Chapter 2
Panopticon of Virtual Classroom: Evolution on Teacher–Student Relationship in Distance Education

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Abstract Are educators the conquerors or refugees from colonialism? In recent years, digital tools are actively used to teach online. However, today's young students, known as Generation Z, are already familiar with the established order, solidarity and all kinds of techniques in the virtual world. One who wants to use traditional classroom authority to rule this democratic and free online world is just like a mantis trying to stop a chariot. This research uses action research and participatory observation to explore the conflict and mutual compromise between the teacher–student relationship from classroom to online platform. This research points out a few common issues of distance teaching today, including: students become pure listeners, are distracted easily, have lost the space perception, etc. Finally, three principles are proposed for building a metaverse classroom: (1) redefining the self-identity of teachers and students, (2) re-establishing the teaching order, (3) characteristics that the virtual classroom should have.

Keywords Metaverse · Mixed reality · Distance teaching · Online to offline

2.1 Research Issue

> To get out of the classroom and back to reality, we have to escape from the four walls of monastic space and look down on our past selves sitting in the classroom from the windows of the universe [1, p. 3].

In recent years, there have been many diverse successful cases of using digital technology to assist teaching in school. There are too many outstanding examples such as pre-recorded courses, digital learning platforms, and various digital tools integrated into the teaching context to list out here. However, under the influence of the COVID-19 epidemic in 2021, teachers' attitudes toward the integration of digital

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tools into teaching have changed from "be able to" to "must to." The lack of complete interaction in teaching in the digital environment has reduced the effectiveness of learning. On the one hand, it is impossible to grasp the expressions of the students, or that feedback is reduced. On the other hand, the private environment lacks the atmosphere of the classroom space, which also reduces the concentration of students.

Reviewing the situation of distance learning from 2021 to 2022, the distance learning environment has not yet developed soundly in Taiwan. Most students and teachers conduct teaching and participate at their own houses or dormitories. Risks of grouping students in certain teaching venues are too high due to the COVID-19 pandemic. Neither parents nor school policies encourage traditional physical classes in groups. There is also a certain possibility that the re-emergence of such infectious diseases will lead to the recurrence of national compulsory distance learning.

Based on the above, the problems caused by using the most common "conference call services" for "synchronous online learning" include:

- Overlapping and unclear sound.
- Poor streaming video quality.
- Inattentive students and influencing factors.
- Unruly students and weak classroom discipline.
- Unable to grasp learning situation of students.
- High cognitive load caused by digital interface.

Some of the above problems, such as streaming video quality, can be solved with "video pre-recording" for "asynchronous distance learning." Students watch the video and complete assignments, quizzes, or exercises of this class by themselves.

However, one is still unable to make immediate adjustments in the teaching process through traditional physical class interaction. When a teacher is reviewing students' results of quizzes or assignments, it is too late to realize that students are not keeping up with the pace or that they misunderstand specific content of the class.

In comparison of learning results between distance learning and physical classes from students' feedback, if the program adopted one-on-one teaching, the difference of the two learning methods is small. However, teaching is conducted to a group, and physical classes can have more learning effects [2].

2.2 Development of Teaching Technology

With the advancement and development of internet technology, there are countless strengthening technologies in applied teaching, which are mainly divided into Learning Management Systems (LMS) and Conversational Technologies. However, little progress has been made or even ignored in the creation of classroom atmosphere.

LMS is used to manage and track students' learning process and performance continuously in various training and learning activities. It allocates various learning resources such as registration and login system, class timetable, learning materials, teaching resources, and online learning delivery [3].

The progress of conversational technology relies on expansion of network bandwidth, which shortens the physical distance of reality and allows conversations to span time and space. The online conversation with video, as opposed to pure audio communication, also adds visual assistance and emotional transmission to result in an interactive experience that is closer to face-to-face communication. However, there is still no substitute for the full experience that face-to-face conversations can bring.

Conference call services such as Google Meet, Zoom, and Microsoft Teams have been commonly used in distance learning in Taiwan in the past two years. These services are mainly used for participants to interact with facial streaming, presentation, conversation and discussion. But these softwares' shortcoming is the weak presence of the participants. For online meetings with more than 30 people, it will be difficult for the host to track every participant; thus, the quality of interaction and conversation is reduced.

