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Comparative Study on the Effects of Online Courses and In-Class Courses

Yue Qin[1, *], Di Lv[2], Yinzi Feng[3]

[1]School of Wealth Management, Ningbo University of Finance and Economics, Ningbo, China

[2]School of International Business and Trade, Ningbo University of Finance and Economics, Ningbo, China

[3]School of Finance and Information, Ningbo University of Finance and Economics, Ningbo, China

Email address:

61458945@qq.com (Yue Qin)

[*]Corresponding author

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Abstract: The outbreak of COVID-19 at the beginning of 2020 has formulated a totally different teaching situation for most of Chinese Universities/Colleges, because inevitably online courses took the leading role in teaching by replacing in-class courses at the beginning of that semester, then in a parallel teaching mode after students' returning to school. This research conducted a comparative study on teaching quality of online courses and in-class courses under this specific background from Chinese college students' perspective by using in-depth interviews and the online questionnaire. This study finds that the quality of online courses is not as good as in-class courses at present, but with a small gap to improve, indicating a positive affirmation and encouragement of improvement for online courses. Furthermore, teaching paradigms have significant impacts on imparting knowledge. Teaching paradigm is the "catalyst" and "accelerator" on the basis of the teachers' own professional knowledge, which facilitating both teaching and learning. Finally, different learning atmosphere (online courses / in-class courses) is a significant factor in explanation of different effects and influences on both teachers and students. A more advanced network technology is needed to create a more interactive and communicative "learning atmosphere" of online courses, thus gradually improving the effect of online courses.

Keywords: Online Course, In-Class Course, Teaching Quality, Comparative Study, Situational Learning

1. Introduction

1.1. Background

The outbreak of COVID-19 at the beginning of 2020 has produced great impacts on all industries and living habits of the people across the country. To actively respond to the call of "suspended class, ongoing learning" during the special time proposed by the Chinese Ministry of Education, all universities and colleges formulated a whole scheme of online learning to minimize the impacts of COVID-19 on teaching and learning for the upcoming semester.

Then, in the first half of 2020, a teaching situation totally different from the previous online teaching was formed in the whole higher education in China. Particularly, for these participating college students in the present study, the previous online courses were inevitably used as supplementary or follow-up to in-class courses under the coexistence between the two, however, at the beginning of that semester (at the end of February of 2020) in-class courses were completely replaced by online courses for 10 weeks, and then in a parallel teaching situation with online courses when teachers and students went back to school[1]. Thus, for the very first time, the online courses worked separately from in-class courses and took a leading role in the first 10 weeks of that

1 These participating college students experienced different kinds of online courses before COVID-19 (which is not the focus of the present study). However, what the present study tries to emphasize is a thorough replacement of all their college courses by online courses during those 10 weeks, which gave them a dynamic immersion to the online courses. Thus, this study made a comparison between the effects of online courses and in-class courses. Furthermore, this study was conducted at the end of that semester and focused on the whole experiences of their learning.

semester for the participating college students. This study compared the effectiveness of online courses and in-class courses from the college students' perspective by using in-depth interviews and questionnaires under this specific teaching mode, then raised the constructive suggestions on improvement of teaching qualities.

1.2. Literature Review

Before 2020, online courses were investigated and discussed by academic circles in the case of coexisting with in-class courses in China. Xie and Xiong found that the average score of online courses is lower than that of in-class courses, while it is easier for students to get higher scores by taking online courses from the perspective of their individual academic performance [1]. According to the empirical analysis on data collected in the form of questionnaires, Sun et al. found that students' teaching evaluation on teachers' entity projects significantly affects their frequency of taking online courses, that is to say, the more dissatisfied the students are with teachers' teaching, the more inclined they are to supplement their learning by taking online courses; the higher the students' interest in learning, the more frequently they use online courses; the frequency of liberal arts students using online courses is much higher than that of science students [2]. Ye said that students will choose online courses for the practicability and competitive advantage of online learning [3]. Han et al. summarized that curriculum, platform, teachers, students and interaction factors are the five factors influencing the effectiveness of online learning, and put forward the suggestions of strengthening supervision and management, and implementing virtualized practice mode [4].

The outbreak of COVID-19 in 2020 has created a special teaching environment different from any time before. At the initial stage, online courses replaced in-class courses, rather than the educational situation of online and offline coexistence discussed above. However, the online courses during the epidemic in 2020 have certain differences with solo online education which is a complete set of online teaching mode. During the last stage of that semester, most of schools reopened and teachers and students came back to school, the teaching situation returned to the former coexistence of online courses and in-class courses, and in-class courses taking the leading role. Thus, it formed an effective comparative situation, one subject—two learning circumstances, for comparing the teaching quality between the online courses and in-class courses. Therefore, the literature reviewed on online courses under the background of COVID-19 in 2020 is summarized as followed:

Most researchers believe that online courses are unable to replace in-class courses, with its effects to be put into practice. According to the questionnaire survey on teaching quality of online courses, Ma et al. found that students can accept online teaching, but they prefer in-class courses [5]. Zhang said that the effective equivalence of online courses and in-class courses needs to be tested by time and verified by practice, while at present and in the future, there is still a certain gap between online courses and in-class courses, without possibility of replacing in-class courses by online courses [6]. Luo and Liu found teachers should notice and respect the differences of the students' learning ability and effectiveness. The desynchrony between teachers and students is the main deficiency of online courses, which mostly depending on the students' self-consciousness on learning [7]. Du et al. explained distraction factors of online courses based on the theory of situational matching. The online courses changed the living situation into a learning situation as well. The pressure and task from the coexistence of living spaces and learning spaces distracted the students learning and made them feel exhausted and distracted [8].

Some scholars put forward corresponding countermeasures to improve the effectiveness of online courses. Xiao proposed the inevitable acceleration of educational informationization by online courses. As a necessary expedient under the epidemic situation, online course itself is a long-term plan for education [9]. According to the investigation and research on college students' use, participation and expectation of online education platform and online course resources, Zhang and Ren proposed to establish a complete set of effective online course evaluation system, so as to make online course one of the effective auxiliary ways [10]. Deng and Liu suggested to light the students' enthusiasm of online learning by designing interactive communication between teachers and students, such as giving a like to students who answered the question or participated in the online courses actively [11]. Chen et al. argued that we should improve students' independent learning capability when combing the online courses and offline courses [12].

Furthermore, by taking a course as an example, some teachers found the different effectiveness of online courses for different subjects and different courses. The model innovation on task-based teaching method from the perspective of human factors was conducted on the online courses of College English by Wang, thus proposing that the task-based teaching method can stimulate learners' interests in learning, enhance the sense of participation and experience, and form a student-centered teaching mode and method innovation [13]. According to the comparison between traditional mode and online course of law education, Hong believes that the enrichment of teaching methods for law education by online teaching mode is manifested by the following aspects: the teaching environment similar to "block chain" that replaces the teaching mode of "teacher-centered". Multi-directional discussion and study of online teachers and students available at the same time. Thus, it expands the teaching contents, and students can get a large amount of relevant information at any time [14]. Xu et al. said that most students found online learning was more difficult for a demanding course with many theoretical formulas, such as Chemical Thermodynamics. Because of the limited time and the inability to communicate face to face, students could not concentrate on online lectures fully [15].

