Original Article

# Effects of Online Teaching Model of "Super Star Learning System and QQ Group" on Learning Enthusiasm and Academic Performance

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## ABSTRACT

**Background:** Online teaching based on multiple platforms has become an important and respected teaching method. **Aim:** We aimed to investigate effect of "Super Star Learning System and QQ Group" online teaching model on learning enthusiasm and academic performance. **Materials and Methods:** An evaluation system of learning enthusiasm was established and evaluated. Students' academic performance in online teaching group and traditional teaching group were compared. Nine variables were selected, including chapter learning times (1), chapter quiz score (2), homework score (3), classroom interaction score (4), usual performance (5), classroom performance score (6), classroom practice score (7), rush answer score (8) and discussion replies score (9). Correlation between learning enthusiasm and academic performance was investigated, and important variables were obtained by principal component regression analysis. A questionnaire was used to find important factors affecting students' satisfaction. **Results:** Academic performance of online teaching group was improved to a medium degree in comparison with traditional teaching group ($p < 0.001$). Some variables (variable 2,4,5,6) from learning enthusiasm were moderately correlated with academic performance ($r_2 = 0.608$, $r_4 = 0.514$, $r_5 = 0.604$, $r_6 = 0.516$, $p < 0.01$). The order of influencing variables on academic performance was variable 2,3,5,9,4,6,7,8,1. Mean scores of achievement expectation factor and learning experience factor were 4.24 (± 0.73) and 4.23 (± 0.76), respectively. **Conclusion:** The online teaching model could stimulate learning enthusiasm and improve academic performance of pharmacy students. There was a certain positive correlation between learning enthusiasm and academic performance. Achievement expectation and learning experience might be the two most important factors that affect students' satisfaction.

**Keywords:** Online teaching model, Learning enthusiasm, Academic performance, Super star learning system and QQ group, Satisfaction survey.

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## INTRODUCTION

With rapid development of education informationization, there are many forms of online teaching, such as embedded video, discussion boards and multiple-choice medical teaching.[1] Students could participate in creation of content for an MOOC as part of an elective course.[2] A university entrepreneurship education model established based on the theory of lean startup and flip class.[3] An innovative teaching model[4] for student learning was proposed. A case teaching (CBL) method was used to develop graduate teaching of medical oncology.[5] Teachers who used innovative teaching practices were more communicative.[6] Undergraduate students who used a mobile app–the iPOT mobile learning app gained stronger motivation, mood state, and satisfaction than students who didn't.[7] E-learning has effect on nursing care among nurses in terms of nurse reactions, knowledge, and skills.[8]

Online teaching became a main form of education during the COVID-19 pandemic.[9] Multiple platforms were used to carry out online teaching, such as rain

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classroom, MOOC platform of chinese universities, and superstar learning platform.[10-12] A live broadcast model was adopted to carry out online postgraduate teaching, and students' learning enthusiasm, active learning and critical thinking were stimulated.[13] Some principles of good practices for online teaching were proposed, such as alignment of online teaching, learning with delivery of curriculum and objectives, synchronous and asynchronous interaction between teacher and student.[14] Online communication tools provided opportunities for teachers to interact with children, and online teaching played an indispensable role in early childhood education and learning programs.[15] These literature reports showed that the online teaching model improved teaching quality and effect, and mobilized learning enthusiasm of students.

However, evaluation methods of learning enthusiasm under the online teaching model and relationships between learning enthusiasm and academic performance were not elaborated in these literatures. Therefore, the aims of the study were: (1) the establish of evaluation system; (2) the evaluation of learning enthusiasm under the online teaching model; (3) the effects of online teaching and traditional teaching on students' academic performance; (4) the relationships between learning enthusiasm and academic performance; (5) the important factors that affect students' satisfaction.

## MATERIALS AND METHODS

### Study Design

#### *Intervention methods in traditional teaching group*

Traditional multimedia classroom teaching method was adopted in traditional teaching group, which was mainly based on the teacher's presentation, classroom exchange of questions, answers and group discussion in classroom. Knowledge transfer was completed in accordance with teaching plan. Students' basic knowledge was consolidated by after-class exercise and reading.

