Studies Suspension Prevention System of Distance University using Analysis of Learning Activity and Learner’s Big Data

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Abstract. Due to the increase in withdrawals and temporary absences of students from changes in the external environment, distance learning universities are trying to establish various policies and increase the number of enrolled students, and at the same time, are trying to establish various policies and efforts to increase the enrollment. However, it is difficult to systematically diagnose the main cause of the interruption of students, and prior research efforts related to the problem of student suspension in distance learning universities have accumulated, since there are various reasons for the student suspensions. In the proposed distance university Studies Suspension Prevention System (SSPS), distance university students can use two types of learning analytics services. In order to analyze learning activities, we propose the asynchronous learning activity analysis module, and the synchronous learning activity analysis module. In the asynchronous analysis module and synchronous analysis module, quiz, LINE group chatting & discussion forum communication, and online lecture has a learning state score according to the lecturer’s directions. Learning activities in the learning management system have three kinds of learning states, passive activity state, negative activity state, and medium activity state. Learning activity states are used to predict the student learning state. In the proposed Student Support System, there are two types of learning support services connected to the smart learning portal server. One is the intelligent distance university chatbot service for personalized chatting and caring services. The other is push message services for alarm, warning, notices, and alerts, such as dashboard service.

1. Introduction
Due to the decrease in the number of students enrolled in distance learning universities, and the increase in withdrawals and temporary absences of students from changes in the external environment, distance learning universities are trying to establish many kids of policies, and are making efforts to increase the number of enrolled students, and at the same time, are trying to establish various policies and efforts to increase the student enrolment, and at the same time to prevent any withdrawals. However, it is difficult to systematically diagnose the main cause of the interruption of the students, and prior research efforts related to the problem of student suspension in distance learning university have accumulated, since there are various reasons for the student suspensions.

The reasons for the abandonment of distance learning university students are analyzed as the failure to pass the graduation scholastic ability evaluation, graduate education, and qualification acquisition and graduation reservation for grades. Of course, there may be cases where the student has stopped studying...
due to personal reasons of the student that not related to the school system itself. However, the personal reasons can be analyzed by the learner’s big data, such as social background, and student’s inclination and preference information. The reasons for the withdrawal of distance learning university students are analyzed as the failure to pass the graduate scholastic ability evaluation. Of course, there may be cases where the student has stopped studying due to personal reasons. However, the personal reasons can be analyzed by the learner’s big data, such as social background, and the student’s inclination and preference information.

In this paper, we designed a study suspension prevention system for distance learning university students. We also proposed the Distance Learning Cloud and students’ Big Data of distance learning university students. To overcome the drawbacks of the existing distance learning university policy and services for Studies Suspension Prevention, we analyzed the Studies Suspension Prevention issues and Services that takes the characteristics of the distance learning university. Moreover, we proposed Studies Support services for the distance learning university.

This paper is organized as follows. First, chapter 2 analyzes previous related research of learning cloud and learner’s Big Data for Studies Suspension Prevention. Then, chapter 3 defines the proposed Studies Suspension Prevention Service Model and classifies related information, before introducing the learning cloud for the Studies Suspension Prevention Service and related learners’ Big Data for the service. Finally, chapter 4 concludes our research.

2. Related Works
The Research project of the Hellenic Open University presents the theoretical foundation, design, and creation of an integrated system of focused training support provision for undergraduate and postgraduate students[1,2,3]. Student supporting services and methods were defined, and an integrated system was developed. This work focused on self-directed study and openness of services for distance leaning universities, so that it did not support the analysis of personal learning situations, or the academic policies of any one particular distance learning university.

In [4,5,6], the concepts, requirements, and definitions of smart learning, private cloud for the personal information of distance learning universities, Intelligent tutoring system for student learning activity tracing and analyses of preferences of learning and studying, and learning contents adaptation model for personalized learning contents are proposed respectively. Lastly, design and development methodology for learning suspension prevention policy of distance learning university and were proposed[7].

3. Studies Suspension Prevention System with Learning Cloud and Leaner’s Big Data
In National Open University(NOUC), the studies suspension prevention services for students is fulfilled by each of 8 learning centers over Taiwan. NOU provides various studies suspension prevention services for students, and after the service, there are no way to track or trace the student’s reaction or confirmation. Thus, there are no interactions between the students and the studies suspension prevention service, so that those kinds of service are passive services. In this paper, an active and traceable studies suspension prevention service for students are designed and proposed.

In NOU e-Learning environment as like figure 1, there are two learning management systems (LMSSs). One is the WiseMaster LMS, while the other is the TronClass LMS. The TronClass LMS is a prototype LMS for a mobile-based e-learning service. Meanwhile, the WiseMaster LMS supports mobile access to learning service and learning contents. Online tutorials are managed by TronClass LMS and WiseMaster LMS, and are supported by the Webex Virtual classroom on the public cloud. Online tutorials are recorded and stored on the Webex Virtual classroom server. NOU students can access recorded online tutorials whenever and wherever they want.

