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A Study of Learners in Information Retrieval System in Relation to Learning Parameters

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Abstract—

For the last few years, education methodologies are drastically changing as per leaner's needs. In the current competitive environment, if a learner wants to achieve a good grade in their course work the learner should focus on various parameters as per their learning style. In this paper, we focused mainly on learner-centric approach rather than teacher-centric approach. Learner -centric approach facilitates the leaner to involve in the teaching learning process. In this approach, educationist considers learning curricula, learning theories, learning styles, learning models, learning methods, and learning evaluation to understand learner's effectively. Educationist can track the involvement of the learner and their progress by various approaches, but learning analytics is a modern approach to understand, focus and analyze learner's easily with available tools and technologies. In this paper, we focused on learning analytics approach with a group of learners to understand their ability of learning based on cognitive theory and able to find slow and fast learners.

Keywords— Learning; Analytics; Learner Centric; Fast Learners; Slow Learners; Learning assessment; Cognition.

I. INTRODUCTION

Learning can be defined as a change in behaviour as a result of experience. It is greatly influenced by teaching. Therefore, Teaching includes all activities to provide education through interaction so that learners can stand on their own feet. Learning Analytics is the measurement and analysis of collection of data about learners and their contexts for effective learning process. Academic institutions are now drawing attention in finding methods for making effective learning process, for identifying learner's achievements and weakness, for tracing academic progress and also for predicting future performance. For effective learning process, educationist considers Learning curricula, Learning Theories, Learning Styles, Learning Models, Learning Methods, and Learning Evaluation as shown in fig: 1. Depending on the curricula and learners understanding level, learning styles and methods may be varied. A Learner centered approach is the more interactive approach, which involve the learners in teaching learning process .It shifts the focus of learner from traditional teacher centric approach and also influences the learners interest level. By practising this approach, learners gradually develop the problem solving skills and improve their performance level by participating in group discussion and collaborative team work.

Learning Analytics

Learning analytics is defined as the collection, measurement , analysis and reporting of data [3] about learners and their contexts, for the purpose of understanding and learning optimization, and the environments in which it occurs. Learning analytics helps us to:

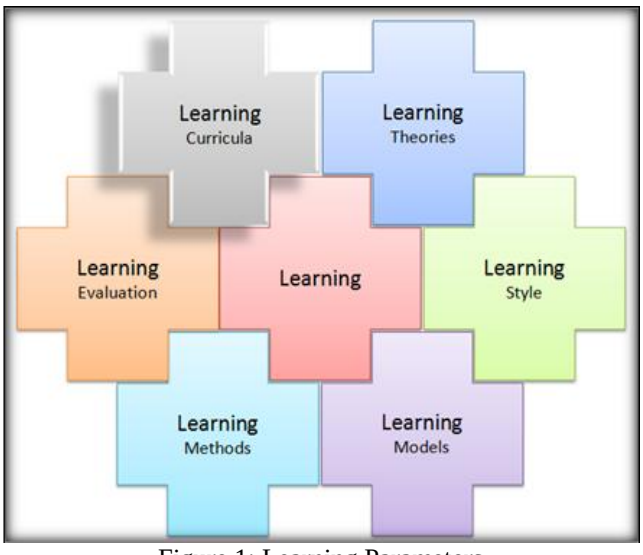

Figure 1: Learning Parameters

- Enable grade prediction and learner success
- Improve learner retention
- Determine what learners know and what they currently do not know
- Monitor learner engagement
- Personalize learning
- Ensure relevant content is delivered
- Reduce classroom administrative work
- Measure learner performance

Learning Curricula: Curriculum is the name in which it explains "the course to proceed". It not only include the course name and the lessons that to be learned, but it is a cluster of some procedural activities such as what to include in the course curriculum, teaching-learning process ,and an assessment of learner with respect to course curriculum as shown in the fig:2