#### *Intervention methods in online teaching group*

"Super Star Learning System and QQ Group" online teaching model was adopted in online teaching group. An online course system was established, including electronic textbooks, teaching plan, practice, self-test, reference books, courseware PPT, video files, audio files and other materials. And students prepared according to learning requirements before class. They listened carefully and carried out group discussion around one theme in class. After class, a certain amount of exercises and extracurricular reading should be completed, and feedback and communication between teachers and students were collected, which would revise and improve teaching design.

"Super Star Learning System and QQ Group" online teaching model (Figure 1) is a student-centered teaching model which was mainly based on super star and QQ group teaching platform. It covers whole process of learning, including class teaching design, preview before class, online class and reflection after class. Modern teaching methods (including PBL and flipped classroom) are implemented in online classroom. These four parts complement each other and promote each other. And they mobilize students' learning enthusiasm and cultivate students' autonomous learning ability.

### Study Subjects and Settings

A total of 150 students majoring in pharmacy in Hebei University of Chinese Medicine were enrolled in this study. According to the natural grouping of classes, 53 students majoring in pharmaceutical engineering of 2017 grade were selected as traditional teaching group, and 97 students majoring in pharmacy of 2017 grade were selected as online teaching group, including 72 females and 25 males, aged 20-23 years. There were 35 females and 18 males in traditional teaching group who were 20 to 23 years old. Both groups of students have systematically studied the basic courses related to natural pharmaceutical chemistry, such as basic chemistry, biochemistry, inorganic chemistry, organic chemistry and analytial chemistry. Natural medicines chemistry (7th edition, edited by Pei Yue-hu and Lou Hong-xiang), a national altitude academy planned textbook for tenth five-year plan, was adopted in this study.

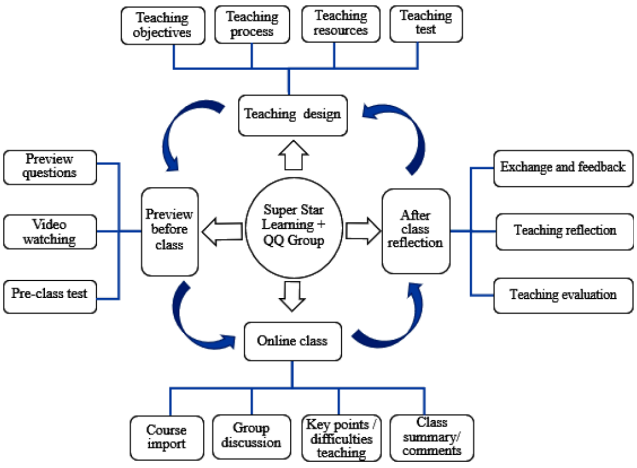


**Figure 1: Online teaching model of "Super Star Learning System and QQ Group".**

Figure 1 shows relationships between different parts of the online teaching model.

**Table 1: Evaluation system of learning enthusiasm in online teaching.**

| Dimension | Evaluation Content |
|---|---|
| Learning engagement | pre-class video viewing time, pre-class video viewing frequency, chapter learning times, sign in times |
| Learning completion rate | pre-class video completion rate, in-class exercise completion rate, homework completion rate, task point completion rate |
| Learning interaction | rush answer times, discussion times and selection to answer times |
| Learning performance | classroom practice score, chapter quiz score, discussion replies score, rush answer score, homework score, pre-class quiz score, classroom interaction score |

Dimensions in Table 1 are dispersed throughout whole process of online learning.

## Study Instrument

### *Evaluation system of learning enthusiasm*

Data of students' online learning activities were collected and used as a basis for evaluation of learning enthusiasm, such as chapter learning times, time and frequency of video viewing before class. Then, they were divided into four dimensions: learning engagement, learning completion rate, learning interaction and learning performance (Table 1). And evaluation system of learning enthusiasm was built.

### *Academic performance assessment*

Theoretical natural medicinal chemistry is an independent course whose summative assessment contains two parts: usual performance (30%) and final grade (70%). Usual performance contains sign in, learning interaction, learning completion, learning performance, and reading. And final grade is obtained by closed book exam which contains objective questions (20 single best answer questions, 20 true or false questions, and 2 short answer questions) and subjective questions (3 discrimination and comparison questions, 1 separation question, and 1 spectrum analysis question). SPSS software was used to analyze students' academic performance in online teaching group and traditional teaching group, and the results of two teaching groups were compared to evaluate their differences (Table 2). Summative assessment of practical natural medicinal chemistry was not analyzed in this study.

