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A Multi-Source Stream Analysis Model for Adult Education Sustainability Study

Abstract: - Adult education is instruction intended for students who are elder and have recently gone into employment. People have the opportunity to increase their expertise and develop new abilities by learning as adult students. Investigation into adult education has been ongoing for a while, and there have been efforts made all around the globe to increase its application. The study's objectives were to investigate the features of the courses provided by education centers (EC), determine if they promote equality, and determine any organizational obstacles to adult education that were connected to these courses. Through the training courses they provide, ECs attempt to satisfy the educational requirements of people and industries in a variety of subjects. As a result, this research suggested a Multi-Source Stream Analysis (MSSA) Model for Adult Education Sustainability Study. The adult education sessions were the source of the information for this investigation. The adult education provided by ECs was evaluated by several criteria, including technical knowledge, communication skill, art and music, customs management, and self confidence. The research demonstrates that adult education enhances educational achievement and other professional abilities and makes adults more capable of realizing their full capability.

Keywords: Adult Education, education centers, Multi-Source Stream Analysis, communication, and educational achievement

Research Highlights

- Instruction aimed at older students who have just entered the workforce is known as adult education.
- As adults, we have the chance to learn new things and hone our existing skills. Research on adult education has been going on for some time, and people from all around the world are trying to find more ways to use it.
- The purpose of the research was to identify any institutional barriers to adult education that were associated with education center (EC) courses, as well as to examine the characteristics of these courses to see whether they foster equality.
- Training courses offered by ECs aim to meet the educational needs of individuals and businesses across a range of disciplines.
- This study's findings led to the recommendation of an MSSA model for future research on the long-term viability of adult education programs. This investigation was based on data collected from the adult education programs.
- Technical knowledge, communication skills, art and music, self-confidence, and customs management were among of the criteria used to assess the adult education offered by ECs.
- According to study results, adults who take the time to further their education are better equipped to reach their full potential in terms of academic performance, professional competence, and other areas.

1. Introduction

The purpose of adult education and learning is to provide people with the skills they need to exercise and realize their freedoms while taking charge of their own lives. It promotes personal and professional development, empowering people to take an active role in their societies, communities, and surroundings. It promotes equitable, sustainable economic growth and adequate employment opportunities for people. As a result, it is an essential instrument for reducing poverty, enhancing health and well-being, and fostering learning communities that are sustainable [1]. Adult learners have various qualities compared to regular students. They first understand why what they require to study. It is also generally recognized that adult learners want to reflect on their educational experiences. These learners come from different educational backgrounds and have a range of educational goals. They differ from other students in terms of the obligations they have in their everyday life, which has an impact on how they study. Adult learners have a lot of options to choose their learning approaches as a consequence of the flexibility that the learning environment people who understand their study responsibilities are expected to manage their learning processes[2].To prepare students for further education in lower secondary schools, primary schools teach the fundamentals such as reading, writing, and arithmetic as well as impart foundational information and abilities important for learners at their developmental stages. Lower secondary schools continue the work of

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elementary schools by providing students with a foundational education that helps them become better people, members of society, and citizens by building on and deepening the information and abilities they've already gained [3]. The number of institutions and organizations in Greece that provide adult and continuing education programs has grown, as has the number of people needed to plan, organize, and carry out these programs. Thus, these human resources must get proper training. Even though there were adequate adult trainers with appropriate expertise and understanding of their cognitive area, the application of current active teaching approaches, the design of teaching modules, and educational programs lagged, according to relevant research done in 2002 [4]. Adult education and training have received significantly less attention, despite being the longest stretch of learning during one's lifetime. One may argue that school education is a better predictor of health disparities than adult education. So far in this, learning has not included adult education for individuals may start now and have a big societal and personal influence on changing how adults behave in terms of their health. An innovative strategy to assure teachers' participation in innovation activities is required to maximize the efficiency and manageability of these operations. The concept of creating methods of educational administration of a university teacher's inventive activity emerges in this setting [5]. Achieving Sustainable Development Goals is essential, and adult education is proper management in overcoming issues including persistent unemployment, the digital revolution, globalization, aging, and climate change. A lack of resources and learning opportunities has kept many individuals from pursuing essential education and training throughout the previous several decades. Fortunately, the advancement of ICT in recent years has made it possible for an increasing number of individuals to access educational opportunities and resources because of distance learning. Online learning is a significant way to connect formal and informal learning and support learners' goals of lifelong learning since it is flexible, accessible, and not constrained by physical time and location[6].

