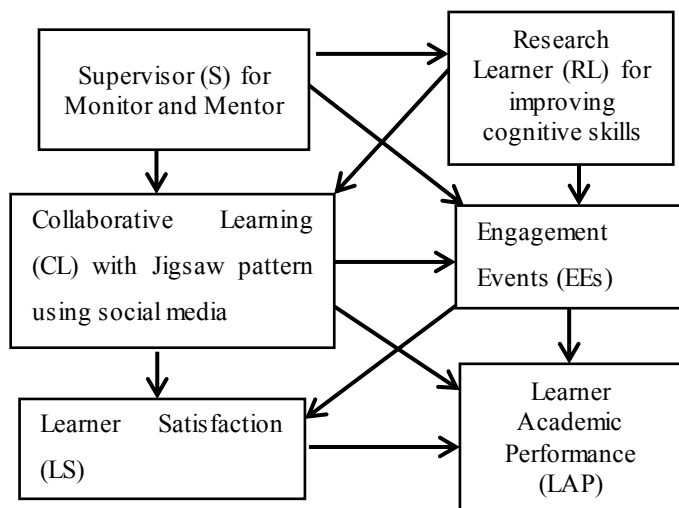


FIGURE 1 PROPOSED FRAMEWORK OF JIGSAW PATTERN FOR CL USING SOCIAL MEDIA

3. Observing process

The lecturers have introduced the engagement events by providing several subtopics to the group. The supervisors are involved in monitoring both the members and leaders participated in this research. However, the involvement of both dropout interested students and non-dropout interested students have been monitored and mentored if necessary. Hence, the observing process have better interaction with students, supervisor, and lecturers. As a result, the academic performance of students has been monitored using five primary indicators, and social media has been used to develop a student-lecturer interaction and even increase student academic performance. The observing processes are discussed below.

- Each member from the group may assign the roles for the subtopic given by the lecturer. The group leader can assign, as well as the group member can lead and assign the work to complete the task.
- Each heterogeneous group has their respective subtopics; the problem analyzing it, plays a major role to complete the task on time. Each member is provided with a limited time to analyze the problem.
- In the discussion time, all the students are required to discuss their points and during discussion the students of the group have to listen and take notes of essential points to acquire knowledge.
- After discussion, the student of the group understands the topics and the problem faced. This assists to accept the difference from their ideas and acquire knowledge by surfing the details of unknown area of the topics.
- Completion of task from each member and group leader of the group is reported and a daily activity report from the teammates of the respective group is made.
- In order to present the subtopics, the lecturer guides and facilitates the student to understand and complete. Supervisor notes down the group members and leader, about their interaction, helping and respecting each other activities.

4. Reflection process

This process is involved in identifying and justifying the student cognitive skills and the performance of student's academics. The performance of students and cognitive skills are measured based on the score given by the lecturer, and the behavior and interaction of students are evaluated by the supervisor. The attitude performance like helping, developing friendship, respecting other team members, and assigning roles have been evaluated through scores from supervisors. However, the focus of this research is to avoid dropout student by improving the student's skills and their confident level. Therefore, the CL through social media assist in better interaction of students, lecturer and supervisor that build the relationship with lecture and the students in developing the cognitive skills as well as relationship among the students and mentors to build the bridge gaps in students' use of strategies. The students are motivated by the supervisor when the students lose their confident level in proceeding the activities of engaged events provided from the lecturer and group leader.

Moreover, the activity monitored and advised by the supervisor as well as feed from the lecturer have produced the outcome with student's satisfaction status. Hence, the attitude and cognitive knowledge of students are analyzed by their score given by supervisor and lecturer, which is out of 10 as shown in figure 2. The students who have considered this jigsaw pattern teaching of CL with social media are listed based on their academic year joined. The year of students joining is mentioned as 2017-2018, 2018-2019 and 2019-2020, which is shown in table 1.

Table 1 Student Satisfaction status based on academic year

S.No	Academic Year	Student Satisfaction	
		Yes	No
1	2017-2018	78	5
2	2018-2019	228	7
3	2019-2020	256	18

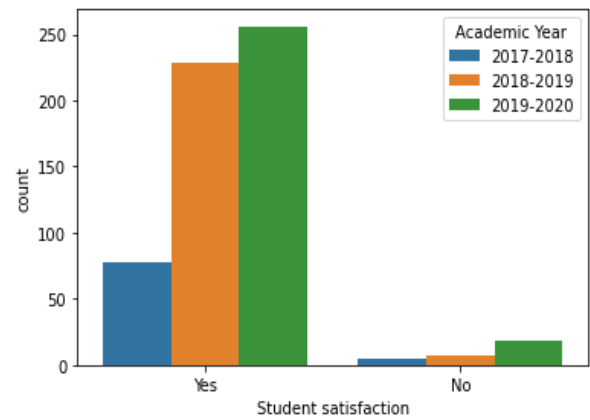


Figure 3 Status of student satisfaction using Jigsaw pattern CL using social media

Moreover, the proposed Jigsaw pattern teaching with CL using social media is evaluated through machine learning model logistic regression with its accuracy score and specificity value. Therefore, this research has generated a solution to minimize the dropout interest from the student's mind of their institution.