1.3. Research Questions

To sum up, although most researchers in the literature

review believe the effectiveness of online courses cannot approach to that of in-class courses, the measurement of the gap and especially the reasons for explaining the gap have not been explored deeply. Then this study conducted a comparative study on the teaching quality of online courses and in-class courses under this specific semester (teaching situation) by using in-depth interviews and survey questionnaire from the college students' perspective, thus digging into the reasons why there is gap in effectiveness between online courses and in-class, and proposing the corresponding methods and countermeasures for the improvement of teaching quality of both online courses and in-class courses.

2. Methods

2.1. Research Model and Procedure

This study was carried on from qualitative research to quantitative research. First, the researchers conducted in-depth interviews with targeted participants (college students) who showed willingness to participate in the present study. Second, based on the analysis of interview data, the researchers compiled and modified the online questionnaire, then distributed the online questionnaire to the college students in one University in China using the questionnaire network (wenjun.com), and then a total of 221 valid questionnaires were collected.

2.2. Research Context

The teaching situation of the studied semester is as follows: Teachers and students get to know each other through online courses from the first week and start teaching and learning. Network teaching (hereinafter referred to as online courses) is offered in the first ten weeks, then students return to school at the 11th week, and face-to-face teaching (hereinafter referred to as in-class courses) is offered from the 12th to 17th week. Namely, the in-class courses are not conducted until the 12th week. Thus, the course time ratio of online courses to in-class courses in this semester is 5:3.

2.3. Instruments Used and Validation

In-depth interviews with 11 college students who showed their willingness to participate in the present study were conducted at the end of the studied semester to avoid potential influences on the students' study. Then, based on the analysis (see 3.1) of these in-depth interviews, the questionnaire was designed and revised (Appendix 1 & 2). The questionnaire includes three parts (see Table 1) with 13 items in total mainly focused on the comparison of teaching quality between online course and in-class course, with an extension on the relationship between teachers' guidance and students' learning, the appropriate proportion of online courses to in-class courses, and teachers' influencing factors during teaching process. The design of choices of each item of questionnaire is the results of the former qualitative interviews, thus a part of results of the present study, which guarantees the validation of the online questionnaire. In the following sections, the results and analysis of the in-depth interviews and online questionnaire will be showed separately.

Table 1. *Contents and Purposes of the Questionnaire.*

	Contents	Item number	Purposes
Part I	Individual information (including gender, grade, scoring of "self-control ability" and "learning effort")	1-3	Participants' evaluation on themselves and guidance into the learning situation
Part II	Online courses VS In-class courses (including scoring of online courses and in-class courses, comparison of advantages and disadvantages, and appropriate proportion of online courses and in-class courses)	4-10	Main part: quality of online courses and in-class courses and influencing factors of the quality
Part III	Students' learning VS Teachers' guidance	11-13	Extension part: a sub-study on the guiding role of teachers to students and its influencing factors

2.4. Limitations and Future Research

The limitation of time and energy makes this study fail to interview the students who expressed their willingness to participate in further in-depth interviews after the questionnaire survey. In addition, for the purpose of this paper (from the college students' perspective), this study did not conduct in-depth research on teachers. Thirdly, this study did not make a comparation with students from other cultures. If time permits, the researchers will continue the research on the above three aspects. Finally, the generalizability of these findings may be limited by the fact of differences among different teaching and learning situations of different culture.

3. Results and Analysis

3.1. Results and Analysis of In-depth Interviews

11 college students participated in the in-depth interviews, including 7 girls and 4 boys who were numbered as F1, F2, F3, F4, M5, F6, M7, M8, F9, M10 and F11 in order (F refers to Female and M refers to Male).

3.1.1. Reasons for Preferring Online Course

Two students (F1 and F 11) believed online courses to be with better effects, while the other nine students believed in-class courses to be with better effects. F1 as a highly self-disciplined but timid student prefers online courses due to its inexistence of various "requirements" for face-to-face communication: "I don't dare to ask the teacher questions

face to face, while online courses allow me to ask the teacher questions by sending message through Dingding software directly, which is very convenient for me. I am very timid and feel comfortable asking questions in this way [online]. As to the effect, I think online courses have higher efficiency as far as I am concerned, for I am self-conscious, attending online classes on time and always alone in a quiet environment. While in offline classes, sometimes I don't participate in the class very attentively due to the talking and laughing with my classmates." However, in terms of whole effect, she also affirmed the necessity of offline courses, "it's also impossible for you to only have online classes. Generally speaking, I think online courses are as important as in-class courses."

F11 found that online courses worked better due to the available repeated playback: "I can learn more in front of the computer by taking notes, while I don't take notes in in-class courses, thus 8 points for online courses and 7 points for in-class courses."

To conclude, this indicates that students with high self-discipline can learn more in online courses, without a big gap between the effect of online courses and in-class courses.

3.1.2. Reasons for Preferring In-Class Course

During the interviews, most students (9 out of 11) believed that in-class courses with better effects due to the easy distraction when taking online courses (F2, F3, F4, M5 and F9). F4 deliberated: "it is too easy to be distracted by eating food and playing mobile phone when taking online courses at home, while the in-class courses make it difficult to get the phone out from below the desk, thus we can only read books and listen to the teacher, with a short period of distraction, which is not as serious as online courses." F6 felt it difficult to absorb enough information when listening to online courses: "I can not bear listening to too many online courses facing a computer, it is not vivid enough."

Another important reason is that online courses provide no "learning atmosphere": "attending in-class courses with my classmates make me feel happy, while taking online courses alone at home has no learning atmosphere (F4)." M7 also mentioned "atmosphere": "the atmosphere of online courses makes students to be lazy easily and lose interests in learning, while the face-to-face teaching pushes me to listen to the teacher along with other classmates, thus I don't want to take online courses alone. Traditional primary school, junior high school and universities all offer in-class courses, not too much online courses, so it is a habit, of a sort." It can be concluded that the "atmosphere" of in-class courses is a kind of learning-driven circumstances and atmosphere created by both teachers and students in the face-to-face classroom, which is completely broken by the special situation of online courses. In turn, the original inherent "in-class identities" of teachers and students are being redefined and/or created by "online courses atmosphere", which is "incomplete and partial"(F4), even "one-sided and unreal"(F6) sometimes, such as online mutual communication is not smooth (M7), etc. However, the "all-round and colorful" (M7) communication of in-class courses makes the amount of information abundant, facilitating in-class courses' higher efficiency, better effect and faster absorption from the students' perspective.

The last reason is the more convenient teacher-student interaction: for example, "in-class course makes it available to ask the question I do not understand immediately, while it will be embarrassed to send messages to ask a question for so many students online watching (F3)". M8 talked about the lack of interaction in online courses: "the lack of interaction in online courses makes us easy to be distracted, thus we only answer questions when being asked by the teacher. Online course is rigid and in-class course is active." At the same time, he also argued that the appropriate ratio of online courses to in-class courses should be 2:8 if a subject is composed of both.

3.1.3. "Interesting" Teachers Are Favorable for Students

On the extension part of the research question, the researchers discussed with the participants the qualities a good teacher should have to facilitate the students' learning. First, the participating students affirm the importance of teachers' guidance in the learning process of a subject: "I'm learning mathematics, which needs teachers' guidance at the initially unfamiliar stage, and then I practice repeatedly by learning and using teachers' thinking mode, and draw inferences about other cases from one instance, thus finally I finish my learning (F2)." Moreover, besides imparting knowledge, the potential influences of teachers on students are also confirmed: "Teachers do affect us significantly in sense of values, maybe the opinions about matters, or attitudes towards things, which is very vague, but it does have an impact (M5)." F2 also mentioned the role of teacher in affecting her future plan besides imparting knowledge: "The great impact of teacher's 'three views' on me pushes me to consider that why I can't go out to see the outside world like other people do when she talked about what she had seen and heard in her studies. She [the teacher] also influences me significantly by her viewpoints on some affairs, for example, she said people should live for themselves rather than someone else, which is very right and I could not agree more. What she has talked about did not only help me in learning her course, but also changed my own plans for the future. However, I will also work hard and take it seriously in her course, because I don't want to disappoint her."

