

A Study on the Efficiency Enhancement of Self-Directed Learning and Online Lecture Using Emotional Factor Control

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ABSTRACT

The 4th industrial revolution, AI, and ChatGPT have been advancing up as key topics in industrial areas and educational systems. This paper deals with the effective teaching method for the effective nurturing of manpower including the ChatGPT. ChatGPT and AI are highly impacting on educational systems as well as many industrial areas because ChatGPT can be easily used by everyone to ask questions and get responses about any field. However, online teaching cannot catch up their teaching results because they cannot see directly. Therefore, they have to develop on how they can see the results of their lecture.

This paper considers methods to see the results using emotional factors. During online lecture, when students have a satisfaction with lecturer's lecture results, students will express happiness, enjoyment, sadness, fear, anger, disgust, surprise, and embarrassment depending on their satisfaction level. Basically, whenever they have emotional feeling, they can show their faces status such as happiness, enjoyment, sadness, fear, anger, disgust, surprise, and embarrassment.

This paper suggests the method that lecture can adjust or control lecture style through emotional factor measurement and expression.

Keywords: Emotion control, Self-directed learning, Education, Online education

INTRODUCTION

Online education or distance education has a long history as shown Figure 1 and it has been developed as current online education and seminars. In 1858, the University of London started the first distance degree and the University Wisconsin Madison used the first distance education.

Currently almost countries have online education system full-time degree because there are many advantages. Now, almost people can touch an institution of higher education and online system as well as the advanced countries as far as since the internet services provide.

In the online education of current, we do not know or we do not communicate well because we have to teach and reasoning by monitor (or video) and online voice system. Therefore, we must consider how we have to transfer teacher's opinion and teaching purpose and how much listeners (or students) can understand well teacher's contents.

However, it is not easy for lecturer to confirm situation of listener's understanding level because of a long distance.

Additionally, ChatGPT is giving an impact on all areas needless to say education system and we have to think about how to introduce into education system and use it. As ChatGPT (Generative Pre-Trained Transformer) is a language model, it is developed by OpenAI, which is established in 2015. Therefore, it has capability of producing response text that is nearly indistinguishable from natural human language.

Basically, Generative Pre-Trained Transformer (GPT) is one of a machine learning model that uses supervised learning techniques, unsupervised learning, and reinforcement learning to understand and generate human-like language.

As supervised learning is basically one of many learning methods, when we teach or train the machine, we use data that is well-labelled, which is already tagged with the correct answer. So, it can well have optimization result for performance criteria with the help of well-labelled data but it needs a lot of computation time for optimal training of supervised learning.

As unsupervised is the machine training using information that is neither classified nor labeled without guidance. Therefore, it has advantages that does not require training data to be labeled. This learning method is also flexible to apply to a wide variety of problems. It is less time and cost can be lower. But it can be difficult to measure accuracy or effectiveness due to lack of predefined answers during training. There are many types in unsupervised learning such as clustering method (Agglomerative, Overlapping, Probabilistic), clustering style method (Hierarchical clustering, K-means clustering, Principal Component Analysis, Singular Value Decomposition, independent Component Analysis).

As reinforcement learning is one of several learning methods, it uses rewarding desired behavior for training.

The impact of ChatGPT is giving an influence to online education.

Herein, self-directed learning is needed and lecturer have to confirm an efficiency of teaching. It means we must create and develop learning experience for students like self-directed learning method. John Dewey suggested the theory of self-directed through education experience and explained the educator's role is import for guidance. Currently, a variety of educational systems have an idea that personal characteristics should be developed, which focuses on educational freedom, democratic governance and personal responsibility.

Basically, self-directed learning can be implemented as diversity using designing your own learning path, selecting resources, teacher's guides, and good information. No matter how we educate online learning and teaching to advance self-directed learning, there are several methods teachers can use to increase teaching efficiency and responsibility in learners.

In online education, understanding of emotion factor is quite important for self-directed learning and identifying listener's understanding about teaching contents. Camras & Allison (1985) mentioned performance on emotion understanding through the early school years and they (Denham, 1986; Pons & Harris, 2019) describe that it is individual differences.

Especially, emotionally arousing events are usually better remembered than neutral ones. Therefore, it was recently proposed that the emotional enhancement memory is additionally driven by memory enhancing cognitive characteristics of emotional stimuli. That emotional factor controlling can provide for online self-directed efficiency.

This paper deals with the enhancement of online education and self-directed learning using emotional factor control.