### *Correlation between learning enthusiasm and academic performance*

Indicators of learning enthusiasm (Table 1) and influencing factors (including usual performance and classroom performance score) were analyzed to determine their correlation. And influencing factors which significantly correlated with academic performance were selected to be the optimal variables. Further relevant analysis of variables and academic performance was done to find strongly correlated dependent variables ($P$ <0.05). And important variables were further studied to reassert their roles in online teaching. Principal component analysis was used to determine influence sequence of each variable on academic performance. And recommendations of online teaching were put forward.

**Table 2: Comparison of total scores of theoretical examinations in two teaching groups ( $\bar{X}$ + s).**

| Group | Number of cases | Mean score |
|---|---|---|
| Traditional teaching | 53 | 80.06±8.45 |
| Online teaching | 97 | 85.79±9.85 |
| *t* | 3.58 | |
| *P* | 0.000 | |

The measurement data were described by mean ± SD. $P$ <0.05 indicated that the difference was statistically significant.

### *Student satisfaction questionnaire survey*

In order to ensure comprehensive evaluation on learning enthusiasm and academic performance, and find important factors that affect students' satisfaction, a questionnaire survey on online evaluation of teaching was designed in accordance with notice of online teaching and learning survey questionnaire by academic affairs office of Hebei University of Chinese Medicine. Questionnaire survey which contains a total of 97 questionnaires were distributed and recycled by rate of 100%. Students' perceptions of the traditional and online teaching model were collected and scored on a 5-point Likert scale ranging from very dissatisfied (score 1) to very satisfied (score 5). The questionnaire consisted of 22 items, including four factors: (1) content rationality; (2) learning experience; (3) learning enthusiasm; (4) achieve one's expectations; and (5) learning satisfaction (Table 3). Each factor had at least three items and a maximum of six.

The questionnaire was investigated and analyzed by SPSS 22.0 software, and its validity was analyzed by expert evaluation KMO test. The KMO value was 0.931 and the Bartlett's spherical test $\chi 2$ was 3 227.162, d$f$ =231, $P$ <0.001, which indicated that the questionnaire was valid and suitable for further factor analysis. And there

| Table 3: Student satisfaction questionnaire survey. | | | |
|---|---|---|---|
| **Factors, Statements** | **Mean (±SD)** | **Overall Factor Mean (±SD)** | **Cronbach's alpha** |
| **Content rationality** | | | |
| I am satisfied with settings of sign in, notification and learning mission point | 4.31±0.81 | 4.15±0.81 | 0.87 |
| I am satisfied with setting of online teaching activities, such as selecting and responding to questions | 3.96±1.06 | | |
| I am satisfied with setting of online classroom quizzes and exams | 4.19±0.85 | | |
| **Learning experience** | | | |
| I am satisfied with learning activities, such as discussion, group chat | 4.23±0.86 | 4.23±0.76 | 0.95 |
| I am satisfied with pre-class learning tasks and learning objectives | 4.27±0.78 | | |
| I am satisfied with pre-class test | 4.21±0.84 | | |
| I am satisfied with online class group discussion | 4.12±0.99 | | |
| I am satisfied with content and form of online learning resources | 4.35±0.74 | | |
| Online pre-class and classroom quizzes helped to identify strengths and weaknesses | 4.23±0.80 | | |
| **Learning enthusiasm** | | | |
| I needed to spend more time preparing for the online learning compared to the traditional learning | 4.27±0.67 | 4.03±0.88 | 0.94 |
| Problems such as network instability are little influence on online learning | 3.88±1.11 | | |
| Online teaching helped to improve my learning enthusiasm | 4.01±0.97 | | |
| I have enough learning enthusiasm and motivation to prepare for the online exam | 4.10±0.87 | | |
| I have enough confidence to prepare for the online exam | 4.10±0.92 | | |
| **Achievement expectation** | | | |
| I think it is necessary to strengthen learning | 4.29±0.72 | 4.24±0.73 | 0.96 |
| I received immediate and useful information from online learning | 4.22±0.82 | | |
| I have mastered the basic theory and knowledge of this course | 4.23±0.77 | | |
| I think Online learning resources can meet my learning needs | 4.22±0.78 | | |
| **Enhanced learning satisfaction** | | | |
| I received scores and got sense of achievement by participating in online teaching activities | 4.39±0.72 | 4.16±0.80 | 0.97 |
| My learning efficiency has been greatly improved in online teaching | 4.12±0.86 | | |
| I am satisfied with online learning performance | 4.16±0.83 | | |
| I am satisfied with teaching model of superstar learning system and QQ group | 4.22±0.79 | | |

Student opinions and attitudes concerning the summative and formative of online teaching model of "Super Star Learning System and QQ Group". PBL and flipped classroom learning; ±SD, ±standard deviation. Five-point Likert scale: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree.

was a certain connection between variables. Cronbach's alphas were generated for each factor is indicated in Table 3.