Teaching in the classroom is a many-to-many interaction among teachers with their students and students with their peers, who are all participants in physical class. The physical classes have their own disciplines and rules but are distorted and deteriorated in the context of distance learning. The distortion is that disciplines are no longer actively followed, and the deterioration is the evolved learning habits and methods.

In the preliminary period, this study had tried to conduct distance learning several times by using online virtual space service, but most of the feedback received by students was negative. The reason is that extra operational cognitive resources were required to move the avatar in the virtual space by using the mouse or keyboard shortcuts. The curiosity about the new interface may also prompt students to constantly wander in the virtual space, which was causing visual interference for teachers and other participants.

The evolution of teaching skill also involves incorporating more diverse learning methods. Numerous digital tools, brand-new teaching methods, and constantly stacking content all show the evolution of teaching of this era, which not only deepens the richness of learning, but also deepens the difficulty of learning. The difficulty of learning is not only in "learning and how to use learning tools" but also faced with more sources of information in the surrounding, with large screens, small screens, and the always present social messages.

Garrison and Anderson [4] believe that a good online lecturer should be able to create a continuous, shallow-to-deep, and interactive scenario during the course and establish a reassuring online environment to encourage learners to put forward multiple perspectives and comments on the topic of the seminar. They also suggested that online lecturers should make students feel the following atmosphere:

- Feel welcome and needed.
- Have a sense of honor to belong to an important community.
- Be able to control by oneself.
- Expected concrete results.
- Willingness to join the conversation.
- Occasion to facilitate conversation.

- Dare to ask questions on points one may or may not understand.

Keller proposed a systematic design pattern of learning motivation called attention, relevance, confidence, and satisfaction (ARCS) [5]. This model is constructed on four factors:

- Arouse students' attention and interest in one thing, that is attention.
- Let students discover the relationship between this matter and themselves, that is relevance.
- Make students feel capable and confident to handle it, that is confidence.
- Sense of accomplishment and satisfaction after completion, that is satisfaction.

The whole process emphasizes on the fun of learning, by keeping the learners' interest through a series of reinforcement strategies to improve teaching and learning effects [6].

According to the time or space separation of teachers and learners, distance learning can be divided into two modes: synchronous and asynchronous online learning. Asynchronous online learning is when there is a time-spatio separation between teachers and learners, and they are not online at the same time. The students use the digital tools to submit homework, express opinions through online discussion boards, or interact with others [7].

Common asynchronous online learning applications include database or web-based systems where teachers store learning material or class notes as files or images, so that students can watch or read at any time. Asynchronous online learning environments typically utilize media technology to deliver class content and provide two-way interactions among teachers and their students, students and their learning material and peers. The challenge of practicing distance learning is to face the aforementioned distortion of disciplines and deterioration of rules of class.

What teachers are forced to face are: learning new technologies, large or immobile devices, unstable network bandwidth, inattentive or nonparticipating students, small or uncertain audiences, and little interactions in the class. Those listed above are all the dilemmas or disadvantages for teachers to promote distance learning. This also shows that teaching methods do not evolve with the same merit with the addition of digital technology. On other points of view, distance teaching even accelerates and increases students' learning gap and increases the burden of after-school homework.

2.3 Discipline and Space

The challenges and difficulties we previously highlighted might not solely stem from technical issues like bandwidth limitations or information processing capabilities; rather, it could be a deficiency of disciplinary measures and organizational structure among teachers.

We all know that sticks can't be used in virtual space, but what can be discussed is to rebuild a disciplined space. The teaching environment this study investigates is

not in a physical space. It can be an asynchronous distance learning scenario where teachers and students are neither in the same area nor online at the same time and how to build a disciplined space to make both students and teachers experience the spatial authority in physical classrooms.

Let us discuss the authoritarian factor of space in real classrooms first. This study conducted a questionnaire with 110 Taiwanese college students to investigate the authoritarian factor that students felt in the classroom and initially classified them into three categories: sight, distance, and sound.

Students will obey the discipline in classrooms because they feel invisible pressure from those three authoritarian factors in the space. Then the author added more lecturers and peers to increase authoritarian factors again and recorded the pressure index that the participating 110 college students feel. Data was recorded using a 5-point Likert scale, and results are shown below.