LITERATURE REVIES OF CURRENT ONLINE EDUCATION

There are many research materials how to influence on memory and human's learning such as matching the emotional semantic relatedness and neutral stimuli of EEM (Manning & Julian, 1975; Dewhurst & Parry, 2000; Talmi & Moscovitch, 2004; Buchanan et al., 2006; Talmi et al., 2007a), a purely arousal-driven long term EEM, emotionally enhanced selective attention (Kensinger & Corkin, 2004; Sharot & Phelps, 2004; Kern et al., 2005; Talmi et al., 2007b), and multifactorial theory of the EEM (Talmi et al., 2007b).

Positron emission tomography (PET) and function magnetic resonance imaging (fMRI) reveals enhanced amygdala activity as well as amygdala-hippocampal connectivity (Cahill et al., 1996; Canli et al., 2000; Kilpatrick & Cahill, 2003; Dolcos et al., 2004b; Kensinger & Corkin, 2004; Richardson et al., 2004; Kensinger & Schacter 2005, 2006; Dougal et al., 2007; Talmi et al., 2008).

To eliminate the impact of cognitive factors to the EEM, they used valence pure lists of positive, negative, or neutral words for their semantic relatedness within the list (Talmi et al.,

2007a). Emotional stimuli are inherently semantically interrelated (Maratos et al., 2000; Dillon et al., 2006).

Zhang (2018) provides a definition and connotation of emotional factor and analyzes emotional factors that affect learning efficiency of middle school student. This paper also studies emotional and psychological learning characteristics of middle school student and gives the emotional factors that can influence on English learning of middle school student.

Lianzhuang Qu (2022) studies six key influencing factors that have an impact of negative emotional comments on consumption than positive emotional comments.

The paper by Shafait et al. (2023) investigates the effects of emotional intelligence on learning outcomes related to academics and administrators in universities and tests creative performance. Then, it gives the mediating role of self-directed learning and knowledge management processes on the relationship between emotional intelligence and learning outcomes. They created six lists of 18 words for each of three valence levels (resulting in 108 words for each valence level).

Shafait et al. (2021) study management of the emotions of self and others, which students who have emotionally quotient will have good self-control so that there is greater potential for implementing independent learning.

Mitrović Veljković et al. (2020) aimed to determine the effect of emotional intelligence, learning discipline, and the peer interaction on mathematics learning outcomes of State Junior High School (SMP) Students in Samarinda City.

Okwuduba et al. (2021) provide material to understand the influence of emotional intelligence and self-directed learning readiness.

Nurismail et al. (2021) illustrate a very strong correlation between emotional intelligence and self-directed learning readiness and they also suggest that emotional intelligence predicts self-directed learning readiness with very little support from gender. Their paper is aimed at exploring the influencing factors of the emotional tendency of product reviews, analyzing a large number of reviews of a certain mobile phone product, and extracting the keywords of the influencing factors.

Sommer et al. (2008) present that arousal is the crucial factor in the emotional enhancement of memory (EEM) and observes the characteristic neuronal correlates of the EEM.

Ogren and Johnson (2021) show that children's emotion is crucial for healthy social and academic development. The behaviors influenced by emotion understanding in childhood have received much attention and they present theoretical arguments for the substantial roles of three aspects of children's environments in the development of emotion understanding. They predict the effects of environmental influences on the development of emotion understanding more broadly.

Alhalaseh and Alasasfeh (2020) describe that emotion has a substantial influence on the cognitive processes in humans, including perception, attention, learning, memory, reasoning, and problem solving. They describe that emotion has a strong influence on attention, especially modulating the selectivity of attention as well as motivating action and behavior. This attentional and executive control is intimately linked to learning processes, as intrinsically limited attentional capacities are better focused on relevant information.

In the brain signal, the emotion recognition depends on the efficiency of the algorithms used to extract features, the study of electroencephalography (EEG) signaling identify emotions and emotion states can be classified by AI. Their experiments show the efficiency of the proposed method as a 95.20% accuracy was achieved using the CNN-based method.

The aim of this paper is to offer ideas, strategies, and design examples for emotional based online education after reviewing many materials and summarization by AI control.

HISTORY OF ONLINE EDUCATION

The University of Chicago started courses in 1891 and before this Gazette offered to teach shorthand. However, first distance education by radio in 1922 was done, which was the technology of radio broadcasting in Pennsylvania State College. In 1953, broadcast television was becoming more prevalent, and the University of Houston responded by offering televised college classes for credit. The technology of the internet revolutionary changed distance education by 1980s.