## Statistical Analysis

Data were analyzed by SPSS 22.0 software (IBM, Armonk, NY) and presented as mean, ± standard deviation (± SD). A probability value less than 0.05 was considered significant. Effect size was calculated by means of cohen's d. Firstly, an evaluation system of learning enthusiasm under the online teaching model was established. Secondly, two kinds of summary examination were summarized and analyzed. Data from traditional teaching group and online teaching group were collected and were used to represent the traditional teaching model and online teaching model respectively. Two independent samples t-tests and two-tailed tests were adopted to compare mean-level differences between the two groups, and scores were graded in hundred-mark system. Thirdly, in order to investigate relationship between learning enthusiasm and academic performance, their correlations were determined to find significantly variables associated with academic performance. The independent variable was summative and formative approach to online teaching model of "Super Star Learning System and QQ Group" and the dependent variable was summative evaluation

score. And these variables' effects were determined by principal component analysis. Finally, a questionnaire survey on online teaching model was conducted to analyze students' degree of recognition.

## RESULTS

### Evaluation of Learning Enthusiasm

Analysis of learning data indicated that students performed well in video viewing, chapter learning times, completion rate of in-class exercises, homework and task point. Among them, chapter learning times was significantly increased after class, which might be related to convenience of online learning. Learning enthusiasm (including chapter quiz score, homework score, video viewing score, classroom interaction score, discussion replies score, sign in times and chapter learning times) was evaluated. The result showed that over 60 percent of students scored 80 points or more.

### Evaluation of Theoretical Academic Performance

Theoretical academic performance of the two teaching groups were investigated. Mean percentage of total scores of traditional teaching group and online teaching group were 80.06 (± 8.45) and 85.79 (± 9.85), respectively, with 100 points in total. Difference between two teaching groups was determined by independent samples *t*-test. The result demonstrated that there was statistically significant difference between the mean scores of two teaching groups (t = 3.58, $P < 0.001$, cohen's d = 0.624). Online teaching model was significant influence on students' theoretical academic performance.

### Correlation between Learning Enthusiasm and Academic Performance

We selected nine variables which significant correlation with academic performance in sample correlation analysis, including chapter learning times (1), chapter quiz score (2), homework score (3), classroom interaction score (4), usual performance (5), classroom performance score (6), classroom practice score (7), rush answer score (8) and discussion replies score (9). Among them, variable 2,4,5,6 were moderately correlated with academic performance ($r_2$ =0.608, $r_4$ =0.514, $r_5$ =0.604, $r_6$ =0.516, $p$ <0.01), and the others had less correlation with academic performance ($r_1$ =0.455, $r_3$ =0.455, $r_7$ =0.451, $r_8$ =0.443, $r_9$ =0.500, $p$ <0.01). These variables were collected from learning activities in online class and after class. The result indicated that there was a certain positive correlation between learning enthusiasm and academic performance in the online teaching group.

### Principal Component Regression Analysis

Students' tested data from online teaching platform were entered into Excel and imported into SPSS 22.0 for KMO-Bartlett test. The KMO value was 0.795, and the *p*-value for Bartlett test of sphericity was less than 0.01. The result indicated that principal component analysis was suit for the variables' analysis and their relational interpretation.

The variables of online teaching practices were normalized and investigated by multicollinearity diagnostic analysis. The result showed that five variables had serious collinearity, including variable 4,6,7,8,9 ($T_4$ =0.371, $T_6$ <0.1, $T_7$ =0.155, $T_8$ =0.295, $T_9$ <0.1; $VIF_4$ >10, $VIF_6$ >10, $VIF_7$ >10, $VIF_8$ >10, $VIF_9$ >10). Principal components analysis was carried out on data collected from 97 students to calculate eigenvalue and contribution ratio of principal components. The result showed that eigenvalues of the first and second principal component were 6.178 and 1.022, respectively, and their cumulative contribution rate was 79.994%.