On the basis of affirming these influences, "interesting" teachers are favorable for students in the learning process. F2 mentioned the points of "interesting" and "being able to solve problems from students' (beginners') perspective": "For example, the teacher can explain the cases using his own words rather than the written language. The more understandable way adopted by teachers will make me understand easily, and then I will have a sense of achievements and continue my learning. The interesting stories and/or expressions in boring study suddenly provided by teachers are helpful to attract my attention again when I get to be distracted during listening."

M5 also mentioned "interesting" as a good quality for a teacher: "When we listen to classes, he [the teacher] will talk about some things to attract our attention, which is very interesting. My high-school teacher would tell a relevant story to make you listen to him again and continue to listen to his classes. Sometimes, the too long [course] time makes it impossible to focus on the whole course, so you need a point to let you focus again…Just some short stories, no matter whether to be integrated with the teaching contents or not…sometimes, just share his [the teacher's] own experiences in the past...That is not a waste of time". All the participants in the present study who mentioned that their teachers' teaching and explanation of certain knowledge combined with the teachers' own experiences and/or short stories, did not assume the teachers' sharing is a waste of time, but all affirmed that this teaching method is beneficial for knowledge understanding and attracting students' attentions.

F11 also mentioned teachers' "interesting": "His [a teacher] interesting style in class makes me concentrate and be willing to participate in classes...He would tell some short stories to adjust class atmosphere…we feel relaxed and can learn more knowledge in his class due to more interactions and students' participation, while some teachers only enjoy their own teaching…good teachers are conductive to our learning."

M7 also mentioned the quality of being "humorous": "The humorous lecturing style of my high school history teacher makes me and my classmates enjoy taking his class, and he would tell the stories about extracurricular contents, rather than lecturing rigidly, which is no waste of time, but can facilitate my learning."

M8 also mentioned contents explanation combined with story telling: "It is interesting to combine with stories for lecturing, such as the combination of modern history and stories." M8 also said that there are some differences in teachers' performance during online courses and in-class courses: "The inexistence of interaction in online courses make it difficult for me to understand what the teacher talks about and feel boring, while actually, this teacher is really interesting in in-class courses, who likes to joke and laugh very much, and we can understand once he combines the contents with funny stories, thus learning by listening to the story. The interesting stories not written in books make people feel funny, which is no waste of time, but can promote my learning...With the accurate control on the degree, he would stop the story telling when he thinks that we have get it." This indicates the different situations between the online courses and in-class courses not only have a great impact on the learners but also on the teachers.

M10 also mentioned the combination of life examples and class contents by teachers: "My junior high school science teacher would combine class contents with life examples, rather than rigid lecturing, thus the relaxed class atmosphere makes us not feel bored. More communication in class will result in higher learning efficiency, which is closely related to teachers' teaching methods, so the way of class and communication with students should focus on more communication, only keeping contents explanation will make people feel tired when listening."

In addition, F3 proposed the quality of "logicality": "It means the bit-by-bit lecturing, and the continuity of knowledge points. That is to say, when all the students understand what the teacher has explained, he can talk about two more knowledge points, and then do exercises, which will be more specific by combining these related points." Furthermore, "helping my learning" in "appropriate time" mentioned by F1 means that providing appropriate guidance when needed.

Inspired by the above results and analysis of in-depth interviews, the researchers designed and revised the questionnaire (Appendix 1 & 2) used in the following survey research. All the choices of certain item of the questionnaire based on the former data of in-depth interviews. Thus, the contents of the questionnaire are part of the results of the present study. The followed sections are results and analysis of the questionnaire survey, which answered the research question and sub-questions from quantitative perspective.

3.2. Results and Analysis of Questionnaire Survey

3.2.1. Respondents

As shown in Table 2, among the 221 valid questionnaires collected in this survey, there are 149 girls, accounting for 67.42%, and 72 boys, accounting for 32.58%. The 221 respondents are freshmen, sophomores and juniors, with basically reasonable proportion (Table 3). Senior students did not return to school during the researched semester, so no one participated in the survey.

Table 2. *Number of Respondents with Different Gender.*

	Number of respondents	Proportion
Male	72	32.58%
Female	149	67.42%

Table 3. *Number of Respondents with Different Grade.*

	Number of respondents	Proportion
Freshmen	62	28.05%
Sophomores	72	32.58%
Juniors	87	39.37%

3.2.2. Online Courses VS In-Class Courses

For the sub-question that which one has better effects? online courses or in-class courses (Figure 1), 65.16% of the students chose in-class courses, which is nearly twice as much as those who assumed online courses are better. Although online courses are completely replacing in-class courses at the beginning of this semester, more students still think in-class courses have better effects compared with online courses.

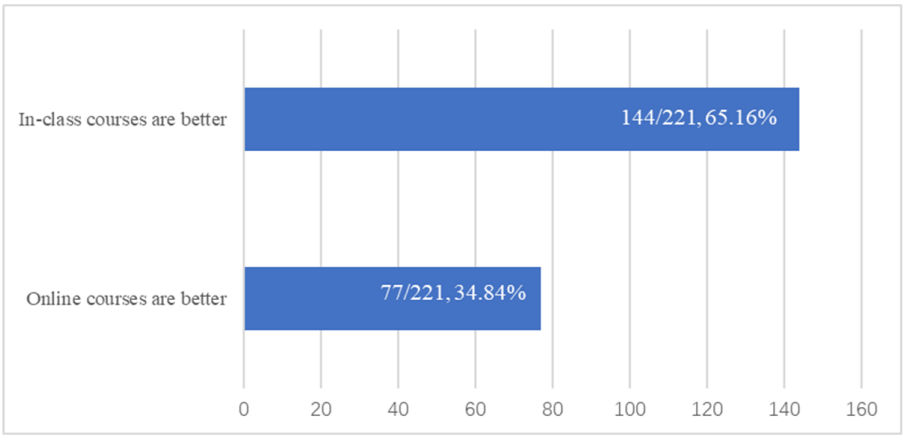


Figure 1. *Proportion comparison in effects between online courses and in-class courses.*

However, the analysis from the perspective of gender shows that 41.6% of girls and only 20.8% of boys chose online courses to be with better effects, showing the proportion of girls is twice as much as that of boys (Figure 2).