4. RESULTS AND DISCUSSION

Student ID	Academic Year	Gender	Dropout Interest	Group	Team role	Problem Analyzing	Making Group report	Surfing for details	Accepting differences	Assigning roles	Listening	Notes Taking	Completing task	Acquiring knowledge	Helping	Respecting	Developing friendship	Scores from supervisor	Scores from lecturer	Status
20171002	2017-2018	Male	Yes	A-1	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	8	Yes
20171003	2017-2018	Male	Yes	A-1	Member	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	No	6	6	Yes
20171004	2017-2018	Female	Yes	A-2	Member	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	7	7	Yes
20171008	2017-2018	Female	Yes	A-2	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	9	Yes
20171019	2017-2018	Male	Yes	A-3	Member	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	5	5	No
20171020	2017-2018	Male	Yes	A-3	Member	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	7	7	Yes
20171021	2017-2018	Male	Yes	A-4	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	6	8	Yes
20171024	2017-2018	Male	Yes	A-4	Member	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	8	Yes
20171025	2017-2018	Male	Yes	A-5	Member	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7	8	Yes
20171026	2017-2018	Female	Yes	A-5	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	9	Yes
20171030	2017-2018	Female	Yes	A-6	Member	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	9	Yes
20171041	2017-2018	Female	Yes	A-6	Member	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	7	7	Yes
20171043	2017-2018	Male	Yes	A-7	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	8	Yes
20171044	2017-2018	Male	Yes	A-7	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7	8	Yes
20171045	2017-2018	Female	Yes	A-8	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	8	Yes
20172001	2017-2018	Female	Yes	A-8	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	8	Yes
20172002	2017-2018	Female	Yes	A-9	Member	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	5	6	No
20172004	2017-2018	Female	Yes	A-9	Member	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	7	6	Yes
20172012	2017-2018	Male	Yes	A-10	Member	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	9	Yes
20172017	2017-2018	Female	Yes	A-10	Member	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	8	Yes

Figure 2 Dataset of student event engagement in Jigsaw learning pattern using social media as CL

Figure 3 illustrates that the academic year of recent joining students are more involved for dropout interest and now they have motivated and built confident level. This assists in improving their cognitive skills and attitude of helping and respecting their group members as well as assigning the roles to each other.

Based on the experiment results, the student's satisfaction status is made to be evaluated with respect to the cognitive skills, attitude and scores provided by both lecturer and supervisor. However, the ML technique assists in evaluating the significant and optimal features to predict the student satisfaction status. The logistic regression model has been built to identify the features significant by Recursive Feature Elimination (RFE) in order to perform the model accuracy better. 15 attributes are considered for this proposed jigsaw pattern whereas the lecturer as well as supervisor have identified their skills through monitoring the event engagement. In the case of lecturer, the student deliverable is the key source and their involvement in the activities in the event engagement. The cross-validation scores assist to identify the most significant features present in the 15 features namely problem analyzing, scores from supervisor and scores from lecturer. The optimal number of features is shown in figure 4.

Optimal number of features: 3
Selected features: ['Problem Analyzing', 'Scores from supervisor', 'scores from lecturer']

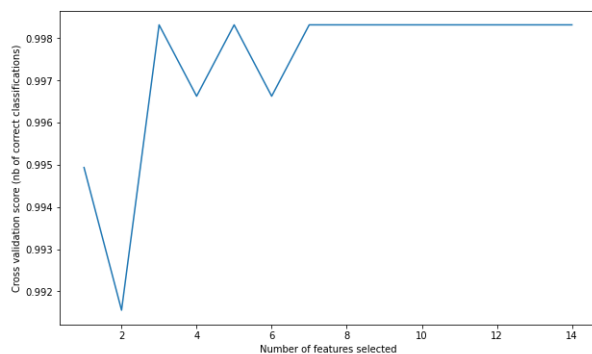


Figure 4 Optimal number of features from dataset

Figure 5 illustrates the evaluation of test split model in justifying the classification scores of the proposed model with accuracy of 99.2%. The AUC of logistic regression is 1.0 which represents that specificity is 1.0, and that means the false positive rate is 0.0%. According to this research, the non-dropout students do not get diverted and their status of satisfaction is “Yes”.