Table 2.1 shows that 74.55% and 42% of students feel pressure in the classroom due to the sight from the lecturer and peers, respectively; there are 71.82% and 39.09% of students who are stressed as a result of the distance from the lecturer and their peers respectively.

However, compared with the authoritarian factors above, the voice of instructors or peers in the classroom influenced fewer students, which also indirectly confirms that distance learning with only voice conversations is hard to stimulate students' motivation in learning or requires students to obey the classroom norms.

This paragraph discusses the teacher authorities in the teaching process, including the authority for the interpretation of teaching content, the authority for the option in teaching methods, and the authority for the evaluation of students' learning [8].

Although teachers have legal authority over students, students have the knowledge of how to respond. Students react negatively and show by their passive learning motivation, unconcerned teacher–student interaction, and the learning outcome that is far from goals to express disagreement with those teachers' authority [9, 10].

In recent years, the embodiment of distance learning is like students "listening" to the online interactive courses like radio programs, "playing" the pre-recorded courses as background music, and also "watch the end" directly by operating the video at the platform, or "hand in homework directly" without participating in any course. There's no doubt that it will substantially decrease the learning effect when students cannot follow the teaching guideline to learn step by step.

Table 2.1 Pressure index of authoritarian factors from Taiwanese students

Authoritarian factors	Pressure index (%)
The sight from the lecturer	74.55
The distance from the lecturer	71.82
The sight from peers	42.00
The distance from peers	39.09
The voice from lecturer in the classroom	38.18
The voice from peers in the classroom	27.27

Fig. 2.1 Panopticon. *Source* Sydney Criminal Lawyers, 11/07/2017 Photo by Paul Gregoire & Ugur Nedim, https://www.sydneycriminallawyers.com.au/

2.4 Reconstruction of Spatial Order and Redefinition of Roles

Continuing the topic on the influence of the authoritarian factor of space, the British philosopher Jeremy Bentham proposed a "panopticon" in 1785. A panopticon is a building where annular surroundings are divided into separate single cells (Fig. 2.1). There is a surveillance building in the center with a surveillance room on the top. The open side of the surveillance room will have a semi-transparent structure like shutters to block sight from outside. Prisoners who live in those single cells would not be able to know whether there is an overseer watching them or not. Michel Foucault [11] believed that prisoners will follow the disciplines and rules set by the overseer at all times in this unequal sight situation.

This research does not regard students as prisoners but wishes to point out an interesting social relationship through this theory. "Sight" (or gaze, observe) is one of the few remaining tools that teachers can use to manage students in modern classrooms. All the punishments that may influence students' right of education are forbidden,[1] including corporal punishment and oral abuse. Without tools, the difference between teachers and students comes from external social tacit understanding that gives teachers higher social status (compared to students). This provides an external advantage for teachers to use their authority, so that students obeying teachers' order has become a norm [12].

As Michel Foucault said in "The Birth of the Clinic," a doctor's gaze at his patient is a performance of showing power. In other words, a gaze from the leading position

[1] Corporal punishment has been prohibited in Taiwan through law amendment on 2006/12/12.

is also a gaze from the dominator. It is also a one-to-many interactive relationship between participants in a traditional classroom [13, 14].

How a teacher judges a student if he/she is concentrating on his/her learning tasks is through sight. Students can see each other in the classroom, too. In that case, they form a mutual restraint. The transformation from hierarchical observation to peer-to-peer observation aims to empower students as overseers in learning tasks. This shift seeks to redefine the dynamics of sight-restricting relationships, allowing students to take an active role in monitoring and facilitating their peers' learning processes. The implementation of this approach involves the following specific methods:

- Announce the degree or percentage of completion of the preview items.
- Announce the degree or percentage of completion of the learning tasks in the learning process.
- Announce the results of students after completing the learning tasks.
- Give all students differentiating power, including evaluation of learning outcomes and attendance records.

The participants already have tacit agreement while learning together in a course. For those who interfere or drop out, the course will be intervened and coordinated by teachers.