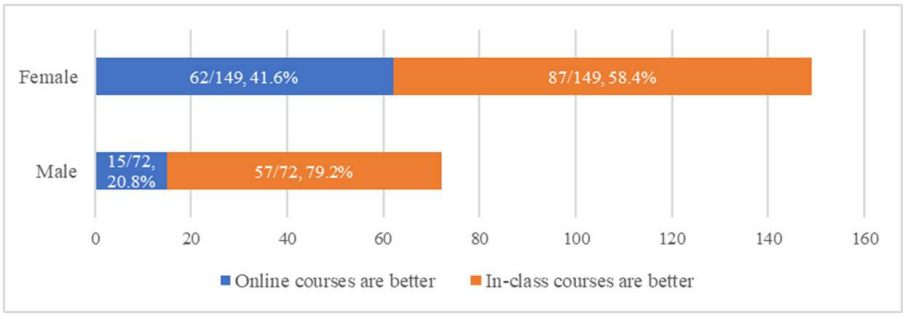
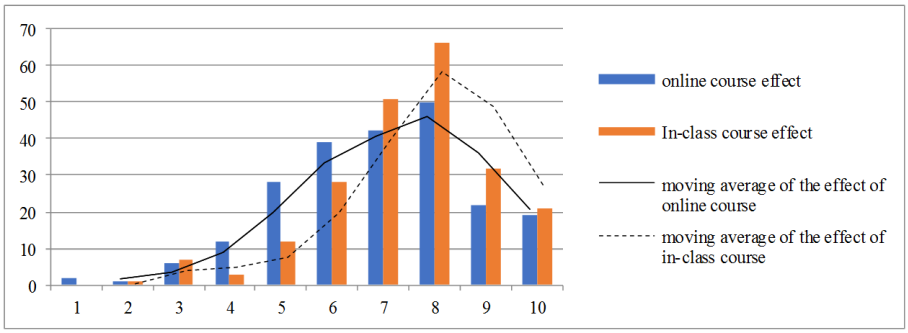


Figure 2. *Effect evaluation on online courses and in-class courses by male and female.*

Based on the above results, the respondents are required to evaluate the effect of online courses and in-class courses with scores (Figure 3), with the results shown in the following figure.



Specific options in Figure 3	1 point	2 points	3 points	4 points	5 points	6 points	7 points	8 points	9 points	10 points	Average score
Online course effect (full score is 10)	0.90% 2	0.45% 1	2.71% 6	5.43% 12	12.67% 28	17.65% 39	19.00% 42	22.62% 50	9.95% 22	8.60% 19	6.9
In-class course effect (full score is 10)	0.00% 0	0.45% 1	3.17% 7	1.36% 3	5.43% 12	12.67% 28	23.08% 51	29.86% 66	14.48% 32	9.50% 21	7.45

Figure 3. *Scoring on effect of online courses and in-class courses (full score is 10).*

The overall effect shows that online courses are not as good as in-class courses, while the average score 6.9 of online courses rated by respondents indicates their certain affirmation to it, which is 0.55 less than that of in-class courses (7.45), thus there is not a big gap between them. With the advantages and disadvantages of online courses summarized in Figure 4 and Figure 5, the biggest advantage is the available playback of class contents for repeated watching, which can not be achieved by offline courses, unless offline courses are also recorded in class; another biggest advantage is the relatively free time allows students to take the classes according to their own time, which requires the certain self-discipline of learners. However, online courses also have obvious disadvantages: under online situation it is easy to be

relatively lazy, prone to have snacks and play mobile phone for students, thus leading to the inattention and lack of vividness when facing the computer, without enough learning atmosphere.

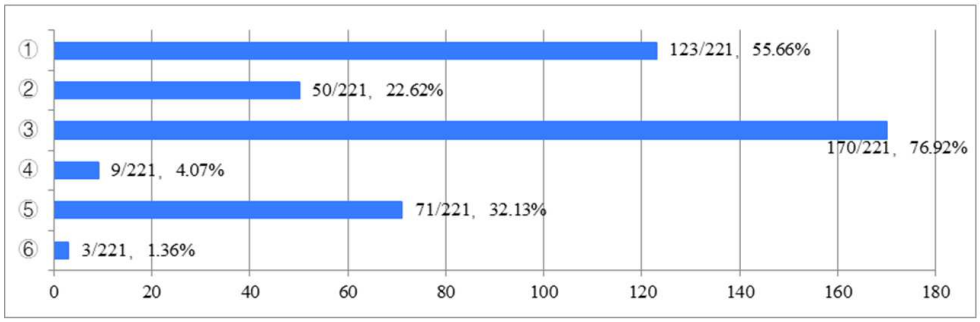


Figure 4. *Advantages of online courses (two items at most).*

Specific options in Figure 4: (1) refers to Take class according to your own schedule due to time flexibility; (2) refers to Get high efficiency by taking advantage of fragmentation time; (3) refers to Available playback of class contents for repeated watching; (4) refers to Teachers' more detailed explanation; (5) refers to Without the impact of weather, temperature, etc.; (6) refers to Others (please fill in the blank).

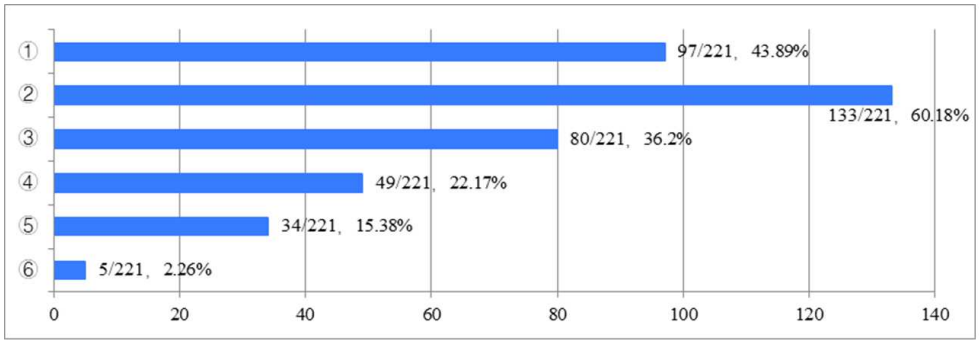


Figure 5. *Disadvantages of online courses (two items at most).*

Specific options in Figure 5: (1) refers to Inattention; (2) refers to Easy to be lazy, eat food, play mobile phones, etc.; (3) refers to No learning atmosphere at home; (4) refers to The lack of vividness makes students fail to keep listening for a long time; (5) refers to The lack of interaction; (6) refers to Others (please fill in the blank).

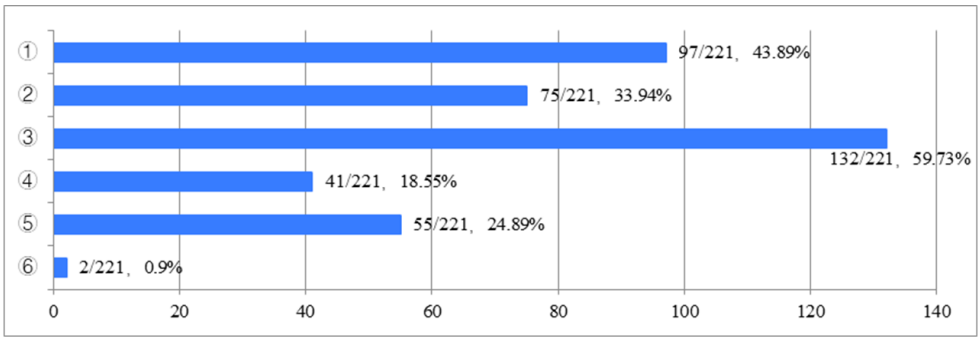


Figure 6. *Advantages of in-class courses (two items at most).*

Specific options in Figure 6: (1) refers to More concentrated attention; (2) refers to Ask the questions immediately; (3) refers to Learning with classmates have learning atmosphere; (4) refers to The few online courses in primary, junior and high schools make in-class course a habit; (5) refers to Supervision on class by teachers makes students more concentrated; (6) refers to Others (please fill in the blank).

