THE DIFFERENCES BETWEEN STUDENTS' PERCEPTION TOWARD FACE-TO-FACE AND ONLINE COLLABORATIONS IN THE POST-COVID-19 PANDEMIC

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ABSTRACT: Collaboration skills are one of the important factors that students must have for their success in the digital era of the 21st Century. This paper describes the results of survey research regarding students' profile of face-to-face (F2F) and online collaboration skills as well as their differences in the post-COVID-19 pandemic era. Furthermore, the factors affecting the differences between the two types of collaboration skills are also explored. This study employed a Likert scale consisting of four aspects with 34 items overall. The data were collected online using Google Forms with the respondents of physics education students at one of the universities in Lampung, Indonesia. Of 177 respondents who participated in the survey, only 73 passed the screening of valid responses. Descriptive and inferential statistics were applied for the data analysis technique. The results, even though students' online collaboration skills are generally at the 'high level', found that students' perceived collaboration skills between F2F and online were significantly different, both for overall score and for each aspect of collaboration skills. The interview results show that there are five factors regarding the difficulties students face during online learning as the cause of the differences. These findings imply that although students have experienced a long period of online learning, educators should take into account the challenges students face in online collaboration so that their online collaboration skills will improve as well as their F2F collaboration skills.

Keywords: Collaboration skills, COVID-19 pandemic, face-to-face collaboration, online collaboration, physics education students

INTRODUCTION

The COVID-19 pandemic has hit Indonesia and the world for more than two years. Generally, during that period learning at various levels of education was carried out online by the help of ICT. This situation presents various challenges as well as opportunities. These challenges include the need for adequate ICT equipment and skills as well as the demands for teachers' pedagogic abilities. In addition, challenges related to the social and affective aspects of students must also be considered (Lemay et al., 2021). The opportunity presented by the emergence of this pandemic is the acceleration of improving ICT skills and literacy, both for educators and students. However, before the pandemic, ICT has been developing rapidly and become a major factor in the industrial revolution 4.0 and society 5.0.

After more than two years of implementing online learning, teachers and students are likely to become more skillful and comfortable in using ICT for

teaching and learning. In the pre-pandemic, there were several challenges encountered in conducting online learning, such as the lack of internet tools and poor internet connection (Sari & Nayır, 2020; Suana, 2018; Suana et al., 2017). With the support of experience and adequate ICT equipment, the obstacles in online learning are expected to decrease. That way, the educational system will shift from fully face-to-face (F2F) to a combination of F2F and online, which is often called blended learning. This statement is supported by Dai et al. (2021), which states that the world of education is predicted to transform into a new era of learning, blended learning.

Various types of learning can improve student learning achievement (Muslem et al., 2019). Whatever the combination format of online and F2F learning, one essential factor that students must have is their ability to engage in the learning process and interact with lecturers and other learners. These factors will determine the effectiveness of the teaching process and present excellent chances for students to advance their knowledge and abilities.

One of the relevant learning theories regarding how students learn through social interaction is the social constructivism theory of Vygotsky (1978). According to this theory, students learn something through the construction of their knowledge from their interactions with smarter peers (Choo et al., 2014; Schreiber & Valle, 2013). The social interactions in learning activities teach students to be honest, responsible, polite, and mutually respectful (Zulkhairi, & Hajar, 2023). Through interaction and collaboration, students can master something they cannot do alone. In other words, learning takes place in the zone of proximal development (ZPD) during collaboration (Choo et al., 2014).

Based on the theory, many teachers try to optimize student interaction with their peers, for example through collaborative learning (CL). According to Barkley, CL encourages students to actively learn through collaboration to construct and reconstruct their knowledge (Monteiro & Morrison, 2014). Apart from CL, many other learning strategies require students' collaboration skills. Currently, the ability of students to collaborate is also one of the major competencies that must be achieved by students. Within the framework of the Indonesian education curriculum, four kinds of learning skills must be possessed by individuals in the 21st Century. These skills are critical thinking skills, creative thinking, collaboration, and communication (Bialik & Fadel, 2015).