The concepts of sustainability and education serve as the foundation for the idea of sustainable education. The former is a way of thought that holds that the environment, society, and economy can all be balanced to promote quality of life. The latter is an action or process for learning or imparting information or abilities, strengthening one's capacity for thought and decision-making, and mentally preparing oneself or others for life. To promote sustainable living, many of today's difficulties need a genuine transformation in mindset and conduct. According to, sustainable education may help bring about the required cultural shift [7]. The billions of people who live in societies and economies across the globe, from young adults and recent graduates to elderly people, are all interested in the topic of adult literacy. These people come from a variety of life and age groups. Adult numeracy is a topic that is understudied and has several difficulties. From an educational, scientific, and policy standpoint, this field is also very promising. Adult numeracy is the ability to handle the many mathematical, quantitative, and statistical issues that come with adulthood. Some definitions of numeracy place a heavy focus on the development of young children's numeracy skills or basic computational skills [8]. One of the organic aspects of sustainability at universities is the incorporation of the idea, values, and principles of sustainable development and education for sustainable development into the curriculum for higher education. Research, campus operations or facility management, community engagement, and the institutional framework are other aspects or generally acknowledged sectors where higher education institutions might apply the notion of sustainability [9]. Adult education is a method in which people participate in regular, systematic self-educational activities to learn new knowledge, abilities, attitudes, or values. Education for adults differs from education for children.

An identify eco-friendly surface management method, deep reinforcement learning, a technology that enables agents to learn the appropriate course of behavior in a given situation, is used. A management strategy that lowers the predicted global warming impact of a pavement facility throughout its life is found using Proximal-Policy Optimization, a subclass of Deep reinforcement learning algorithms [10]. The group also publishes a global periodical on self-directed learning. Self-regulation is a term with a more recent origin that some authors sometimes used interchangeably with self-direction. The phrase self-directed learning, which is used most commonly in adult education, is the subject of this review article. Many people believe that one key distinction between kids and adults in a learning environment is their propensity for self-direction [11].To research the idea of transformational learning and its application in Learning about sustainable development and the environment, and also to gather information on how to encourage learning that is transformative in formal and informal contexts [12]. The school community is energy regarded as a form and a civic ecological practice based on group tree stump gardening. These educational programs powered by local organizations aim to increase young people's critical thinking, responsibility, and agency for taking personal action towards more climate-resilient cities despite their varied nature and consequences. Yet when applied to the collective, making links between agency, empowerment, and transformational learning becomes more difficult [13]. The use of andragogy in the Ethiopian integrated Functional Adult Education curriculum. This is used a qualitative case study approach as its framework. It showed that learning was not used as effectively as anticipated. The session goals were not communicated by the facilitators before each session, and they made only a little attempt to help people become self-directed learners [14].

The task scheduling algorithm for cloud computing is enhanced by cloud-side collaborative computing technology, which then makes use of the improved algorithm. Moreover, it integrates the local and global

optimization procedures to improve the performance of the final optimum solution and cut down on cluster task scheduling execution time, enhancing cloud computing's compute effectiveness [15]. Development of the Artificial Intelligence AI education system and suggests an AI education system based on support vector machines and differential evolution algorithms. To accomplish automated education, various educational tasks are implemented using a support vector machine model that has been optimized using a differential evolution method after first automating the collection of education demand information data [16]. The research finds that policy discussions rarely address the use of AI in education, whereas the importance of education in preparing a workforce for AI and increasing the number of AI specialists is consistently given top priority. Moreover, despite the importance of AI ethics debates in these texts generally, the ethical implications of Artificial intelligence get limited consideration [17]. It implies having a national plan and having diverse sectors ready to work together is necessary but not sufficient requirements to guarantee successful intersectional cooperation in the delivery of adult education. It also means that when software is created without true and significant input from its intended users, it will most certainly fail. Effective intersectional cooperation often demands political commitment, increased coordination between regulations and procedures that take into account the local theme, as well as active community engagement [18]. The platform connects back-end adaption algorithms with front-end specialized websites. In a pilot study for the mathematics curriculum. It was shown that there was an increase in learning effectiveness when comparing the post-test to the pre-test. Most significantly, among the students who began the trial with a relatively poor score, both groups saw gains in academic performance and satisfaction levels [19].