Among the advantages and disadvantages of in-class courses shown in Figure 6 and Figure 7, the biggest advantage is the formation of learning atmosphere by learning with classmates, thus indicating the importance of learning atmosphere (situation) in the whole process of leaning, which is consistent with the theory of "situational selves" (Qin & Lowe) [16]. As said, people will show different identities in different situations. Thus, the differences of learning situations between the online courses (alone at home) and in-class courses (comparison with classmates in classroom), will trigger different identities or different sides of identity, which leads to the different effects

of online courses and in-class courses. The convenience of in-class courses reflected by students includes the more concentrated attention, immediate consultation with teachers on questions, indicating teachers' "all-round existence" in in-class courses directly affects the effect of in-class courses. However, the disadvantage of in-class course is also reflected in the interaction between students, which needs the correct guidance of teachers. In addition, the weather and climate factors sometimes make it inconvenient for in-class courses.

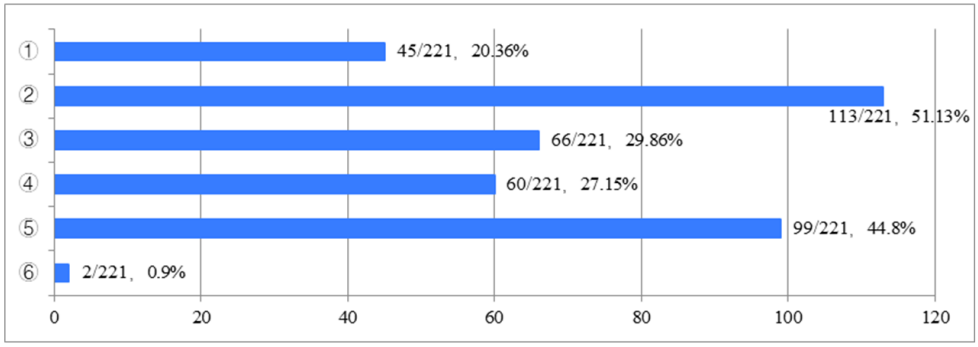


Figure 7. *Disadvantages of in-class courses (two items at most).*

Specific options in Figure 7: (1) refers to Repeated knowledge leads to low efficiency; (2) refers to Chatting with classmates results in inattention; (3) refers to When the teacher asks questions, I am shy; (4) refers to I feel embarrassed to ask the teacher question face to face; (5) refers to Weather factors (too hot, too cold, heavy rain, etc.; (6) refers to Others (please fill in the blank).

After answering the above questions, the last question in the discussion of the comparison between online courses and in-class courses is to find the more appropriate proportion of online courses to in-class courses if a course is composed of them (Figure 8), thus indicating that online courses can already take on a considerable proportion, although it is not as good (effect) as in-class courses in proportion.

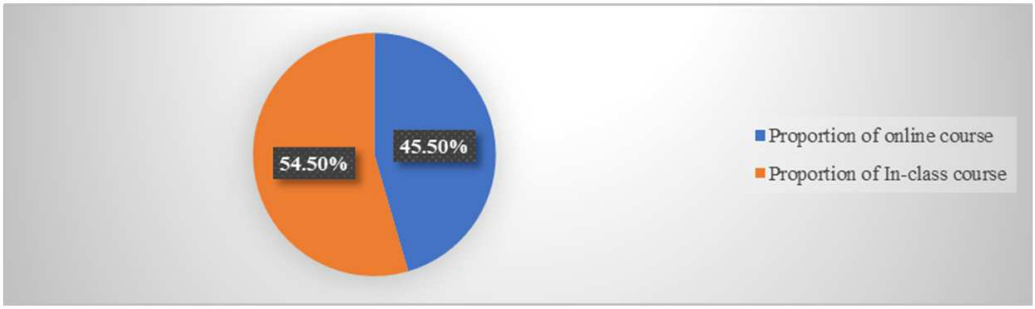


Figure 8. *Appropriate proportion of online course to in-class course in a curriculum.*

3.2.3. Students Self-learning VS Teachers' Guidance

Based on the above study, the third part is to explore the relationship between students self-learning and teachers' guidance during the learning process of a course (Figure 9). More than half of the participating students believed that when learning a course from knowing nothing to grasping something and then to in-depth learning, students' self-learning dominated in this process accounts for 51.6%, while teachers' guidance and help accounts for 48.4%, which means that teachers' important role in teaching and learning can only be played through students' active cooperation to achieve the ultimate teaching purpose.

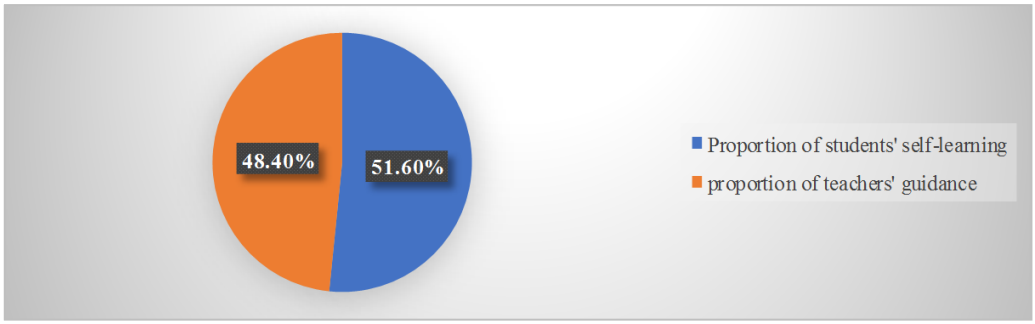


Figure 9. *Proportions of students' self-learning and teachers' guidance.*

As for the students' scores of their self-control and self-efforts being put into their own studying (Figure 10), the trend of these two qualities is nearly the same. That means in the process of studying, the student is taking the leading part and the quality of self-control is a very important quality for this role.

Specific options in Figure 10	1 point	2 point	3 point	4 point	5 point	6 point	7 point	8 point	9 point	10 point	average
Scores of self-control	3	3	2	9	31	31	60	43	19	20	6.91
Scores of self-efforts being put into learning	2	2	3	7	31	35	59	40	22	20	6.96

Figure 10. *Scores of students' self-control and self-efforts being put into learning.*

As for the qualities that a good should have in helping students' learning (Figure 11), the option with largest proportion is that "class is funny and humorous, inflexible, with the ability of combining knowledge with the teacher's own life experience during teaching", which is consistent with the interview data, and the students generally think that this way is beneficial for learning by not wasting class time and improving students' concentration and interests. The option ranked second is that explaining problems from the students' (beginners') perspective, indicating teachers with certain achievements in a subject should have the mentality of zero and impart the knowledge from the perspective of beginners when facing the students who are learning the knowledge for the first time. These qualities are the indispensable treasures for a good teacher.