According to Le et al. (2018), collaboration skills are skills in participating in every activity, respecting each other among members, and working in teams to achieve common goals. Meanwhile, according to Greenstein (2012), collaboration skills imply the skills to work together, participate actively and respect each other's opinions. Collaboration can also be distinguished based on the mode of learning, namely face-to-face collaboration and online collaboration. Choo et al. (2014) state that online collaboration (OC) refers to how people can learn

together online with the help of ICT. According to Choo et al. (2014), therefore, F2F collaboration skills may be defined as how students can learn together through F2F meetings.

According to Fadel and Trilling (2009), students are said to have collaborative skills if they demonstrate the following skills: demonstrate effective work skills and appreciate team diversity; demonstrate flexibility and willingness to accept the opinions of others, assume shared responsibilities, and appreciate the contribution of each team member. Furthermore, Siahaan et al. (2020) define collaborative skills as social skills that allow or require students to work together with others. The indicators of collaborative skills are divided into four, namely (1) cooperative skills and respect for group members; (2) skills to engage and contribute within groups: (3) time management skills in doing assignments; (4) and skills to be responsible for the achievement of teamwork (Siahaan et al., 2020).

The studies that examined students' collaboration skills have been revealed by several researchers. Ayun (2021) conducted qualitative descriptive research on the collaboration skills of middle school students in online learning. As a result, it was found that students' collaboration skills were at a high level. However, the research was conducted in 2019, in the pre-pandemic of COVID-19 so that students did not feel the distance learning atmosphere as during the pandemic. Other research, such as Siahaan et al. (2020), examines student collaboration skills in F2F learning. Wang (2010), on the other hand, evaluated students' collaborative behaviors in a blended learning environment more than a decade ago. However, research about students' online collaboration skills during the pandemic is lacking.

How students compare their online and F2F collaboration skills at the end of the COVID-19 pandemic is important to explore further. By knowing students' online collaboration skills and their differences with their F2F collaboration skills, educators will gain insight and input from students' social and affective dimensions on how to well prepare an integration of online and F2F learning strategies in the post-COVID-19 pandemic era. Therefore, the addressed research problems are 1) What are the profiles of online and F2F collaboration skills of students of pre-service physics teachers after more than two years of studying online during the Covid-19 pandemic?; 2) how are their online collaboration skills different from the F2F collaboration?; and 3) if any, what are the factors affecting the differences between the two types of collaboration skills?

METHOD

Research Design

This research is descriptive research with quantitative and qualitative data. Descriptive research is research that describes the characteristics of a phenomenon or population. Quantitative data were taken using a Likert scale and qualitative data were from interviews. This research was conducted in May 2022 with the subjects being students of pre-service physics teachers of the physics education

bachelor program at one of the universities in Lampung Province, Indonesia.

Respondents

Respondents in this study were students of pre-service physics teachers of the physics education bachelor program. Respondents consisted of three different years of study, the first, second, and third years. They were active students enrolled in the Even Semester 2021/2022, from one of the universities in Lampung, Indonesia. The total population was 194 students. The three groups of students have participated in online learning during the COVID-19 pandemic for different lengths of time. First-year students have been taking online courses for almost a year. The second-and third-year students have been joining online learning for almost two and 2.5 years, respectively. However, they all have the same period of fully online learning since March 2020 when the students of first and second years were at high school. When the survey was conducted in the middle of the even semester of 2021/2022, some of the subjects were carried out in full F2F, hybrid learning, or blended learning formats and the rest were full online learning. Along with the significant decrease in COVID-19 in Indonesia, the lecturers have been allowed to choose between the three learning systems. To conduct online learning in the pandemic era, educators and students implemented various platforms. For example, Zoom Meeting and Google Meet for video meetings for synchronous learning mode, and Moodle, WhatsApp, and Google Classroom for asynchronous learning.