2. Material and Method

Evaluation and assessment of educational knowledge offer initiatives in training evidence-based assistance. This enables teachers to comprehend students' demands and the point at which they are when they commence their course. Hence, we suggested a multi-source stream analysis to investigate the sustainability of adult education. The Chinese adult education data sources were used for the study. The data processing was done for obtaining relevant information for the analysis. The research method flow is shown in figure 1.

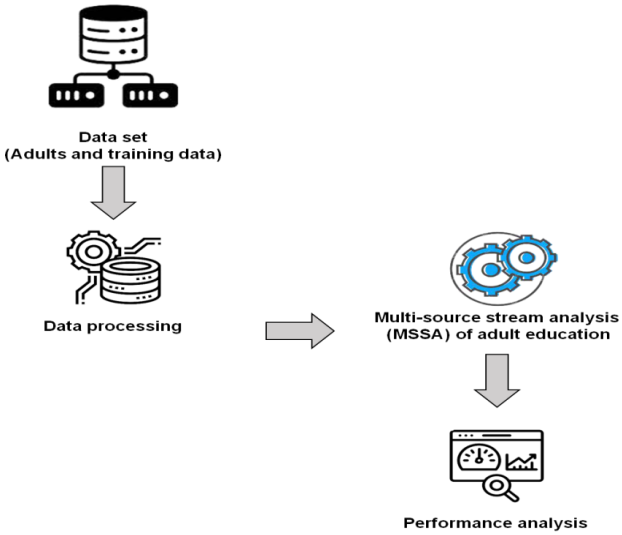

Figure 1: Proposed architecture

A. Dataset

One institution in south-central China served as the recruitment site for the survey respondents. Between the ages of 18 and 25, currently enrolled in school, no self-reported or recognized psychological or physical condition and 4 authorized agreements to participate in the research were the inclusion requirements for research subjects. All of the data was acquired from four different courses' data sources, including theoretical lessons, experiential training, and internet classes. The final test served as the output characteristic or category to forecast, while the first three information sets provided the input characteristics. For theoretical courses and two sets for actual lessons, there was only one unit in this program [20]. As the same instructor was allocated to every organization in this program, a single teacher gathered all the information and videotaped the theoretical courses. After being briefed about the project, all of the adults provided a written agreement to be documented and to have their information from actual and virtual courses in Moodle gathered for the research.

B. Data processing

The information in the relevant Excel files was all analyzed. The information was only made anonymous, Instead of utilizing the students' names as the identity verification (IV), we devised a simple approach and changed the learners' identities in the multiple Excel files to the arbitrarily created IV. The input properties were subsequently scaled. In this instance, we converted the data linearly by rescaling all of the input feature values to a similar range [0-1]. The input and output properties were then discretized. The 10 input characteristics were saved as both

quantitative and category data. We employed the well-known Equal-Width binning technique to do discretization, using the bins/labels Higher, Medium, and Lower. Using this approach, there are only N subranges of similar size among all conceivable values. To forecast (the pupils' ultimate educational success or position), we discretized the output characteristic or class as well. We employed a manual process where the user or teacher had to designate the specified marks. We next changed the Excel files into CSV (Comma-separated variables) formats. It is a separate text file with complete data records on each line that employs the comma symbol or icon to divide elements. As the Csv format can be read and utilized immediately by the architecture that we utilized for the tests, we converted every one of the four Excel files' two variants (mathematical data and categorized data) into Csv format.

C. Multi-source stream analysis of adult education

The many participants (instructors, students) on an instructional tool create digital records of respective actions. We suggest utilizing these records to examine student behavior. This assessment may be made feasible by taking into consideration multiple sources that provide traces. The training situation, the internet website, and the student environment are the three different types of digital monitoring elements used in this case. It is also thought of to have a next component based on untraceable outside occurrences. The next subsections illustrate the specific monitoring that is needed for each of these streams.