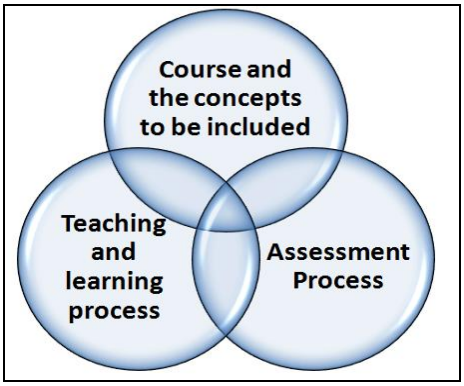

Figure 2: Learning Curriculum

Curriculum can be ordered into a step-wise procedure as follows:
Step-1: Choose the course(s) to include in the curriculum.
Step-2: Form the objectives of learning that particular course
Step-3: Select the content to include in the course
Step-4: Properly organize the content to frame the syllabus
Step-5: Determine whether the practical session is needed or not
Step-6: Allot the sufficient time period to teach the course as well as to practise.
Step-7: Determine the ways of evaluation.

Learning Theories: It describes about how the information is absorbed, processed and remembered during the learning process. Various factors that influence on learners during learning. Few such factors include cognitive (i.e., their thinking, reasoning and remembering level), their prior experience with the concept, their emonality at that time, and also the environment[5]. These parameters show an impact on understanding level of the learner. Theories about learning can be grouped in to four distinct perspectives as specified below:

- *Behaviourism* : It focuses on observable nature of a learner
- *Cognitive:* It describes learning as a mental process i.e., Think, analyze and problem solving approach.
- *Humanistic:* It deals with the leaner emotions and its impact on the learning.
- *Social:* It describes about how the learners do their best in group activities rather than individual efforts.

The other cluster of theories that evolved are basing on memory, intelligence and instructional.

Learning Methods: In general, people learns any concept through a lecture in a class, reading, audio-visuals, demonstration, group discussion, practise, and by teaching others. Percentage level of acquiring knowledge in the above specified methods given by Edger Dale's cone of Learning , is as shown in fig: 3. The various methods of learning include:

a. Definition Based Learning(DBL): Both Problem and Method are known to students. It is also termed as ‘routine’ mode of learning
b. Solution Based Learning(SBL): Problem is known, the method is to be selected by the students.It is also termed as ‘problem solving’ mode of learning
c. Inquiry Based Learning(IBL): Students actively pose questions, investigate, solve problems, and draw conclusions about the topic .
d. Project Based Learning(PriBL): Students work collaboratively to explore a problem or issue and create a presentation/product to demonstrate their learning
e. Problem Based Learning (PBL): An authentic problem is used to define and drive the student learning experience. It is also termed as ‘problem orientation’ mode of learning
f. Case Based Learning(CBL): A complex case is provided to students and followed with in-class discussion about content and concepts

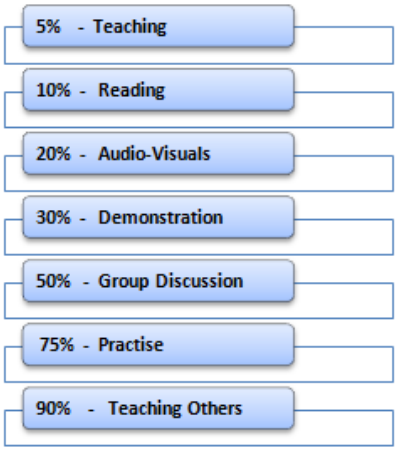

Figure 3: Learning Methods

Learning Models: In general, the top two learning models used for effective learning are:

1. *Active Learning:* Active learning instructional strategies include different activities that share the common element of involving students in doing things and thinking about the things they are doing‖. Active learning instructional strategies can be created and used to engage students in thinking critically or creatively, speaking with a partner, in a small group, or with the entire class, expressing ideas through writing, exploring personal attitudes and values, giving and receiving feedback, and reflecting upon the learning process. Active learning instructional strategies can
   (a) be completed by students either in-class or out-of-class,
   (b) be done by students working either as individuals or in group, and
   (c) be done either with or without the use of technology tools
2. *Experiential Learning* :Learning analytics systems apply models to answer various questions to assess the learners whether they are Active Learners or Passive Learners