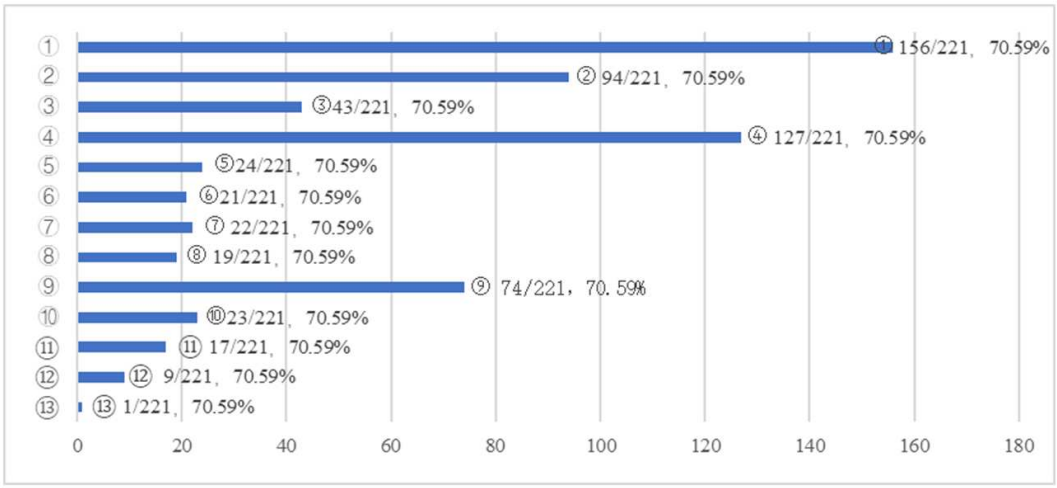
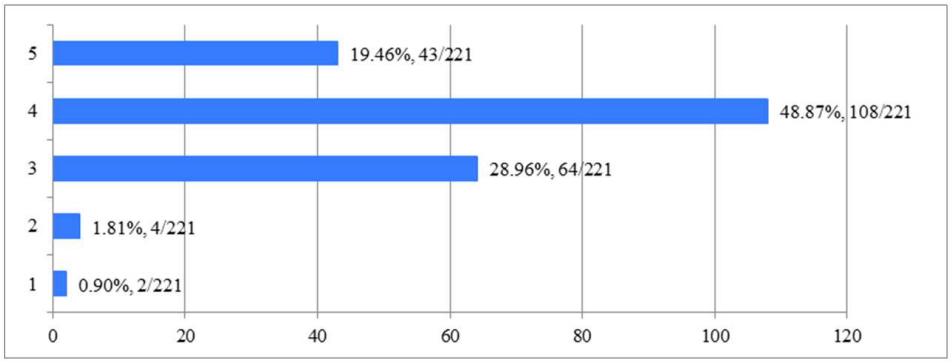


Figure 11. *Qualities that a good teacher should have in helping students' learning (three items at most).*

Specific options in Figure 11: (1) refers to Funny and humorous lecturing based on the combination of knowledge and life experience; (2) refers to Prepare lessons carefully and explain patiently; (3) refers to Knowledgeable; (4) refers to Solve the problem from the perspective of students (beginners); (5) refers to Good appearance; (6) refers to The teacher speaks in measured cadences when lecturing with passion; (7) refers to Teachers' active interaction with students in class by more asking and communication; (8) refers to follow closely with the development of the times by more connection with reality; (9) refers to Be able to connect all chapters and knowledge points with strong logic; (10) refers to Telling their own experiences or stories makes the class interesting; (11) refers to Have good character and the willingness to communicate with students; (12) refers to Be able to respect students; (13) refers to Others (please fill in the blank).

Another problem in this part is to know about whether teachers can affect the college students in other aspects besides imparting knowledge (Figure 12), while 68.33% of the participating students chose the option that teachers have a great and major imperceptible influences on them besides imparting knowledge. The overall weighted average score of 3.84 (the total score is 5), indicating that in the process of teaching, teachers also play the function of imperceptible influences on students besides imparting knowledge, which is the responsibility teachers still shoulder and continue to shoulder in the new era.



Specific options in Figure 12	Proportion	Number of people	Weighted average score
5 points	19.46%	43.0	
4 points	48.87%	108.0	
3 points	28.96%	64.0	3.84
2 points	1.81%	4.0	
1 point	0.90%	2.0	

Figure 12. *The imperceptible influences of teachers on college students in addition to imparting knowledge.*

3.3. Analysis of Questionnaire Data

3.3.1. Correlation Analysis

There is a high positive correlation between students' self-control ability and learning effort, and the effect evaluation of online courses, respectively as 0.839 and 0.536 (Table 4). That is to say, the more learning efforts the students with higher self-control ability pay the higher their evaluation on online courses effect. At the same time, the higher the learning efforts they pay, the more satisfied they are with the online courses effect, showing a correlation of 0.457 between the two.

Table 4. *Bivariate positive correlation analysis.*

Pearson correlation	**Self-control ability**	**Learning effort**	**Online course or in-class course has better effect**	**Effect evaluation of online course**
Self-control ability	1			
Learning effort	.839**	1		
Online course or in-class course has better effect			1	
Effect evaluation of online course	.536**	.457**		1
** means the significant correlation at the level of 0.01 (two-tailed).				
* means the significant correlation at the level of 0.05 (two-tailed).				

3.3.2. Analysis of Run Test

In order to dig deeper into the data, this section does "analysis of Run Test" (Bryman & Cramer) [17] on three sub-questions (No. 12, 7 and 8) of the questionnaire by grouping certain items of the sub-question. The qualities that a good teacher should have in helping students' learning was divided into three aspects: teachers' paradigms, specialty and physical attractiveness; Disadvantages of Online courses was classified as personal reasons and learning atmosphere; Advantages of in-class courses were viewed in subjective and objective aspects (Table 5).

Table 5. *Classification of topic options.*

Questions	**Aspects**	**Specific options**
Qualities that a good teacher should have in helping students' learning	paradigms	(1)Funny and humorous lecturing based on the combination of knowledge and life experience
		(4)Solve the problem from the perspective of students (beginners)
		(6)The teacher speaks in measured cadences when lecturing with passion
		(7)Teachers' active interaction with students in class by more asking and communication
		(10)Telling their own experiences or stories makes the class interesting
		(11)Have good character and the willingness to communicate with students
		(12)Be able to respect students
	Specialty	(2)Prepare lessons carefully and explain patiently
		(3)Knowledgeable
		(8)follow closely with the development of the times by more connection with reality
		(9)Be able to connect all chapters and knowledge points with strong logic
	Physical attractiveness	(5)Good appearance
Disadvantages of	Personal reasons	(1)Inattention

Questions	Aspects	Specific options
online course	Atmosphere	(2)Easy to be lazy, eat food, play mobile phones, etc (3)No learning atmosphere at home (4)The lack of vividness makes students fail to keep listening for a long time (5)The lack of interaction
Advantages of in-class course	Subjective factors	(1)More concentrated attention (4)The few online courses in primary, junior and high schools make in-class course a habit
	Objective factors	(2)Ask the questions immediately (3)Learning with classmates have learning atmosphere (5)Supervision on class by teachers makes students more concentrated

Run test is a method to obtain statistical inference conclusions by using the total number of runs, which can be used for significance test.