Nova Southeastern University serviced accredited graduate degrees through online courses in 1985. Throughout the 1990s, with a variety of both real-time and asynchronous online technologies, educational institutions and universities grew rapidly in distance learning.

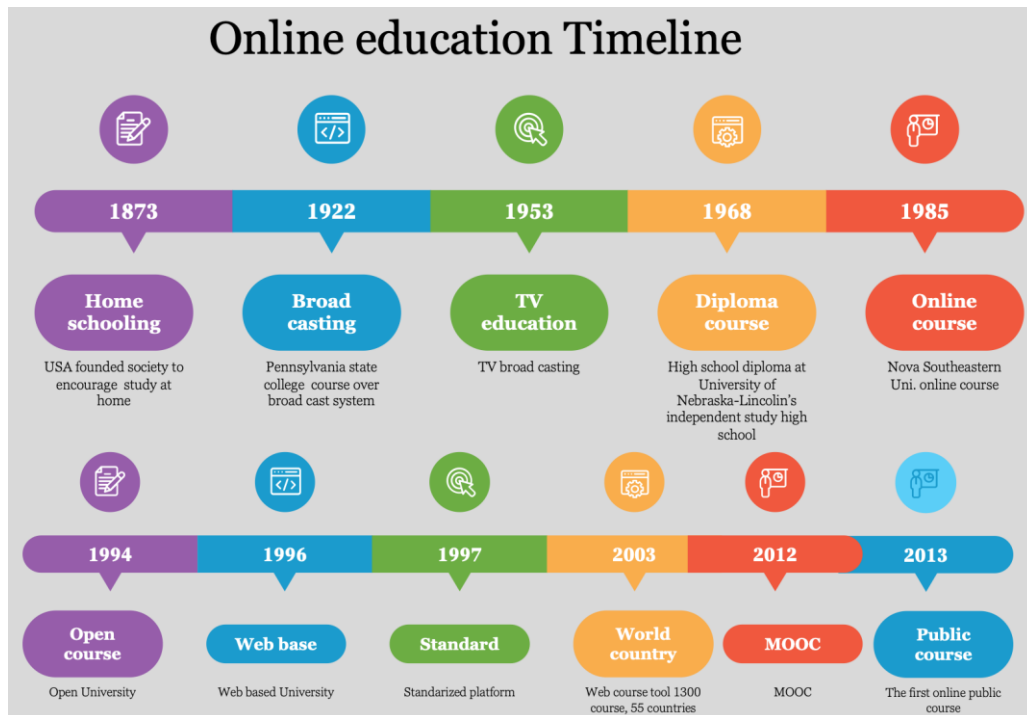


Figure 1: Online education history (revised by this paper)

Source: <https://www.worldwidelearn.com/articles/history-of-distance-learning/>

In 1994, Open University offered an experimental Virtual Summer School (VSS) to some of its Cognitive Psychology students.

WebCT (Web Course Tools) provided more than 6 million student users at more than 1300 institutions in 55 countries. In 2005, YouTube launched and YouTube EDU offered thousands of free lectures online by 2009.

In 2012, massive open online courses (MOOCs) by MIT and Harvard. In 2013, the first online-only public university in the United States, UF Online, was announced for launch in 2014.

REVIEW ON EMOTIONAL INFLUENCES ON LEARNING

Researches show that the primary visual cortex helps to realize both emotion and conceptualization. These investigations illustrate emotionally stimulating by increased sensory responses in the brain experiments. The emotional-affective processes have two functions primary-process emotions and secondary-process learning, which can give memory function. Third is tertiary-process higher cognitive functions. Primary emotional processes regulate unconditioned emotional actions.

Rahimi (2016), and Yıldızbaş's (2017) studies find no significant relationship between

their emotional intelligence experiment and academic achievement. Naik & Kiran (2018) find indirect effect of emotional intelligence on academic achievement such as academic motivation time management, goal achievement, and assertive communication. However, Arradaza-Pajaron's (2015) and Doost's (2017) explain that emotional intelligence predicts academic performance.

Pope et al. (2012), Walsh-Portillo (2011), Fei-Zhou et al. (2013), and Fei-Zhou et al. (2013) suggest there are some significant factors between emotional intelligence and academic achievement. A study by Alam & Ahmad (2018) reports significant relationship between a teacher's emotional intelligence and student achievement. Khiat (2017) shows that academic performance factor depends on the teacher's educational outcomes.