Learning Styles: People have different learning styles and techniques. Everyone has a mixture of different learning styles. People use different style in various circumstances. Distinct learning styles are discussed as follows:

1. Visual (spatial): People who prefer using pictures, images, and spatial understanding are good in learning visually.
2. Aural (auditory-musical): People who prefer using sound and music are comes under this type of learning style.
3. Verbal (linguistic): People who prefer using words, both in speech and writing are verbal learners.
4. Physical (Kinaesthetic): People prefer using your body, hands and sense of touch are kinaesthetic learners.
5. Logical (mathematical): people prefer using logic, reasoning and systems are logical learners.
6. Social (interpersonal): People prefer to learn in groups or with other people will have interpersonal skills.
7. Solitary (intrapersonal): People who prefer to work alone and use self-study may have intrapersonal skills.

Table 1: Evaluation by Learning Activity

S.No	Learning Activity	Learning Outcome	Learning Report	
1	Read	1. Define 2. List Out 3. Describe 4. Explain	20% :: on what they hear and read	Slow Learners
2	Hear			
3	View images	5. Demonstrate 6. Apply 7. Practise	50% :: on what they see and hear	
4	Watch videos			
5	Attend Exhibits /websites			
6	Watch a Demonstration			
7	Participate in hands-on	8. Analyze 9. Design 10. Create 11. Evaluate	70% - 90% :: on what they think, analyze, apply and do	Fast Learners
8	Simulate, Model or Experience Lesson			
9	Design/Perform a Presentation- "Define Real Time problem"			
10	Evaluate			

Learning Evaluation: People have different learning styles and techniques. Everyone has a mixture of different learning styles. Outcome of the learner depends on their Learning activity such as reading, hearing, viewing images, watching videos, by giving demonstrations, participating in practical sessions, by giving presentation and so on.Various stages in progress of learner are as shown in Table-1:

II. PROPOSED APPROACH

In general, a class having set of students may have multiple learning styles. Using multiple learning styles and multiple intelligences for learning is a relatively new approach. As discussed in the table 1, people may learn through reading, writing, watching audio-visuals, practising, or by discussing. So, in this paper we discussed Learner Centric approach in learning Text mining. Basically, we started with Learning, parameters of learning, and then followed by learners Assessment. As a part of Evaluation, we used a questionnaire set, in which easy to moderate questions are to be given to learners. The questionnaire set is prepared by giving 40% at basic level and 60% at application level. Therefore, considering the performance of the learner in the given questionnaire set, we set a threshold value. The learners who are above the threshold value are grouped as Active learners whereas, the learners who are below the threshold value, are grouped as Passive learners. This analysis helps us to predict the learning methods of the learner while learning.

III. LEARNING EVALUATION

Since Learning can happen through Reading, Writing, Listening through audio-visual aids, in our approach evaluation can also be in most possible styles [4]. In other words, assessment was done by the following the questionnaire set ,in which the questions Q1,Q2,Q3,Q4 are at the basic level and the questions Q5,Q6,Q7,Q8,Q9,Q10 are the application level i.e., to analyze and apply. The questionnaire set contains the questions such as define, differentiate, analyze, list out, apply, apply with an example etc..,. The Questionnaire set is as shown in the table given below.

Table 2: Questionnaire set for Assessment

S.No	Questionnaire Set	Questionnaire standard
1	Define Information retrieval system?	Lower-Order Thinking Skill
2	How Information retrieval is related to DBMS, Digital libraries and Data Warehouse?	
3	Explain the functional overview of Information retrieval system?	
4	List out the information visualization methods?	
5	Apply inverted file structure on minimum 50 word paragraph?	Higher-Order Thinking Skill
6	Create an N-gram data structure(Bi-grams and Tri-grams) for "Computer Science Engineering"?	
7	Construct a PAT tree, by taking an example?	
8	Analyze various software text search algorithms?	
9	Demonstrate the porter stemming algorithm by taking an example?	
10	How can you evaluate an information retrieval system?	