Table 6. *Runs test (1).*

The influence of various factors on learning	Attitude	Ability	Physical attractiveness
Test Value[a]	0.95	0.79	0.11
Cases < Test Value	11	46	197
Cases >= Test Value	210	175	24
Total Cases	221	221	221
Number of Runs	19	75	45
Z	-2.112	0.236	0.425
Asymp.Sig.(2-tailed)	0.035	0.814	0.671
a. Mean			

Table 7. *Runs test (2).*

Disadvantages of online course	Personal reasons	Atmosphere
Test Value[a]	0.80	0.53
Cases < Test Value	45	103
Cases >= Test Value	176	118
Total Cases	221	221
Number of Runs	74	127
Z	0.276	2.169
Asymp.Sig.(2-tailed)	0.782	0.030
a. Mean		

Table 8. *Runs test (3).*

Advantages of in-class course	Subjective factors	Objective factors
Test Value[a]	0.79	0.70
Cases < Test Value	47	66
Cases >= Test Value	174	155
Total Cases	221	221
Number of Runs	77	81
Z	0.402	-2.026
Asymp.Sig.(2-tailed)	0.688	0.043
a. Mean		

The results of Table 6 are obtained by run test to analyze the influences of teachers' paradigms, specialty and appearance attractiveness on teachers' aides to students' learning. The mean values of teachers' paradigms, specialty and attractiveness were 0.95, 0.79 and 0.11, respectively; The number of runs were 19, 75 and 45, and the Z-test statistics were: - 2.112, 0.236 and 0.425, respectively. Because the significant value of teacher's paradigms is 0.035 < 0.05, the zero hypothesis is rejected, that is, the teacher's paradigms can offer significant help on students' learning; The significance of teachers' specialty and attractiveness is 0.814 and 0.671, larger than 0.05, so the zero hypothesis is accepted, that is, the results show that teachers' specialty and attractiveness have no significant effect on students' learning.

According to Table 7, the significance of atmosphere is 0.03. The main reason is that the poor learning atmosphere of online course leads to the low satisfaction of students on online class, while the influences of students' personal reasons of online courses are not significant and the value is 0.782.

The results in Table 8 show that the advantages of face-to-face teaching is that the objective reasons leading to the higher satisfaction of students, with a high significance of 0.043.

That is, face-to-face teaching can provide students with a better learning atmosphere, and teachers can supervise and answer students' questions; In the in-class courses, students' personal subjective reasons have no significant effect and the value is 0.782.

4. Conclusion and Discussion

4.1. Online Courses in Current Stage Are Not as Good as In-Class Courses in Effect, But with a Small Gap

The initial in-depth interviews results find that nearly four-fifths participants believed in-class courses to be with better effect. Quantitatively (221 participants), 65.16% of survey participants chose in-class courses to be with better effect. However, the online courses are also affirmed to a certain extent by being scored closely to that of in-class courses (the average score of online courses is 6.9, and that of in-class course is 7.45). In the current stage, not only students need a learning process for the use of online courses, but also

teachers need a learning process to complete the learning and practice of teaching by using online courses. The online courses are not as good as in-class courses in effect by this survey, but with not a big gap between them, indicating a positive affirmation and encouragement of improvement for online courses.

4.2. Situational Learning

One of the important reasons for the better effect of in-class courses is "learning atmosphere" formed by both teachers and students in offline classroom, which is lacking (and/or failure of formation) in online courses. As for this "atmosphere", "situational self" theory (Qin and Lowe) [16] could partially explain the different behaviors between the online courses and in-class courses on both teachers and students. The "atmosphere" of in-class courses created by both teachers, students, and the communication between them with clear identities which are colorful, immediate and abundant compared to online courses. The richness of face-to-face information provided by in-class courses is more obvious after comparing with online courses. Such as, F2 reflected that some knowledge that she did not fully understand in online courses until taking in-class courses; M8 argued one of his teacher's different performances between online courses and in-class courses. However, the amount of information communicated in online courses through "one window" (computer screen) is far from enough, which not only refers to the knowledge learned and taught, but also the "learning situation" formed by the communications between teachers and students. The situations ignored by in-class courses are just found/emerged by lacking in online courses, which are the "learning atmosphere" in the present study, formed by both teachers and students during face-to-face in-class courses, promoting the understanding and communication between teachers and students, facilitating to impart knowledge.

Therefore, in order to improve the teaching effects of online courses, a more advanced network technology is needed to create the "learning atmosphere" of online courses and increase the information communication of online courses, so as to make teachers and students have the wholehearted network experiences by creating a more interactive and communicative atmosphere, and convey more "learning atmosphere" through network, thus gradually improving the effect of online courses.

4.3. Enhance the Teacher-Student Interaction for Timely Information Feedback

More specific, to improve the effect of online courses and let students break away from the identity of "audience", the enhancement of teacher-student interaction and the timely information feedback are conductive to adjust mentality and teaching mode by both sides of teaching. Namely, in order to make the communicative information more abundant and timely, both teachers and students should enhance the interaction more actively for the timely information feedback in the whole teaching process by asking and answering more questions, and creating space for communication.

4.4. Teaching Paradigm Helps to Impart Knowledge

Firstly, during the contact with students, besides imparting knowledge, the imperceptible influences of teachers on students is affirmed in the present study. 68.33% of the college students on survey chose the options of "great" and "extremely great" for the item of teachers' subtle influences, with the overall weighted average score of 3.84 (the total score is 5 points). Therefore, as an occupation to transmit wisdom, impart knowledge, and dispel doubts, teachers can also produce subtle influences on students through the contacts with students in the creation of class atmosphere and activities in and beyond class. This kind of influences is more like the kind of "learning atmosphere" being formed in in-class courses, and/or "interesting teachers" facilitating on students' learning as discussed in this study. These qualities are a teacher's own intangible value, which can inevitably affect students during interactions with students.

Then, as the mode of imparting the knowledge to students through different kind of thinking modes and methods, teachers' teaching paradigms offer significant help on students' learning. Two qualities of teachers' paradigms, being "interesting" and "able to solve problems from the perspective of students (beginners)" are prominent. Furthermore, the teachers' combining their own experiences or stories with course contents for explanation not only makes the subject interesting and vivid, but also attract students' attention again, which is not a waste of time, but is able to promote students' learning. Therefore, teaching paradigm is the "catalyst" and "accelerator" on the basis of the teachers' own professional knowledge, thus we should fully understand the importance of teaching paradigms, and use teaching paradigms to help teaching and learning, so as to make teachers give full play to their role and values.

Finally, this study shows that in the process of learning new subject or knowledge, the ratio of students' self-learning to teachers' guidance is 5.16:4.84, thus indicating the dominance of students' learning willingness and efforts in the relationship between teaching and learning. Teachers' guidance is also important, but can play better performances only under the cooperation of students' active learning. At the same time, participant students believed that the appropriate ratio of online courses and in-class courses in a curriculum is 4.55:5.45, indicating the developing network information technology pushes it to be an inevitable trend of using online courses to serve education, which is also realized and embraced by the students.

Acknowledgements

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Appendix

Appendix 1: Questionnaire in Chinese

线上网课VS线下面授课

感谢您能抽出几分钟时间来参加本次答题，现在我们就马上开始吧！

1.性别 *

- 男
- 女

2.您是大几的学生？ *

- 大一
- 大二
- 大三
- 大四

3.如果满分10分 *

您的自控能力多少分？

您对学习的付出多少分？

4.对于您自己来说，您觉得网课和面授课比较，哪个效果更好？ *

- 网课
- 面授课

5.如果满分是10分，从您自己学习效果角度，请您给网课和面授课效果各打个分？ *

网课效果（满分10分）

面授课效果（满分10分）

6.网课有哪些优点？（最多选二个） *

- 时间自由，按自己时间规划上课
- 效率高，可以利用碎片化时间
- 上课内容可以回放，反复看
- 老师讲得更细致
- 不受天气、温度等影响
- 其他（请具体填在空格里）