Training situation: Implementing the training paradigm operations allows us to produce imprints with conceptual parts that have distinct semantic meanings and represent actions. We must specify what the teacher needs to teach in the training situation to get such a good adult education. For instance, if we keep note of when each course begins and ends, the source assisted the student in achieving the activity. A teacher may quickly analyze these indications. The Pscenario component was used in this instance to build the training situation. This component has the benefit of being instrumental and is simple to incorporate into the technical system and easy to learn the concepts. At this point, the training situation appears to be a collection of opaque boxes that stand in for preplanned events. Owing to the Pscenario component, every course of the situation is simply recognized by its start and finish throughout the study. This would motivate us to instrumentation simply in the virtual classroom to examine as many conceptual components as feasible. The instructor may therefore observe how every student is progressing and how they are performing.

Internet website: An additional resource of analysis is the program logs kept by the internet website. Commonly utilized web servers like Apache offer log files that detail every operation made on the system. Even so, since the detected pieces are at a reduced rate, the subject is difficult for an adult to understand a course with a variety of themes. An analyst or instructor couldn't use it to their advantage immediately. Nonetheless, study on raw log simplification has previously been done in several areas, including textual data, online use mining, and web log mining. This training offers a variety of tools, such as those text categorization, log purification, and log session simulation for learning adult education. Certain portions of the retrieved log files may be made interpretable by these programs. Students will be able to integrate all the subjects and focus on the ones that interest them.

Student environment: Consider a situation when a student uses an instant communicator to speak to a classmate during a class. On the internet website or the training environment, nothing of these interactions is shown. Nonetheless, this conversation could be a key part of explaining the adult's behavior. Thus, we suggest equipping user terminals to record all adult engagement. Key loggers are what we suggest using for this. Key loggers are lightweight programs that run on a host machine. The fundamental working tenet is to log each keystroke in a word document. In the study, we modified this kind of software to track user activity by logging all keystrokes, system operations, conversation box headings, and material shown on the display.

Despite the subject's numeric variety as a consequence of the adults' stations, it's possible that certain key interactions for shaping the adults' behavior are missing. So, none of the earlier identified materials would provide a verbal description from the instructor or an oral debate among students if the recorded instruction takes place in a school with a teacher's attendance. The issue is analogous in the case of remote learning: it is hard to tell whether or not the student is in front of her computer. Camera or human analysts might be used as supplementary sources of monitoring during the class.

4. Analysis and Discussion

An examination of the education field is a comprehensive, in-depth diagnostic of the educational institution. It helps in comprehending how an educational system functions, why it functions in that manner, and how to make it better. Adult education analysis is crucial for improving student performance. As a result, we suggested multi-source stream analysis for the assessment of adult education. The criteria utilized for assessment include technology knowledge, communication skill, art and music, customs management, and self confidence. The traditional methods that were used for comparison are Edge Computing and Data Analysis (EC-DA) [21], Hybrid analytical framework (HAF) [22], and Conceptual framework (CF) [23].

i.Technology knowledge

Technology knowledge is a person who is knowledgeable about how currently available technology works and how to use it for various purposes. It gives learners rapid accessibility to knowledge, rapid education, and exciting chances to apply what they have acquired into action. This knowledge is very useful for education. Figure 2 shows

the proposed and existing method. Table 1 shows the result of the proposed method. Technology knowledge is improved in adults through adult education training.