Instrument

The instrument consisted of a Likert scale and an interview protocol. The Likert scale is a self-assessment of F2F and online collaboration skills. The scale was developed by the researchers based on some research results (Ayun, 2021; Siahaan et al., 2020; Stover & Holland, 2018). The scale consists of two parts, i.e. identity and prerequisite information part and main part. The identity and prerequisite information section consists of six items, such as the respondent's name, phone number, year of study, and questions related to whether or not students often collaborate in F2F and online collaboration during the ongoing semester. The main part of the scale consisted of items that measure perceptions of students' collaboration skills. This section consists of 18 items for each F2F and online collaboration and one item for students' seriousness screening in responding to the scale. Collaboration skills are grouped into four indicators, namely communication, team responsibility and success, commitment and discipline, and member acceptance and conflict handling.

The Likert scale consisted of five response levels, ranging from 1 (extremely low) to 5 (extremely high). This scale has also been tested for validity and reliability. The validity test was carried out with the Pearson correlation test. From the 36 items, 34 items were found valid and two items were invalid at an alpha of 0.05. Furthermore, a reliability test was carried out using

Cronbach's alpha. For 34 valid items, it was found that the scale met the reliability criteria with Cronbach's alpha coefficient of 0.87, extremely reliable. Data collection using the Likert scale was done online with Google Forms.

Meanwhile, another instrument was a semi-structured interview protocol. The interview consisted of four main questions, which were aimed at revealing the causes of differences between students' F2F and online collaboration skills. There were four main questions, one for each indicator of collaboration skills. For the first collaboration indicator, communication, the question was: "Why are your F2F and online communication skills different, what are the contributing factors?" Interviews were conducted through F2F focus group interviews with seven randomly selected students for one hour.

Data Analysis Technique

For quantitative collected with the scale, before the data was processed, it was filtered first. The first screening was based on the precision detection item. The item statement was "This item is used to detect your seriousness in filling out this scale. In doing so, choose score 1 for this item". The second data filtering was only data from students who stated that they often collaborate both online and F2F during learning in the semester. It was intended that students could provide valid information based on their experience in both online and F2F collaboration.

After obtaining the data that passed the selection criteria, then the students' responses to the negative items were changed reversely. If respondents chose score 1, then it was changed to 5 if they chose score 2, then it became 4, and vice versa. If the student chose score 3, then it remained unchanged. The final data were then processed and analyzed using descriptive statistics which include mean and standard deviation. The average scores for each indicator of collaboration skills were later categorized and interpreted. In addition, data analysis also implemented inferential statistics in the form of a mean difference test with the Wilcoxon test. This test was intended to determine whether there is a significant difference between online and F2F collaboration skills of students. Non-parametric statistics were carried out because the data were not normally distributed.

Meanwhile, for qualitative data from interviews, transcription of interview results was carried out and grouped according to certain themes. The reasons revealed by the respondents were grouped and described.