Goodwin (2016) presents that emotional factors are one of predictors of academic achievement. Hadiwijaya & Hutasoit (2017) mention that social awareness influence on learning achievement.

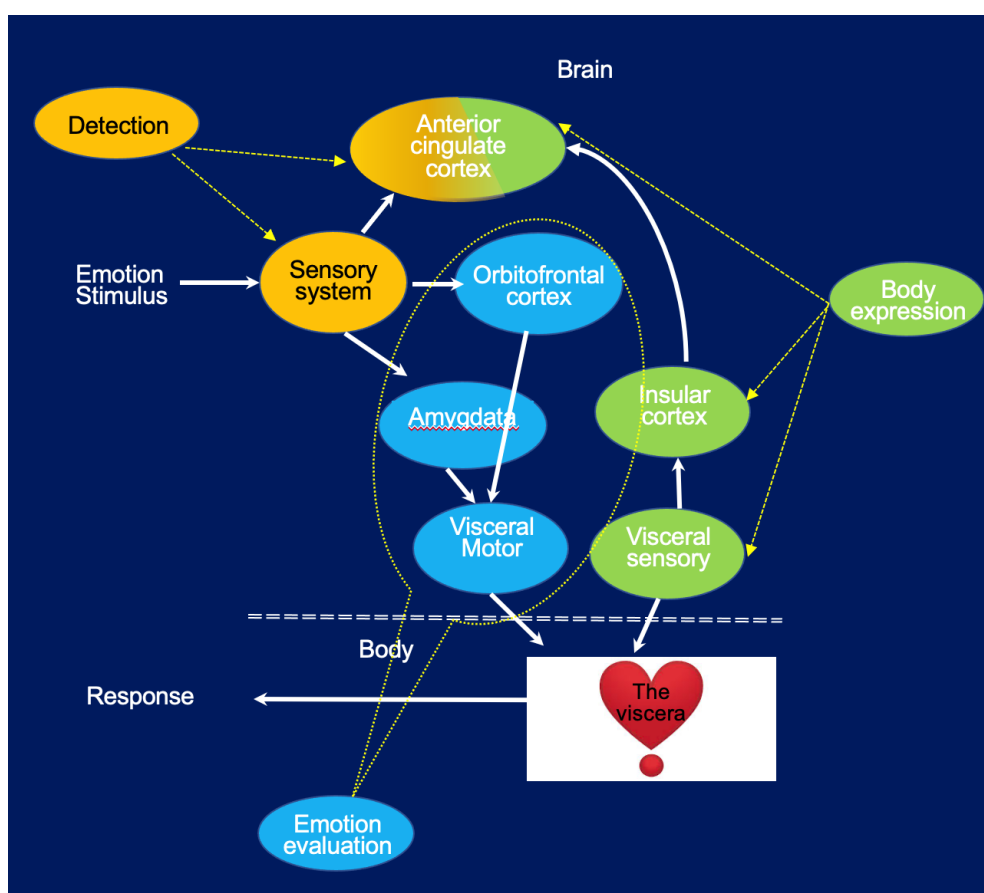


Figure 2: Online education history (revised by this paper)

Boyatzis et al. (2011) describes that self-directed learning improve emotional intelligence through creation of personal learning agenda. Straka & Schaefer (2002) explain the factor emotions such as joy, anger, and boredom should be considered.

When we consider between emotional intelligence and self-directed learning, it can be greater academic goals and better organization of learning system. Costa & Faria (2015) suggest regulation of emotions (emotion control) helps develop intrinsic motivation for academic achievement.

Bar-On (1997) studies self-directed learning and emotional intelligence. Bar-On (1997) confirms that self-directed ability is an emotional competence. Emotional ability is strongly linked to motivation for study.

Eggen & Kauchak (2007) emphasize that self-motivation is an important factor in removing obstacles to overcome self-confidence and achieve self-directed learning as well as autonomy. Learning motivation is also affected by becoming self-directed and how much freedom students have in class and in turn will increase their learning results.

Kırmızı (2015) suggests that readiness gives an influence on motivation of learners as it influences satisfaction in online learning. Lee et al. (2017) present that both motivation and the regulation of motivation is an important factor and the regulation keeps the learner for his learning goals.

Online readiness also influences motivation and Khiat (2017) illustrates that motivation is regarded as an important factor for managing learning process and a trait of self-directed learners. Derryberry & Reed (2008) say that creation of self-motivation should be developed to ensure academic achievements.