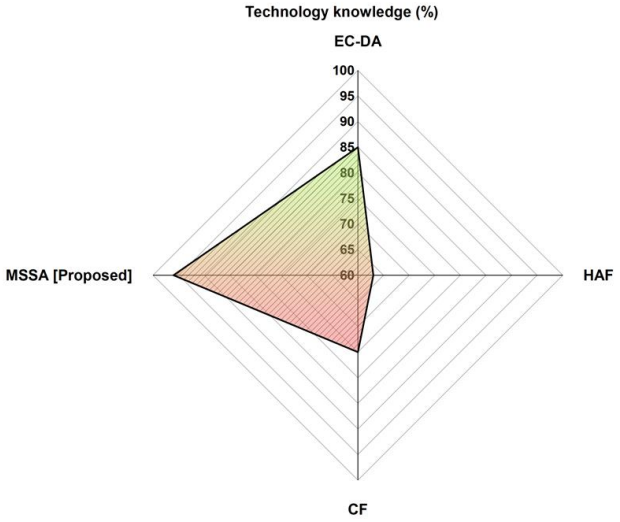

Figure 2: Technology knowledge of the proposed and existing method

Table 1: Result of technology knowledge

Methods	Technology knowledge (%)
EC-DA	85
HAF	63
CF	75
MSSA [Proposed]	96

ii.Communication skill

Communication skill is the ability to effectively communicate ideas and information. Speaking loudly, clearly, and effectively while establishing a positive relationship with the audience is important for adults to pursue in their careers and it helps their employment. Figure 3 depicts the proposed and existing method. Table 2 depicts the comparison of communication skills. This shows that adult education improved their communication skills.

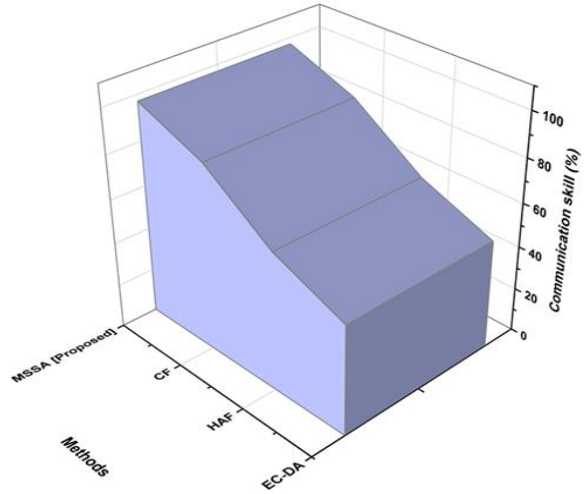

Figure 3: communication skills of the proposed method.

Table 2: Comparison of communication skill

Methods	Communication skill (%)
EC-DA	50
HAF	63
CF	85
MSSA [Proposed]	97

iii.Art and music

Music is a kind of art that combines vocal or instrumental sounds for artistic quality or emotional expression, often in compliance with cultural norms for harmony, melody, and rhythm. The same activity, music, encompasses both the straightforward song and the intricate computer composition. The imaginative portion of the brain is said to be stimulated by art and music, which also contribute to determining an individual's development. Figure 4 demonstrates the proposed and existing method. Table 3 demonstrates the result of art and music.

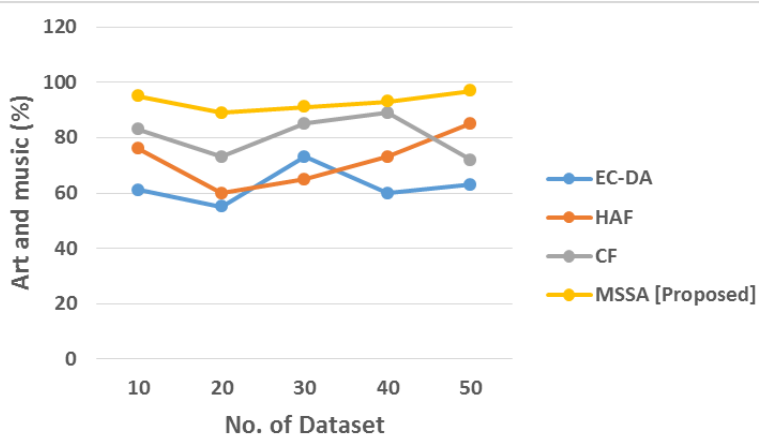

Figure 4: Art and music of proposed and existing method

Table 3: Results of art and music

No. of Dataset	Art and music (%)			
	EC-DA	**HAF**	**CF**	**MSSA [Proposed]**
10	61	76	83	95
20	55	60	73	89
30	73	65	85	91
40	60	73	89	93
50	63	85	72	97

iv.Customs management

Customs management is the capability to simulate international customs administrations and processes using standard technologies, enterprise applications, and facts. Customs administrations are important education organizations created to implement student skills and follow the rules and regulations. Figure 5 illustrates the proposed and existing method. Table 4 illustrates the comparison of customs management. This demonstrates that adult education develops customs management in adults.