FINDINGS

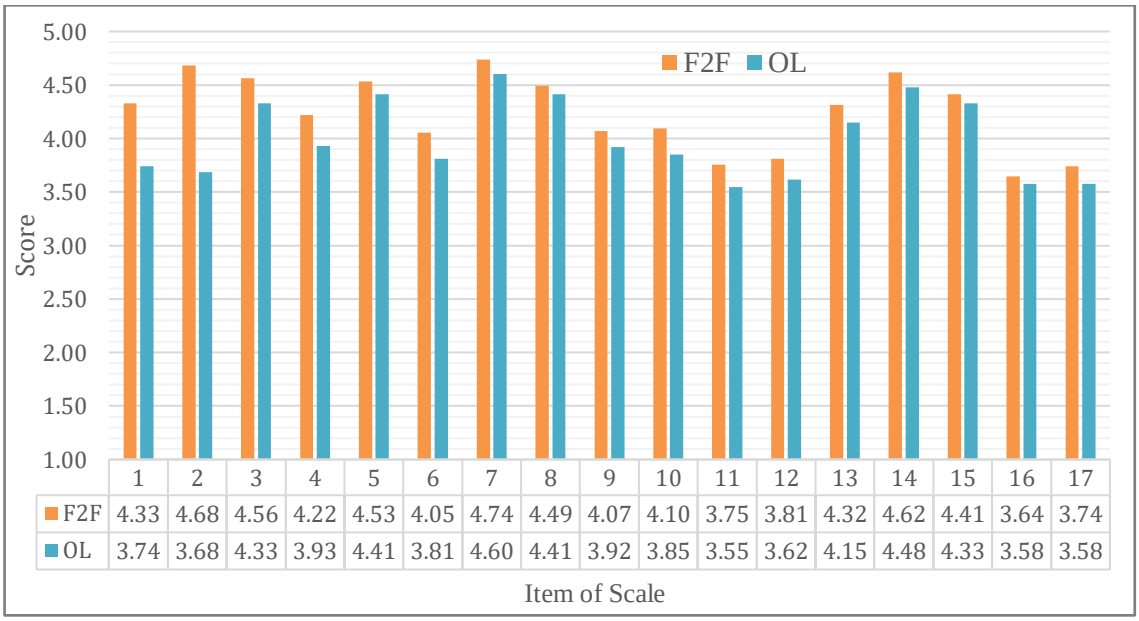
Students Collaboration Skills

The total number of respondents who filled out the scale was 177 students. Regarding the first screening, 43 students failed to respond properly. In addition, with one student who did not often collaborate online and 60 students who did not collaborate F2F, the final valid data were only 73. Almost all of the 73 respondents were girls and only 7 respondents were boys. A brief profile of respondents is given in Table 1.

Table 1. Respondents' profile

	Number of Initial Data	After the 1st Filter	After 2nd Filter	Gender		Year of Entrance		
				M	F	2019	2020	2021
Sum	177	134	73	7	66	16	20	37

The profile of online and F2F collaboration skills from the scale is presented in Figure 1. Indicator 1 (communication) is represented with the items of 1 – 4, indicator 2 (team responsibility and success) is 5 – 9 items, indicator 3 (commitment and discipline) is 10 – 12 items, and indicator 4 (member acceptance and conflict handling) is the items of 13 – 17. For online collaboration (OL), the scores range from 3.55 (neutral) to 4.60 (extremely high) and for F2F collaboration, the scores are from 3.64 (high) to 4.74 (extremely high).



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
F2F	4.33	4.68	4.56	4.22	4.53	4.05	4.74	4.49	4.07	4.10	3.75	3.81	4.32	4.62	4.41	3.64	3.74
OL	3.74	3.68	4.33	3.93	4.41	3.81	4.60	4.41	3.92	3.85	3.55	3.62	4.15	4.48	4.33	3.58	3.58

Figure 1. Students' collaboration skills per each item of the scale

Based on the results of data processing, the profile of F2F and online collaboration skills is obtained as shown in Table 2. Both F2F and OL collaborations have a score of more than 3.50. It means that both of the collaboration skills are above the medium level of collaboration. In detail, it can be seen that overall, the student collaboration skill profile is categorized as extremely high (range of 4.21 - 5.00) for F2F collaboration and high category (range of 3.61 – 4.20) for online collaboration. If we look at the aspect of collaboration skills, two aspects of F2F collaboration skills (i.e. communication, and team responsibility and success) are in the extremely high category. Meanwhile, there is only one online collaborative aspect (team responsibility and success) which is categorized as extremely high. This shows that students assess their collaborative skills at a minimally high level.

Table 2 also presents the results of the different tests between online and F2F collaboration skills. Since the data are not normally

distributed after being analyzed with the Lilliefors test, the average difference tests were conducted via non-parametric using the Wilcoxon test. It was found that for overall and each aspect of collaborative skills, the p-values (Asymp. Sig. (2-tailed)) were all less than 0.05. These mean that there are significant average differences between face-to-face collaboration skills and online collaboration for prospective physics teacher students at a university in Lampung Province, Indonesia.