IV. RESULTS

A. Data Set:

The prepared questionnaire is given to a set of 40 students, who are pursuing Text mining as part of their curriculum. The questionnaire set as shown in table:2 of total 10 questions are designed in such a way that 40% of the questions are at the basic level i.e., the questions Q1,Q2,Q3,Q4 are at the basic level and the remaining 60% of the questions i.e., Q5,Q6,Q7,Q8,Q9,Q10 are at the application level. During the evaluation we calculated the three separate score. One at the easy level, the second at the application level and the third is the total score. Basing on the total score as shown in table: 3, we set a threshold value. The learners who are above the threshold score are grouped as active learners [6] and the groups who are below the threshold are passive learners [1]. Since the easy level questions are countable four in the given questionnaire set, we set a threshold value four to our data set as shown in the table.

B. Reports :

For the chosen data set , the corresponding two reports[2] as listed below are provided:

i. The first report as shown in fig:4, the number of students attempted the each question in the questionnaire set
ii. The second report as shown in fig: 5, gives the active learners and passive learners from the total number of students attempted, by considering the threshold value greater than four.

Table 3: Assessment Data set of Learners

	Questionnaire set (Questions : 10)													
Regd No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SCORE (Q1+Q2+Q3+Q4)	SCORE (Q5+Q6+Q7+Q8 +Q9+Q10)	TOTAL SCORE	REPORT
IT1201	1	1	1	1	0	0	0	1	1	0	4	2	6	Fast Learner
IT1202	1	1	1	1	1	1	0	0	0	0	4	2	6	Fast Learner
IT1203	1	1	0	0	0	0	1	1	0	0	2	2	4	Slow Learner
IT1204	1	0	0	0	0	0	1	0	0	0	1	1	2	Slow Learner
IT1205	1	1	1	1	1	1	1	0	0	0	4	3	7	Fast Learner
IT1206	1	0	1	1	1	1	1	0	0	0	3	3	6	Fast Learner
IT1207	1	1	1	1	1	1	0	0	0	0	4	2	6	Fast Learner
IT1208	1	1	1	0	0	0	0	0	0	1	3	1	4	Slow Learner
IT1209	1	0	0	1	1	1	1	0	0	1	2	4	6	Fast Learner
IT1210	1	0	0	1	1	1	1	0	1	0	2	4	6	Fast Learner
IT1211	1	0	0	1	1	1	1	0	1	1	2	5	7	Fast Learner
IT1212	1	0	0	1	1	1	1	0	0	1	2	4	6	Fast Learner
IT1213	1	1	0	0	0	0	0	0	1	1	2	2	4	Slow Learner
IT1214	1	0	0	1	1	1	1	0	1	0	2	4	6	Fast Learner
IT1215	1	1	1	0	0	1	0	0	0	0	3	1	4	Slow Learner
IT1216	1	1	0	0	0	0	0	1	0	0	2	1	3	Slow Learner
IT1217	1	1	1	0	0	0	0	0	0	0	3	0	3	Slow Learner
IT1218	1	1	1	0	0	0	0	0	0	0	3	0	3	Slow Learner
IT1219	1	1	1	0	0	0	1	0	0	0	3	1	4	Slow Learner
IT1220	1	1	1	0	0	0	0	0	0	0	3	0	3	Slow Learner
IT1221	1	1	1	1	0	1	0	0	0	0	4	1	5	Fast Learner
IT1222	1	1	1	0	0	0	0	0	0	1	3	1	4	Slow Learner
IT1223	1	1	1	0	0	1	0	0	1	0	3	2	5	Fast Learner
IT1224	1	1	0	0	0	0	0	1	0	1	2	2	4	Slow Learner
IT1225	1	1	0	1	0	0	0	0	0	0	3	0	3	Slow Learner
IT1226	1	0	1	0	1	0	0	1	1	1	2	4	6	Fast Learner
IT1227	1	1	0	0	1	0	0	0	0	0	2	1	3	Slow Learner
IT1228	1	0	1	0	0	1	1	0	0	0	2	2	4	Slow Learner
IT1229	1	1	0	1	0	0	0	1	1	0	3	2	5	Fast Learner
IT1230	1	0	1	0	1	0	0	0	1	0	2	2	4	Slow Learner
IT1231	1	1	1	1	1	0	0	0	0	1	4	2	6	Fast Learner
IT1232	1	1	1	0	1	0	0	1	1	0	3	3	6	Fast Learner
IT1233	1	1	0	1	1	0	0	0	0	0	3	1	4	Slow Learner
IT1234	1	1	1	1	0	1	0	1	0	0	4	2	6	Fast Learner
IT1235	1	1	1	1	0	1	0	1	0	1	4	3	7	Fast Learner
IT1236	1	1	0	0	0	0	0	1	1	0	2	2	4	Slow Learner
IT1237	1	1	0	0	1	0	0	0	0	0	2	1	3	Slow Learner
IT1238	1	1	1	0	0	0	1	0	1	0	3	2	5	Fast Learner
IT1239	1	1	0	1	0	0	0	1	0	0	3	1	4	Slow Learner
IT1240	1	1	1	1	1	1	1	1	0	0	4	4	8	Fast Learner