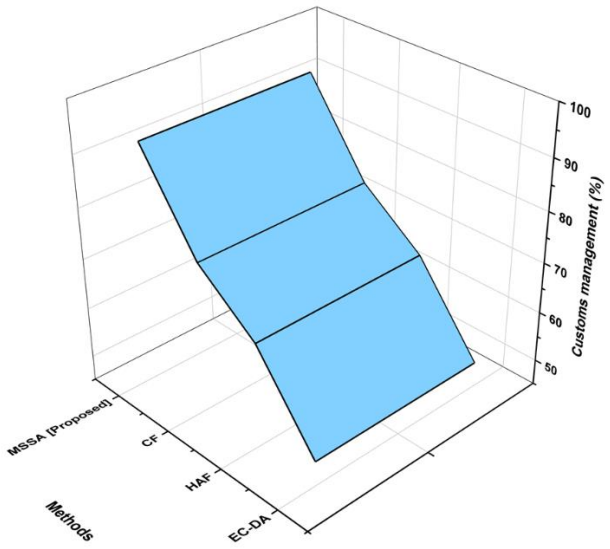

Figure 5: Customs management of the proposed method

Table 4: Comparison of customs management

Methods	Customs management (%)
EC-DA	50
HAF	66
CF	75
MSSA [Proposed]	92

v.Self confidence

Self-confidence is the ability to have trust in one's skills. It provides students with opportunities to experiment and use their creativity in the classroom. Students' self-confidence is essential to their success. The educational aspirations of a student will depend on how much self-confidence he or she has. A student's grades will eventually suffer if they start to lose confidence in school. An adult who has low self-esteem may give up on their goals, dreams, and plans. Figure 6 shows the existing and proposed method. Table 5 shows the result of self confidence. It proves that adult education enhanced the self-confidence of adults.

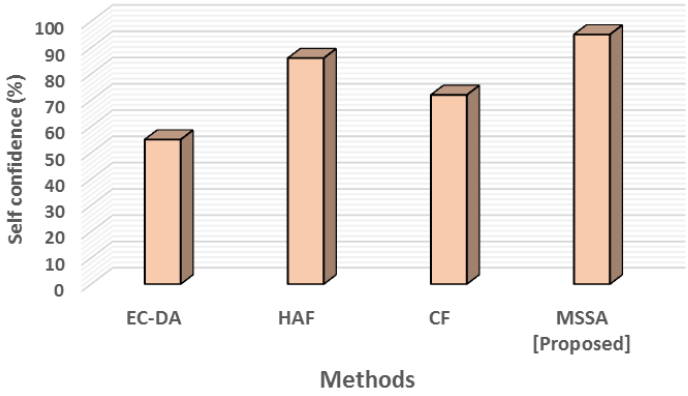

Figure 6: Self confidence of existing and proposed method

Table 5: Result of self confidence

Methods	Self confidence (%)
EC-DA	55
HAF	86
CF	72
MSSA [Proposed]	95

5. Conclusion

Adult education is commonly recognized as having a role in advancing the cause of social fairness by providing educational chances to individuals who had previously been denied such possibilities. This study's first pillar is an analysis of adult education from an equity standpoint. Internationalization and the idea of the information economy provide adult education significant importance and significance in addition to the justice approach. Academic institutions play a crucial role in addressing the needs of modernization and providing academic facilities to raise the standard of schooling for the entire civilization as the expertise community is largely founded on modern science. Continuous learning has also emerged as one of the significant focuses of colleges in the learning industry. The examination of adult education is crucial because of this benefit. Multi-source stream analysis (MSSA) is the investigation of multiple scales, which are patterns found by fusing many data sources into a single viewpoint. Thus, we recommended using multi-source stream analysis to study adult education sustainability. With the use of existing practices, the suggested system is examined and assessed. The parameters such as technical knowledge, communication skill, art and music, customs management, and self confidence are evaluated and provide effective results. The findings of the study demonstrate that the MSSA offers an effective analysis of adult education, which improves the educational achievement of adults.

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