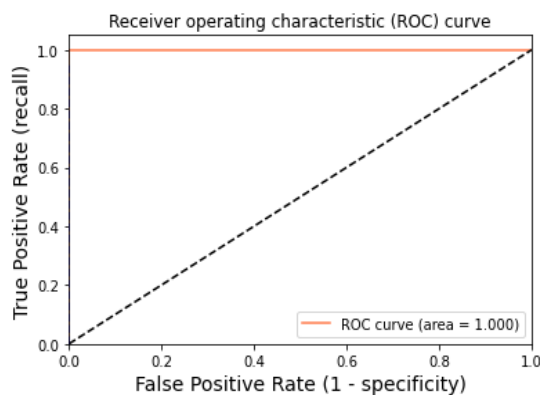


Figure 5 ROC curve for Logistic regression

The cognitive skill and attitude related to the available features are made correlated to identify the strength of interpretation, which is shown in figure 6. The attitude gets established with correlation value of 0.81 with making group report and helping, as well as 0.73 value in helping with completing task.

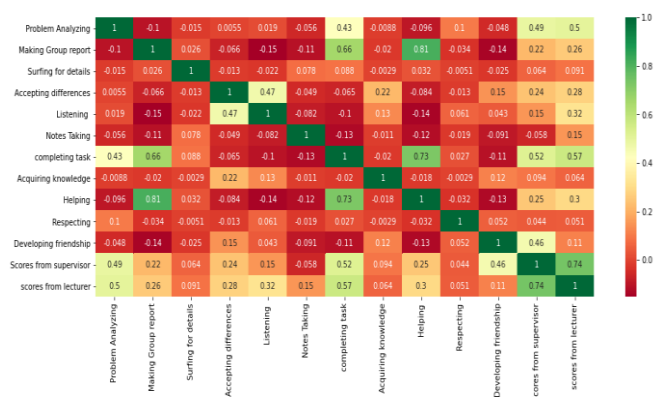
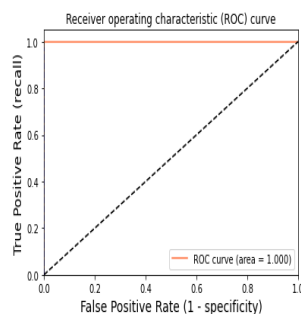


Figure 6 Heatmap of cognitive skill correlation of Jigsaw pattern with CL through social media



Using a threshold of 0.990 guarantees a sensitivity of 0.974 and a specificity of 1.000, i.e. a false positive rate of 0.00%.

Figure 7 ROC curve for Logistic regression with 10-fold cross validation

A 10-fold cross validation is made, and the accuracy score gets improved by 0.6% which brings the accuracy from 99.2% to 99.8% and the average log loss score is 0.019. LR of validation loss is 0.006. However, there is no change in ROC curve with 1.0 which represents specificity of 1.00 and sensitivity of 0.974 as shown in figure 7. Hence, the student gets satisfied from the event engagement representing the sensitivity value. Thus, it is strongly recommended that the pattern of jigsaw with CL using social media in institutions for reducing the dropout interest in the students.

5. CONCLUSION

The academic literature continues to debate whether students can interact more successfully utilizing social networking sites and social media or not. It's vital to note that the majority of university students now utilize social media for connecting with teachers, colleagues, and keep the group engaged and connected with old friends, as well as to transfer resources. In today's environment, most university students have access to a range of social media community groups, such as Facebook pages and Whatsapp groups, where they follow many academic websites to

broaden their knowledge. The work's main purpose is to give students and teachers a meaningful learning experience, and the social media jigsaw teaching pattern is considerably more successful than lectures since it stresses collaboration. The present study concentrates on Jigsaw style and reveals that in order to reach academic greatness, just a small number of pupils must be aware of the importance of CL. The experimental group shows a considerable gain in academic success, implying that Jigsaw learning is more effective in comparison to traditional teacher-centered learning. The evaluation is done using the logistic regression method with the results of 10-fold cross validation, and the accuracy score improves by 0.6 percent, bringing the accuracy from 99.2 percent to 99.8 percent, and the average log loss score is 0.019. The ROC curve with a value of 1.0 indicates that the specificity is 1.00 and the sensitivity is 0.974. Because of the increase in cognitive skills and confidence level, this way of application in the institute may minimize student's dropout. The future work is to implement the collaborative model to all the students inclusive of non-dropout students for analyzing the cognitive skills and improve their standards from the feedbacks of supervisor and lecturer.

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