7.网课有哪些不足？（最多选二个） *

- 注意力不集中
- 比较懒散，容易吃东西、玩手机等
- 在家里没有学习氛围
- 不生动，对着电脑时间长了听不下去
- 缺少互动感
- 其他（请具体填在空格里）

8.面授有哪些优点？（最多选二个） *

- 注意力更集中
- 有问题能马上问老师
- 和同学一起学习，有学习氛围
- 从小学、初高中、大学没有怎么上过网课，面授课程已经形成习惯了
- 有老师监督着上课，更集中
- 其他（请具体填在空格里）

9.面授有哪些不足？（最多选二个） *

- [ ] 效率低，知识点重复
- [ ] 和同学一起容易说话，注意力不集中
- [ ] 老师提问，我比较害羞
- [ ] 我不太好意思当面向老师问问题
- [ ] 天气、气候（太热、太冷、下大雨等）
- [ ] 其他（请具体填在空格里）

10.如果一门课中网课和面授的比例，对您自己而言，您觉得多少适合您？ *

比重总和：10

网课占比

0 2 4 6 8 10 — 0

面授课占比

0 2 4 6 8 10 — 0

11.在学习一门课程时，您觉得您自己的学习和老师的引导占多少比重，更促使您最后学会了这门课程？ *

比重总和：10

自己学习占比

0 2 4 6 8 10 — 0

老师引导占比

0 2 4 6 8 10 — 0

12.这样的老师对我的学习是更有帮助的：（最多选三个） *

- [ ] 上课风趣幽默的，不死板，把知识和自己的生活经历结合的
- [ ] 认真备课，耐心讲解的
- [ ] 学识渊博的
- [ ] 会站在学生角度（初学者）角度来给我讲解问题的
- [ ] 颜值高的
- [ ] 讲课有激情的老师，声音抑扬顿挫
- [ ] 老师上课积极与学生互动，多提问、多沟通的
- [ ] 多与实际联系的，紧跟时代发展的
- [ ] 能把各个章节、知识点联系起来，逻辑性强的
- [ ] 老师能在讲课中讲些自己的经历或者小故事，挺有趣的
- [ ] 愿意与学生交流的，性格好的
- [ ] 尊重学生的
- [ ] 其他（请具体填在空格里）

13.老师对您的影响，除了传授知识以外，其他潜移默化的影响大吗？（具体哪些请填在下面的评价里） *

♡ ♡ ♡ ♡ ♡

14.如果您同意近一步解释您的问卷或者愿意接受手机采访，请留下您的手机长号（短号），谢谢您的配合

Appendix 2: Questionnaire in English

Online course VS In-class course

Thank you so much for attending this online questionnaire, let's begin.

1.Gender? *

- Male
- Female

2.Which grade of university/college are you in? *

- Freshman
- Sophomore
- Junior
- Senior

3.If full score is 10, then *

How much do you score your ability of self-control?

How much do you score your efforts being put into your study?

4.From your own perspective, which one do you think has better effect for you? online course or in-class course *

- Online course
- In-class course

5.If full score is 10, from your own perspective, please score the effect of online course and In-class course on your study. *

Please score the effect of online course (full score is 10)

Please score the effect of In-class course (full score is 10)

6.What are the advantages of the online courses? (two items at most) *

- Take class according to your own schedule due to time flexibility
- Get high efficiency by taking advantage of fragmentation time
- Available playback of class contents for repeated watching
- Teachers' more detailed explanation
- Without the impact of weather, temperature, etc.
- Others (please fill in the blank)

7.What are the disadvantages of the online courses? (two items at most) *

- Inattention
- Easy to be lazy, eat food, play mobile phones, etc
- No learning atmosphere at home
- The lack of vividness makes students fail to keep listening for a long time
- The lack of interaction
- Others (please fill in the blank)

8.What are the advantages of the In-class courses? (two items at most) *

- [ ] More concentrated attention
- [ ] Ask the questions immediately
- [ ] Learning with classmates have learning atmosphere
- [ ] The few online courses in primary, junior and high schools make in-class course a habit
- [ ] Supervision on class by teachers makes students more concentrated
- [ ] Others (please fill in the blank)

9.What are the disadvantages of the In-class courses? (two items at most) *

- [ ] Repeated knowledge leads to low efficiency
- [ ] Chatting with classmates results in inattention
- [ ] When the teacher asks questions, I am shy
- [ ] I feel embarrassed to ask the teacher question face to face
- [ ] Weather factors (too hot, too cold, heavy rain, etc.)
- [ ] Others (please fill in the blank)

10.From your own perspective, what is the appropriate proportion of online course to in-class course in a curriculum of one specific class? (The total is 10) *

比重总和：10

appropriate proportion of online course

0 2 4 6 8 10 — 0

appropriate proportion of In-class course

0 2 4 6 8 10 — 0

11.When learning one specific course, what is proportion of students' self-learning and teachers' guidance more helping in getting knowledge of that subject? (The total is 10) *

比重总和：10

proportion of self-learning

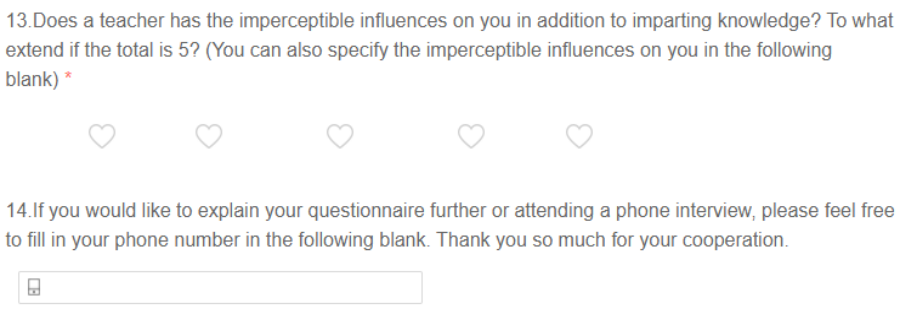
0 2 4 6 8 10 — 0

proportion of teachers' guidance

0 2 4 6 8 10 — 0

12.A teacher with the following qualities (three items at most) is really more helpful for my learning: *

- [ ] Funny and humorous lecturing based on the combination of knowledge and life experience
- [ ] Prepare lessons carefully and explain patiently
- [ ] Knowledgeable
- [ ] Solve the problem from the perspective of students (beginners)
- [ ] Good appearance
- [ ] The teacher speaks in measured cadences when lecturing with passion
- [ ] Teachers' active interaction with students in class by more asking and communication
- [ ] follow closely with the development of the times by more connection with reality
- [ ] Be able to connect all chapters and knowledge points with strong logic
- [ ] Telling their own experiences or stories makes the class interesting
- [ ] Have good character and the willingness to communicate with students
- [ ] Be able to respect students
- [ ] Others (please fill in the blank)



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Biography

Yue Qin: After graduation from EdD at the School of Education, University of Nottingham Ningbo China, I have been an associate professor at the School of Wealth Management, Ningbo University of Finance and Economics, Ningbo, China. My central research interests are the psychology and sociology of the college students in order to explore of the principles and features of the development of different stages in one's life. Recently, I have been studying the relationship formed and developed by both students and teachers in face-to-face courses to find the principles of transition and innovation of knowledge.

Di Lv: I am an associate professor at the School of International Business and Trade, Ningbo University of Finance and Economics, Ningbo, China. My central research interests are the combination of E-learning and In-class courses by using Internet to communicate with teachers and college students.

Yinzi Feng: I am a financial engineering major in Ningbo University of Finance and economics. I have won the provincial government scholarship and the first prize of the provincial university mathematical modeling competition. My main research interest is the data analysis of Internet teaching and offline teaching.