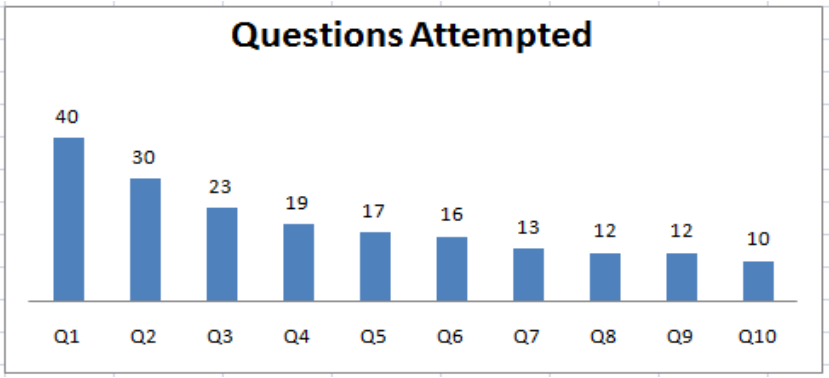

Figure 3: Question attempted by No. of Learners

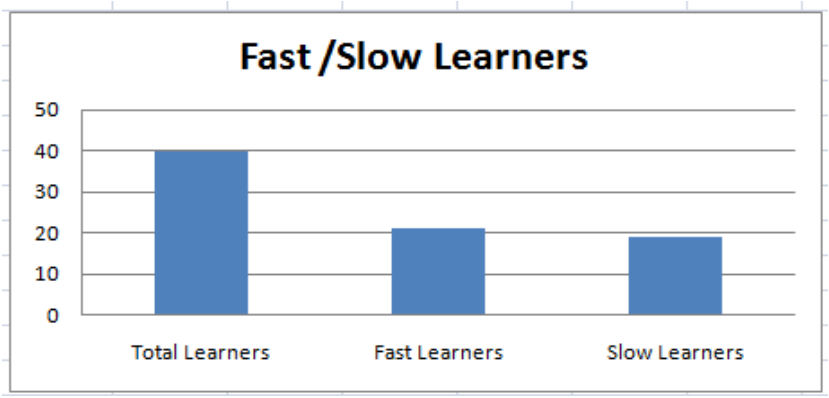

Figure 4: Slow Learners and Fast Learners

V. CONCLUSION AND FUTURE WORK

Now- a- days, as technology goes on improving. It shows a big change in the educational system and standards. In this paper, we have focused on Learner-centric approach to make the students involve in learning. We have considered various parameters of learning and assessed the learners by giving a questionnaire set which consists of basic level and application level questions on Text mining, which is a part of their academic curriculum. The results are analysed by setting a threshold value on the obtained score and generated a report by categorizing them into Fast learners and Slow learners. This generated report helps the faculty to identify the students learning activity and counsel the Slow learners to improve their learning styles and methods and also motivates the faculty for the usage of technology in teaching.

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