Principal component regression coefficient analysis was conducted with a regression equation consisting of the standardized dependent variable and the first principal component $y_1$ and the second principal component $y_2$. There were no complex collinearity in principal component variable $y_1$ and $y_2$ ($T_{y1}$ =7.504, $T_{y2}$ =2.151; $VIF_{y1}$ =1.000, $VIF_{y2}$ =1.000). Estimated values of regression coefficient of the two principal components were 0.603 and 0.173, respectively. The results showed that the regression coefficient and regression equation were significant on the whole. Therefore, regression equation was obtained as follows: $y=0.057\ x_1+0.163\ x_2+0.161\ x_3+\ 0.107\ x_4+\ 0.139\ x_5+0.098\ x_6+0.094\ x_7+0.060\ x_8+0.100\ x_9$ (y was dependent variable and x was independent variable).

Overall, the results suggested that chapter quiz score (2) was the most influential variable. Students' academic performance will change by 0.163 units when chapter test changes by 1 unit. And the order of other influencing variables on academic performance was variable 3, 5,9,4,6,7,8,1 (Figure 2).

### Student Satisfaction Survey

Ninety-seven students out of 97 (100%) responded to the questionnaire. 72 females and 25 males survey results were analyzed, and their responses to the survey items are shown in Table 3. There were five factors in student satisfaction questionnaire (Table 3). Among them, factor of achieving the desired obtained the highest mean score of 4.24 (± 0.73). The majority of students emphasized that they had benefited from the online learning. The online teaching provided a better

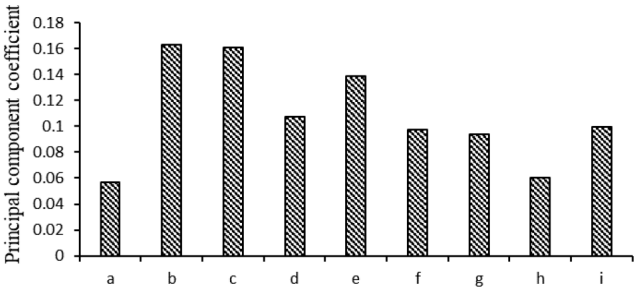


**Figure 2: Principal component regression coefficient analysis of 9 variables.**

"a-i" denoted coefficients of variable "$x_1$-$x_9$", respectively. Larger coefficient indicated greater influence of influencing variables on academic performance.

learning experience than traditional teaching with mean score of 4.23 (± 0.76). Mean scores of learning satisfaction and content rationality were 4.16 (± 0.80) and 4.15 (± 0.81), respectively. Students were satisfied with the online teaching model and its content set. Mean score for students' learning enthusiasm factor was 4.03 (± 0.88). Some students felt that problems such as network instability had some influence on their online learning 3.88 (± 1.11).

## DISCUSSION

This study demonstrates that there are significant differences in theoretical academic achievements between the online teaching group and the traditional teaching group. Students' learning enthusiasm and theoretical academic performance were improved in the online teaching group in comparison with the traditional teaching group. Remarkably, their final-term theoretical examination scores in the traditional teaching group and the online teaching group were 74.64 (± 11.34) and 83.66 (± 12.79) on 100-point scale, respectively. The independent sample t-test results showed that there was a significant mean level difference between the two groups ($t = 4.295$, $P < 0.001$, Cohen's d = 0.747) (Table 4). There were differences between final-term scores and total scores of theoretical examinations of the two groups by comparison of data from Table 2 and Table 4. The difference between final-term scores of the two groups was larger than the difference of total scores. It was speculated that comparison of final-term scores of theoretical examinations of the two groups was also feasible. The reason could be that both groups of students were subjected to a closed book examination. And their assessments had the same content, time and difficulty.

Influences of online teaching on students' learning were reported in various literatures.[16-18] Practice in e-learning was beneficial to achievement of students' learning

**Table 4: Comparison of final-term theoretical examination scores of two teaching groups ( $\bar{X}$ + s).**

| Group | Cases | Mean score |
|---|---|---|
| Traditional teaching | 53 | 74.64±11.34 |
| Online teaching | 97 | 83.66±12.79 |
| *t* | 4.295 | |
| *P* | 0.00 | |

The measurement data were described by mean ± SD. $P < 0.05$ indicated that the difference was statistically significant.