Figure 2 shows the emotional expression process by our body and brain.

Brain's Role for Emotion Detection

The role of brain has complicated function to detect emotion because of emotion's complexity. So, there are many papers for definition.

Jungwon Min et al. (2022) tested the hypothesis by examining an activation in regions associated with emotional experience, such as the amygdala, anterior insula, striatum, and anterior cingulate gyrus as well as in regions associated with sympathetic vascular activity.

Brain has five regions as shown in Figure 3 such as frontal lobe, parietal lobe, cerebellum, and temporal lobe. The cerebellum, cerebrum, and brainstem are called the three major components of the human brain. The cerebrum is composed by the cerebral cortex, brain nucleus, and limbic system.

Basically, the cerebral cortex control cognitive and higher-level emotional functions. It is found on the human brain's outermost layer. The brain is divided into left and right hemispheres by a central sulcus in the middle as shown in Figure 3. The cerebral cortex has the Frontal Lobe, Occipital Lobe, Parietal Lobe, and Temporal Lobe. The frontal lobe is in charge of higher cognitive activities. Prefrontal lobe, frontal motion area, and primary motion area are mainly in charge of planning, thinking, and physiological functions associated with a person's emotions and needs.

The central sulcus is a sensory function of the highest level. It is primarily responsible for the integration of somatosensory information as well as the reaction to spatial information such as pain, pressure, temperature, taste, and touch.

The occipital lobe is situated behind the occipital sulcus, in the back of the hemisphere, and is mostly in charge of processing vision related-information. It also has to do with a person's memory, behavioral perception, and abstract conceptions.

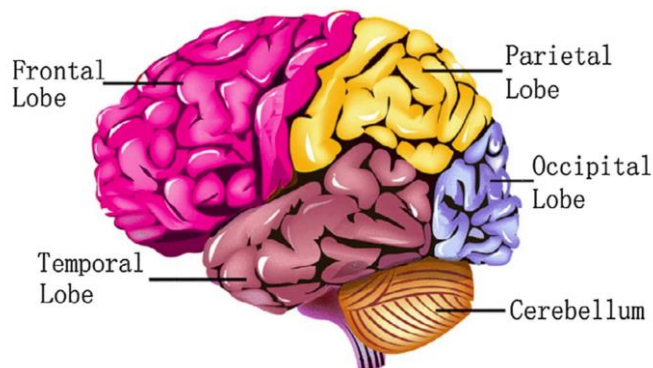


Figure 3: Physiological structure of the cerebral cortex

Source: <https://link.springer.com/article/10.1007/s00521-022-07292-4/figures/3>

The Influence of Emotion for Learning

There are several researches (Azainil et al., 2020) about the influence of emotion to learning in study. The relation between the effect of emotional intelligence and learning discipline was done in the State Junior High School Students in Samarinda City. This research shows significance value on an influence between emotional intelligence, learning discipline.

Hua et al. (2021) illustrate a strongly relation between disease and emotion. That is, a person with dementia or neurodegenerative disease is associated with increased rates of depression and anxiety (emotion functions). They present mental health problems related to dementia caregiving for public health concern.

They study relation between emotional empathy and two measures of cognitive empathy. As emotional empathy, they consider physiological, behavioral and self-reported emotional responses. As two measures of cognitive empathy, they decide identifying the primary emotion experienced by another person and providing continuous ratings of the valence of another person's changing emotions in relation to mental health (standard questionnaires). It means there is a closer relation emotion and cognitive in my opinion.

Brain circuits (Arseny, 2020) shows that adaptive social behavior and mental well-being depend on not only recognizing emotional expressions but also inferring the absence of emotion. Their data indicate greater activation of the right amygdala and midline cerebellar vermis to non-emotional as opposed to emotional body language. As most important, they illustrate the effective connectivity between the amygdala and insula predicts people's ability to recognize the absence of emotion.

Minjia et al. (2019) suggest a system for intelligent learning environments with robots modeling of emotion regulation and cognition based on quantitative motivation. They introduce one bottom-up collaboration method for emotion-cognition interplay and behavior decision-making.

They build a reinforcement emotion-cognition system using the quantitative motivation (it is based on external interactive sensory detection, which is affected by memory and preference), the emotion generation (it is triggered by an initial motivation, which is influenced by external stimulus and by the state in the previous time), the competitive and cooperative relationship between emotion and motivation (it intervenes to make the decision of emotional expression and teaching actions), cognitive reappraisal, and the emotion regulation strategy for the establishment of emotion transition combined with personalized cognition. They display this situation with the robot emotional interactive performance and makes corresponding teaching decision through behavioral and statistical analysis.