Table 2. Collaboration skills between F2F and online and their difference tests

No	Aspect	F2F		Online		Test Statistics	
		Average (Std)	Criteria	Average (Std)	Criteria	Z/ p-value	Interpretation
1	Communication	4.45 (0.21)	Extremely high	3.92 (0.29)	High	.000	Significantly different
2	Team responsibility and success	4.38 (0.30)	Extremely high	4.23 (0.35)	Extremely high	.001	
3	Commitment and discipline	3.89 (0.18)	High	3.67 (0.16)	High	.002	
4	Team acceptance and conflict handling	4.15 (0.43)	High	4.02 (0.42)	High	.000	
5	Overall	4.24 (0.35)	Extremely high	4.00 (0.36)	High	.000	

Interview

To address the third research question, qualitative data were collected through interviews. The interviews were aimed at obtaining information about the factors affecting the differences in students' perceptions of collaborative skills between the two learning modes. There were seven students interviewed using focus group interviews. The interview was held in Indonesian Language and then it is translated into English. The factors that cause students' online collaboration skills lower than F2F collaboration are classified into five. Those are: 1) poor internet connection, 2) distraction and reduced focus, 3) the feeling of isolation, 4) lack of motivation, and 5) difficulty in team management of collaborative work.

Poor internet connection is still an obstacle to online learning experienced by students. For this reason, they often learn collaboratively through asynchronous WhatsApp Chat. Almost all interviewees agreed with the statement. The following is an excerpt from the interview given by one of the students.

Student 1: "I often experienced internet disturbances when studying online, so I prefered to use WhatsApp chat when doing group work".

The choice of the asynchronous discussion mode impacts the intensity of interaction between team members to be less intense than in F2F discussions, as expressed by student 2.

Student 2: "The internet connection was not really good to run video meeting, then we discussed on WhatsApp chat, but the responses were limited and slow …."

When conducting group discussions, students need more time than if they had F2F discussions. The following are the results of interviews that support the finding.

Student 2: "Waiting for responses from friends often took a longer time …, we did something else while studying …."

Student 3: "Yes sir… the discussion using WhatsApp took a longer time. If we met, we could finish it in a short time. But, if we discussed it on WhatsApp, it could take a much longer time".

Regarding the second factor, the distraction and losing focus, students argued as follows.

Student 4: "… sometimes when I was studying, suddenly my parents or relatives asked me for help, sometimes guests came to my house, or I have another homework to do".

"Since we didn't see each other, so I often did something else while working with group. I did housework, other courses' homework, so would reduce my focus on the learning or discussion"

The third factor, related to the feeling of isolation, students said that they often felt bored studying online without having enough F2F interaction. This feeling made the learners become less motivated in learning since they could not do more with their peers compared to what they could do in the F2F meetings.

Student 3: "I was more enthusiastic if I saw the person talking directly, I could see their expressions. When we work in group online, because we didn't talk much to each other, the group assignments tended to be shared and finished individually …."

The fourth factor about lack of motivation, some students said that they felt less motivated when having group collaborations. One student said that she thought that online learning meant free time for her.

Student 4: "When it's F2F, I really felt I had to study, but when it was online, I thought that's my leisure time, so I was just relaxed …."

When they got a new group task, they preferred to delay working on it. They would rather do other assignments in the beginning. One student answered as follows:

Student 3: "… we sometimes delayed to finish our team's work. Some friends didn't even care about the assignments …. Some just leave their individual part to the group when they were done."

Finally, the fifth factor identified from the results of the interview is the difficulty in arranging a collaborative work schedule. Students said that they found it difficult to find a schedule to meet online synchronously. Once the schedule has been agreed upon,

when it comes time to collaborate, team members may have reasons not to attend. This factor seems to have something to do with the second factor concerning distraction from the surrounding environment. The following is an excerpt from the interview.

Student 5: "It was difficult to find a collaboration schedule with the team… regardless of whether synchronous or asynchronous…. When we have agreed to run a group meeting, suddenly there will always be some of us who cannot attend the meeting for various reasons, or even without telling us before".