objective.[19] And multimedia learning was closely related to emotion.[20] Adding anxiety-reducing features to an online lesson could help students to obtain higher accuracy on solving practice problems ($d = 0.71$) and higher perceived effort on learning the multimedia lesson ($d = 0.66$).[21]

Our study describes how an online teaching model integrating superstar learning platform and QQ group effect learning enthusiasm and academic performance. Teachers conducted online teaching, and students positively participated in the teaching activity. Problems in learning were solved timely, and transference and assimilation of knowledge were completed in online learning. The result showed that students' learning enthusiasm was stimulated. And theoretical academic performances in online teaching were better than that in traditional teaching. The online teaching model of "Super Star Learning System and QQ Group" was generally accepted by the majority of students from their feedbacks. There was a certain positive correlation between learning enthusiasm and academic performance in online teaching. Students' learning activities in and after class were closely related to their academic performance. Learning enthusiasm had an impact on academic performance. It has been reported[22] that there were statistically positive relationships between self-regulated learning with intrinsic motivation, extrinsic motivation, task value, control of learning beliefs, self-efficacy and academic achievement in a similar study.

However, students had to deal with uncertainty problems in online learning from their feed-backs. For example, they were not familiar with the online teaching platform. That might be potential barriers to online learning. Students in most dental schools were less satisfied with "interaction between teachers and students" in general evaluation of online learning.[23] These problems could be eased and solved by good communication interaction and self-regulated learning[24] in this study. And barriers to behaviour associated with self-regulated learning could be overcome under guidance of COM-B model.[25]

Further, video playing patterns may be the main factor affecting adult learners' online learning efficiency.[26]

### Limitations

The primary aims of this study were to explore the differences between online teaching model of "Super Star Learning System and QQ Group" and traditional teaching model in natural medicines chemistry theoretical course. Practical natural medicines chemistry course, an independent curriculum, was not involved in this study. And this could be perceived as a limitation. It was because evaluation methods of practical natural medicines chemistry course were different between the two groups due to COVID-19 pandemic.

Online assessment was applied in the online teaching groups, and offline assessment was applied in the traditional teaching group. Therefore, future studies will comprehensively assess effect of the online teaching model on the whole course, including theoretical course and practical lessons.

## CONCLUSION

Students' participation in-class activities and interaction between teachers and students had been strengthened in the online teaching model of "Super Star Learning System and QQ Group". Transference and assimilation of knowledge were promoted by online learning and practice. Compared with traditional learning, academic performance of online learning was improved at a medium level. There was a certain positive correlation between learning enthusiasm and academic performance in online learning. The selected variables including chapter learning times (1), chapter quiz score (2), homework score (3), classroom interaction score (4), usual performance (5), classroom performance score (6), classroom practice score (7), rush answer score (8) and discussion replies score (9) were determined by principal component regression analysis. The order of influencing variables on academic performance was variable 2,3,5,9,4,6,7,8,1. The questionnaire survey results showed that students were positive about the online teaching model, and achievement expectation and learning experience were the most important factors that affect students' satisfaction. In addition, the online teaching model is a viable and effective teaching method for improving learning enthusiasm and academic performance, and it can also be used in adult education.

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## CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

## ABBREVIATIONS

**MOOC:** massive open online courses; **CVID:** Corona Virus Disease; **COM-B:** Capability, Opportunity, Motivation, and Behaviour; **NO:** number.

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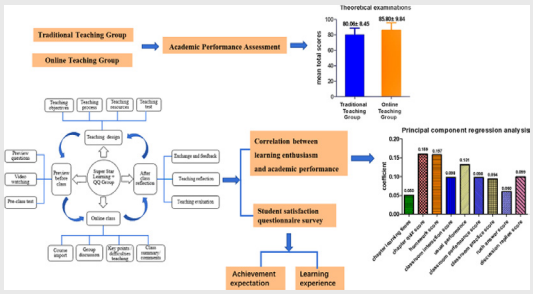
## PICTORIAL ABSTRACT




## SUMMARY


Students' learning enthusiasms could be stimulated under the online teaching model, and feedback information was obtained immediately so that students could improve their learning efficiency. Academic performance of the online teaching group was moderately improved in comparison with the traditional teaching group. There was a certain positive correlation between learning enthusiasm and academic performance in the online teaching group. Nine variables which significant correlation with academic performance were selected and evaluated to find the important influencing variables such as chapter quiz score. Students preferred the online teaching model because of two positive factors including achievement expectation and learning experience.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