Carette et al. (2015) identify the dynamics of emotional relationships during counselling interviews in self-directed language learning. Teacher (counsellors) and learners (student) emotional states are inferred from tone of voice following analysis of audio recordings of their exchanges. Emotions expressed in every turn are characterized on valence and activation scales, and emotional relationships (It can be synthesized in a typology). They illustrate that most of the observed emotional fluctuations are learner-initiated and their results explain that counsellors regulate emotions in order to maintain an emotional climate, which is argued to favor self-directed learning tasks.

SYSTEM DESIGN FOR SELF-DIRECTED LEARNING AND ENHANCEMENT BY EMOTIONAL FACTOR CONTROL

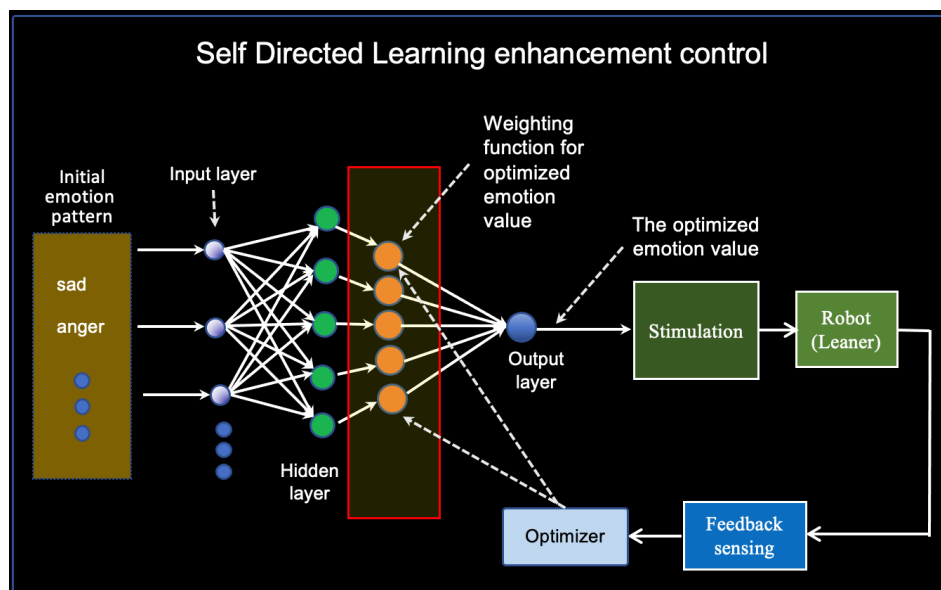


Figure 4: AI control for enhancement of self-directed learning and academic achievement suggested in this paper

As review in the section previous, we can understand well emotional factor can influence on the self-directed learning and learning efficiency (academic achievement) at the online education system. Problems is to figure it out how we must select emotional factor that influence on the self-directed learning and what emotional factor has dominant factor for self-directed learning.

This paper's main idea is going to enhance efficiency of online education after definition of dominant emotion factor. From Figure 3, after measuring initial emotional factor such as happiness, anger, sadness, and others that can give factors to self-learning.

CONCLUSION

This paper provides materials for enhancing online teaching method. That is, how lecturers can teach well students and beginners using emotion factor control as shown in Figure 4.

The OpenAI released ChatGPT3.5 on Dec. 2021 and they opened ChatGpt4.0 on March 2023. Its impact is serious in education systems like K-12. It means that the education system should prepare for AI's impact on traditional education for online education.

In the online teaching, emotional factors can give on impact on lecture results of students. Generally, online teaching focuses too much on cognitive factors of teaching and learning, and they neglect the influence of emotional factors on online learning and teaching. Therefore, it is very necessary to study emotional factors of students to help teachers take different measures according to different emotional features, which is of great significance to improve quality of online teaching for school.

So, this paper offers importance of emotional factor for teaching in online education and suggests improving method using measuring the functions of emotional factor. This paper focuses on analyzing emotional factors that affect learning efficiency of students. Emotional and psychological learning characteristics of students are explored to illustrate influence the emotional factors on online education for students. This research studies control method of the

emotional factors affecting learning of students, which will instruct teachers to do teaching effectively.

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