DISCUSSION

The results of data analysis regarding the collaboration skills of students of pre-service physics teachers showed that overall, they rated their collaboration skills at a 'high' level for online collaboration and 'extremely high' for F2F collaboration. The level of collaboration skills of students varies among the indicators from the high category to the extremely high category. In online collaboration, the team responsibility and success aspect is at the top level, while the other three aspects (communication, commitment and discipline, and member acceptance and conflict handling) are at the 'high' level. Meanwhile, in F2F collaboration, the indicator 1 and indicator 2 are in the 'extremely high' category and the rest are at a high level.

In comparison to other studies, such as (Ayun, 2021), the online collaboration skills of junior high school students in online learning before the COVID-19 pandemic were also in the high category. Students' collaboration skills were divided into three categories, namely high 72%, medium 23%, and low 7% (Ayun, 2021). However, the research was conducted in 2019, during the pre-pandemic situation. The students had online lessons together with their regular F2F learning. They did not feel the same situation like the distance learning atmosphere during the pandemic.

Regarding the differences between online and F2F collaboration, Table 1 shows that students' F2F collaboration skills are superior to their online collaboration skills. Both overall and in each aspect, the average scores of F2F collaboration skills are higher than online collaboration. From average difference tests through the Wilcoxon test, it is also known that the differences in collaboration skills are significant at $\alpha = 0.05$. All p-values (Asymp. sig (2-tailed) are < 0.05. Hence, these differences are significant and can be generalized to the population. This indicates that after taking online courses during the pandemic for more than two years, students are still better to collaborate F2F rather than online.

The pandemic that has forced ICT-based distance learning cannot be expected to directly promote students' learning skills, the collaboration skills. Of course, this cannot be separated from the various obstacles that may arise during online learning. Based on the results of the focus group interviews, it was revealed that the low ability of students' online collaboration compared to F2F

collaboration was caused by several factors. These factors are grouped into five, i.e. 1) poor internet connection, 2) easily distracted and loss of focus, 3) the feeling of isolation, 4) lack of motivation, and 5) difficulty in time management for collaborative work.

The first factor is that poor internet connection becomes an obstacle for students to collaborate with peers. Barriers to online learning due to internet connection factors have been revealed by previous research (Suana, 2018; Suana et al., 2017). Internet connection has become an issue in implementing online learning in Indonesia, especially in Lampung. As it is known from the results of interviews, students generally collaborate asynchronously mostly using WhatsApp chat. Learners become less speaking and respond to discussions in the chat. The time spent discussing a task on asynchronous chat also becomes longer than in synchronous video meetings.

The second factor regarding distraction and reduced focus was also revealed by Hussein (2021), that more than 24 (53%) respondents said they were easily distracted and found it difficult to stay focused when there is an online meeting. Distraction is caused by the surrounding environment, such as by family members and guests who visit their homes. Some of them also said that their ability to focus when physically present in class was better than when taking online sessions (Hussein, 2021).

Furthermore, related to the feeling of isolation and less motivation, students feel bored studying online because they do not meet in person, then learners become less motivated to collaborate online. Group discussions did not run smoothly and team assignments tended to be done individually through the distribution of parts of the tasks without sufficient group discussion. Students become less enthusiastic about working together, procrastinate work, and are often approached by doing other work. Research related to the negative aspects of online learning during the pandemic conducted by Gil-fernández et al. (2021) and Lemay et al. (2021) emphasized that educators need to pay attention to students' online learning difficulties caused by social and affective dimensions.

The last factor is the difficulty in managing teamwork schedules. This happens because of the conflict with assignments/activities schedules of other subjects and interferes with students' chores. As stated in the interview, once they had agreed on a time to study together, either synchronously with video meetings or asynchronously via WhatsApp chat, there were always absent members, with or without any information. It seems that the difficulty of setting the collaboration schedule is influenced by students' poor time management.