NOU Academic Activities are defined as below:
1. Exam: Two times per semester (off-line)
2. Assignment: Two times per semester (off-line or online)
3. Communication between Tutors and students: LINE group Chatting and Discussion forum by WM LMS (online)
4. Off-line tutor meeting (this depends on the number of Students):
  - Four times per semester
  - at each NOU Education Center
  - noticed by mobile App and each NOU Education center
5. Quizzes: online/one quiz per chapter
6. Online lecture: with several education centers

**Figure 1. Present NOU e-Learning System**

Student Learning Activities are classified into two categories of Synchronous Learning Activity and Asynchronous Learning Activity are classified. Synchronous Learning Activity consists of two examinations, two assignments, and off-line tutor meetings. Asynchronous Learning Activity consists of LINE group & discussion forum communication, quiz, Activity in LMS (Num. of Login, Num. of login to course, Learning Progress, Num. of Post, Times of material read, Pages of material access), and Online lecture

**Figure 2. Learning Activity Analytics**

In NOU learning activity analysis, two kinds of category for learning activities are proposed as like figure 2. One is synchronous learning activity, while the other is asynchronous learning activity. Synchronous learning activity has a due date and a due time. In synchronous learning activity, if a student does not submit an assignment or examination, or attend a tutor meeting (by missing the due date and due time), the student loses the opportunity to do so. But, in asynchronous learning activity,
after missing the time for a quiz, line chat, online lecture, or forum communication and posting activity on the LMS, the student can do it again.

In the ALAAM, the first two conditions of learning activity analytics are adopted. Quiz has a score for quiz submission times according to the lecturer’s directions. In the LINE group & discussion forum communication, the online Lecture has three kinds of learning state, namely frequent posting state, medium posting state, and rare posting state. Activities in the LMS have three kinds of learning state, namely passive activity, negative activity, and medium activity. Lastly, the activity in the LMS is added to the examination state, in order to predict the student learning state.

In the SLAAM, the first two conditions of learning activity analytics are adopted. The Off-line tutor meeting has two kinds of learning states, namely attending state, and not-attending state. The Assignment has four kinds of learning state, such as first-submission-second-submission state, first-submission-second-nonsubmission state, first-nonsubmission-second-submission state, first-nonsubmission-second-nonsubmission state. Lastly, the examination learning activity could be predicted for the student learning state in figure 3.

For example, a student joins the discussion forum communication, frequently posts on the LINE group chat, and is active in the LMS. He/she is in active asynchronous activity state. He/she attends the off-line tutor meeting, and submits both assignments. Finally, the student gains high scores in both examinations. As a result, the student is in an active learning state as like figure 4, so that the student would continue their learning activity, and would not suspend or be suspended by NOU, or drop out of NOU.
In the proposed NOU SSPS as like figure 5, NOU students can use two types of learning analytics services. Two types of learning support services are connected to the smart learning portal server. One is the intelligent NOU chatbot service for personalized chatting and caring services. The other is push message services for alarm, warning, notices, and alerts, such as the dashboard service. Basically, NOU SSPS works based on NOU smartphone application and Internet. NOU Learning analysis engine (server) collects learning activity data from the Webex Virtual Classroom server, Wisemaster LMS, and TronClass LMS. As mentioned above, synchronous learning activity analysis data and asynchronous learning activity analysis data are collected by the learning analysis engine, and the analysis results of the learning analysis engine are sent to NOU intelligent tutoring engine (server), which constructs the student support strategy according to NOU student support model. NOU intelligent tutoring engine decides the way to support NOU student. For NOU intelligent chatbot service, NOU academic affair data and information database and a Chinese words dictionary need to be constructed. NOU intelligent chatbot chats with NOU student about their personalized learning progress and learning activity. But the chatting theme is not limited. NOU student push messages, such as academic alarms, warnings, and alerts, are sent to NOU student. NOU student push messages are constructed according to NOU student support model and NOU academic affair data and information database. NOU student push messages would be periodically sent to NOU students, but the contents of NOU student push messages depend on the student’s learning progress, level of learning activity, and so forth. NOU student support model should be constructed by NOU.

4. Conclusion
Many students stop studying for various reasons. In particular, poor interactions between students and teachers, self-managed studies, and few peer students are the main reasons for students quitting their studies in distance learning universities. Other aspects of study suspension are the poor situations of teachers. There may be too many students to be managed or taken care of by the one teacher. One lecturer or one professor has to take care of too many students, so that personal interaction or learning guidance for one student becomes impossible.

Analysis of learner big data gives us the power to predict the future, and it is now possible to acquire the learner’s psychology and behavior, which they had not known before, based on large-scale learner big data as new realistic knowledge. It will be possible to establish a realistic strategy by using existing
learner Big Data to grasp and predict new information. Therefore, it is necessary to collect, store, analyze, and classify data that are scattered in diverse information systems of the distance learning university, and to find similar reasons, while classifying data with similar reasons. If we provide smart learning that provides meaningful information and learning by creating new value groups, learners who stop studying in the middle of courses will be interested in readmissions, and those who are likely to stop studying, will not do so. It will also be possible to prevent the occurrence of additional occurrences by analyzing the patterns of former students who have already dropped out.

Most of the students who have stayed in the absent period, even though they have obtained the necessary graduation credit, confirm with the data that they have applied for the graduation reservation for the purpose of acquiring the qualification of 2nd grade kindergarten teacher, or childcare teacher. They will be able to be provided with learning activities and recommend courses that include information related to academic utilization. This proposal induces the registration of learners by diagnosing the attitude and competence of the learner using the learner’s tendency information, preference information, condition information, experience information, and relationship information. Of course, providing tailor-made and self-directed learning enables learners to learn by utilizing tutoring services for students who are likely to be absent from the distance learning university. In other words, the proposal provides the learner-customized support information continuously, so that the learner can engage in self-directed learning to plan and engage in the learning on their own. As a result, students are advised on the learning process appropriate to their individual level and aptitude, so that similar services can be provided to students with similar tendencies to those who have already stopped studying.

Smart Learning, which aims to prevent disruption of learning, will provide an individualized self-directed learning system to enrolled students who are off-campus students, as well as on-campus students. It provides a lot of advantages in academic achievement, such as graduate study. Smart learning provides a model of how disruptors can analyze real data, create new values, and serve them as services, thereby increasing the amount of learner resources that are being reduced.

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