Based on these findings, there are several factors that educators should pay attention more regarding students' collaborative activities when they want to continue implementing online learning or combining it with F2F as a blended learning approach in the post-COVID-19 pandemic. Educators must care about the attitude and psychological condition of students.

The factors that hinder the collaborative activities of students must be taken into account to achieve learning success. Multiple results indicate that affective and cognitive aspects increase in mixed learning (Akyol et al., 2009; Zheng et al., 2021). These findings suggest that there are ways to address and create social and affective connections in online instruction.

Blended learning, which is a learning model that combines online learning with F2F learning, may be an alternative learning strategy. The massive use of technology in online learning during the pandemic cannot be simply eliminated in the post-COVID-19 pandemic. What's more, in the era of the Industrial Revolution 4.0, digital literacy is one of the key competencies that must be mastered by students. For this reason, the application of blended learning is necessary. Having insights into students' collaboration skills both online and F2F, the obstacles that hinder student collaboration activities, as well as other things that are prerequisites for online learning, can be sufficient provisions for educators to design effective learning approaches oriented to 21st Century skills, by combining online and F2F learning.

CONCLUSION

This study concludes that the profile of students' perceived online collaborative skills as a result of online learning during the COVID-19 pandemic is at a high level, with an average score of 4.00 out of 5.00. In detail per each indicator, students' online collaboration skills range from high to extremely high levels. However, students' perceptions of their online collaboration skills are lower than their F2F collaboration skills. Students of pre-service physics teachers' F2F collaboration skills outperform their online collaboration skills both overall and in each indicator. The results imply that after more than two years of online learning, students' online collaboration skills are not as good as their F2F collaboration skills. The factors influencing the differences are 1) poor internet connection; 2) distraction and reduced focus; 3) the feeling of isolation; 4) less motivation; and 5) difficulty in time management for collaborative work.

These findings suggest that continuing implementation of fully online learning in the post-COVID-19 pandemic is not necessarily easy, even after learners have experienced such a mode of learning for more than two years. Instead of internet connection problems, educators and educational experts should also consider students' social and affective challenges when designing online courses. Considering the high level of students' online collaborative skills, it is promising to adopt a blended learning approach as the new educational system in the post-COVID-19 pandemic.

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REFERENCES

Akyol, Z., Garrison, D. R., & Ozden, M. Y. (2009). Development of a community of inquiry in online and blended learning contexts. *Procedia - Social and Behavioral Sciences*, *1*(1), 1834–1838. https://doi.org/10.1016/J.SBSPRO.2009.01.324

Ayun, Q. (2021). Analisis Tingkat Literasi Digital dan Keterampilan Kolaborasi Siswa dalam Pembelajaran IPA Kelas VII Secara Daring. *Jurnal Didaktika Pendidikan Dasar*, *5*(1), 271–290. https://doi.org/10.26811/didaktika.v5i1.286

Bialik, M., Fadel, C., Trilling, B., Nilsson, P., & Groff, J. (2015). Skills for the 21st century: What should students learn. *Center for Curriculum Redesign*, *3*(4), 29.

Choo, L. P., Kaur, G., Fook, C. Y., & Yong, T. C. (2014). Patterns of Interaction among ESL Students During Online Collaboration. *Procedia - Social and Behavioral Sciences*, *123*, 307–314. https://doi.org/10.1016/j.sbspro.2014.01.1428

Dai, N. Van, Trung, V. Q., Tiem, C. Van, Hao, K. P., & Anh, D. T. V. (2021). Project-based teaching in organic chemistry through blended learning model to develop self-study capacity of high school students in Vietnam. *Education Sciences*, *11*(7). https://doi.org/10.3390/educsci11070346

Fadel, B., & Trilling, C. (2009). *21st century skills: Learning for life in our times*. San Francisco.

Gil-fernández, R., León-gómez, A., & Calderón-garrido, D. (2021). *Influence of COVID on the Educational Use of Social Media by Students of Teaching Degrees*. *22*, 1–10.

Greenstein, L. M. L. (2012). *Assessing 21st century skills: A guide to evaluating mastery and authentic learning*. Corwin Press. https://books.google.com/books?hl=id&lr=&id=uHWu_pPEPiUC&oi=fnd&pg=PP1&dq=Greenstein,+L.+(2012).+Assessing+21st+century+skills:+a+guide+to+evaluating+mastery+and+authentic+learning.+London+:+Sage+Publications.+&ots=u5xGHpnlor&sig=KCbp2xB2fbSvAyMtr_BpFOl0P

Hussein, B. (2021). Addressing collaboration challenges in project-based learning: The student's perspective. *Education Sciences*, *11*(8). https://doi.org/10.3390/educsci11080434

Le, H., Janssen, J., & Wubbels, T. (2018). Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration. *Cambridge Journal of Education*, *48*(1), 103–122. https://doi.org/10.1080/0305764X.2016.1259389

Lemay, D. J., Bazelais, P., & Doleck, T. (2021). Transition to online learning during the COVID-19 pandemic. *Computers in Human Behavior Reports*, *4*, 100130. https://doi.org/10.1016/j.chbr.2021.100130

Muslem, A., Zulfikar, T., Ibrahim, I. H., Syamaun, A., Saiful, & Usman, B. (2019). The Impact

of Immersive Strategy with English Video Clips on EFL Students Performance: An Empirical Study at Senior High School. *Teaching English with Technology*, *19*(4), 90-103.

Monteiro, E., & Morrison, K. (n.d.). *Educational Research and Evaluation : An International Journal on Theory and Practice Challenges for collaborative blended learning in undergraduate students*. *January 2015*, 37–41. https://doi.org/10.1080/13803611.2014.997126

Sari, T., & Nayır, F. (2020). Challenges in distance education during the (Covid-19) pandemic period. *Qualitative Research in Education*, *9*(3), 328–360. https://doi.org/10.17583/qre.2020.5872

Schreiber, L. M., & Valle, B. E. (2013). Social Constructivist Teaching Strategies in the Small Group Classroom. *Small Group Research*, *44*(4), 395–411. https://doi.org/10.1177/1046496413488422

Siahaan, P., Setiawan, Y. C., Fratiwi, N. J., Samsudin, A., & Suhendi, E. (2020). The development of critical thinking skills and collaborative skill profiles aided by multimedia-based integrated instruction on light refraction material. *Universal Journal of Educational Research*, *8*(6), 2599–2613. https://doi.org/10.13189/ujer.2020.080643

Stover, S., & Holland, C. (2018). Student Resistance to Collaborative Learning. *International Journal for the Scholarship of Teaching and Learning*, *12*(2), 1–11. https://doi.org/10.20429/ijsotl.2018.120208

Suana, W. (2018). Students' internet access, internet self-efficacy, and internet for learning physics: Gender and grade differences. *Journal of Technology and Science Education*, *8*(4). https://doi.org/10.3926/jotse.399

Suana, W., Maharta, N., Nyeneng, I. D. P., & Wahyuni, S. (2017). Design and implementation of Schoology-based blended learning media for basic Physics I course. *Jurnal Pendidikan IPA Indonesia*, *6*(1). https://doi.org/10.15294/jpii.v6i1.8648

Vygotsky, L. S. (1978). *Mind in Society*. Harvard University Press.

Wang, M. J. (2010). Online collaboration and offline interaction between students using asynchronous tools in blended learning. *Australasian Journal of Educational Technology*, *26*(6), 830–846. https://doi.org/10.14742/ajet.1045

Zheng, W., Yu, F., & Wu, Y. J. (2021). Social media on blended learning: the effect of rapport and motivation. *Behaviour and Information Technology*.

Zulkhairi, T., & Hajar, I. (2023). Scrutinizing Dayah's Strategies in Shaping Student Characters: A Qualitative Study. *Edukasi Islami: Jurnal Pendidikan Islam*, *12*(02). https://doi.org/10.1080/0144929X.2021.1909140