However, compared to the panopticon, the difference is that the "administrator" has absolute authority and disadvantageous to the "resident." The administrator/overseer will create an illusion by hiding their line of sight so that residents feel they are always under surveillance. On the other hand, teachers' sights are singular and easy to perceive in traditional classrooms.

The teachers and students in the classroom can upgrade the students' position from residents to administrators based on the differences in teaching activities. For instance, teaching methods like flipped teaching, peer review, group discussion, and so on allow students to take the floor or host, in turn making a specific student to become an administrator. In this concept, if the power could be extended again to students or peers at proper timing, the goal of reversing the role of the panopticon could be achieved and allow residents to also become an invisible administrator.

The virtual social space established through this kind of sight relationship will help to upgrade the participation and the concentration of students by supervision between peers. Just like what this research mentioned above, what students should respect is not the role of the teacher, but to agree that classrooms are an authoritative existence. The most important part to rebuild order is that all the participants (teachers, students and observers) understand each other's role and respect their own power.

2.5 Metaverse Classroom

The concept of the metaverse is open-minded and autonomous. It is an opposite and conflicting concept against traditional classrooms. The order of the classroom includes teachers' authority, sense of classroom space, and peer pressure. There

are also many fixed linear structures of time and effect verification that cannot be rearranged when designing the courses.

The necessary items in the classroom are "participants," "sensory stimulation that can be detected" and "order." The "order" here means the establishment and maintenance of the school's rules. It is a relatively stable relationship mode, structure, and status built in the process of teaching interactions of classroom participants [15].

Considering what the public defines as metaverse, the imagination of a metaverse classroom might have the following characteristics:

- Space: Full with virtual avatar with full-body motion capture and move freely in a virtual space which is similar to a classroom environment.
- Role: Everyone can teach, and everyone can learn.
- Freedom: Learn anywhere, learn anytime, learn on demand.
- Boundless: The concepts of classes, departments, colleges, groups, and schools are gradually weakened or disappeared altogether.

The following section will describe the four characteristics in detail:

2.5.1 Space

The space in this study is not exactly a virtual reality of a three-dimensional space generated by digital technology, but an "environment" provided with order, discipline and participants' power that this research previously mentioned. Perhaps, it will be easier to understand if we regard "space" in this study as "classroom discipline of virtual social space." Of course, this study will introduce some methods to establish order and maintain discipline by means of digital technology, which is still in the digital design.

The classroom order should contain specific learning goals to allow the participants to track their current progress, track each other's information to see whether they have participated or not. It should have a specific course evaluation system, and specific ways to participate in the course, such as synchronous learning, asynchronous learning, due time, subjects.

This study emphasizes the authority factor formed by participants' sight, so it needs a system to make participants feel they have partners. For instance, when learning in the virtual social space, a learner should have another participant to accompany and learn with them. Although in the asynchronous learning scenario, a student who started learning activity first may not have a classmate. The virtual character (NPC) can play the role of accompanying the first participant to learn together.

The participant's sight includes a learning progress mutual review of participants in the course. The learners preview prior to class and the understanding of teachers about their students can be fulfilled by the digital management system nowadays. The learners' learning status and the teachers' compliance to the progress and syllabus are very important in the course. It helps learners realize whether they are ahead or

behind in the course progress. Students comparing each other's results or work after learning allow learners to evaluate their own results or against others' after finishing a task. Observing the footprint of other learners, or observing where others excel or make mistakes are all parts to a learning process.

It is true that evaluation in courses involves students' privacy. This study considers from the point of view of classroom management, announcing students' learning results by stage helps participants finish their tasks positively because they care about their performance. However, the method or degree of the content announced needs to be considered precisely. For example, do not announce ranking, convert scores into ranking, or simply announce complete/incomplete.

2.5.2 Role

Just like the feature of the metaverse, one is free to play a role of someone else, although there are limits to role play in the virtual social space in the classroom. Like the definition of gender, you can play the role of a teacher, or a student, or both characters, or none of these characters. Role play is a process of building identity. These characters are all endowed with the holy missions to teach and learn, and finally gain achievement.

The standard and value of the learning or teaching achievement can be redefined through blockchain technology or non-fungible token. A learner who has good learning effectiveness may become an educator in the future. The way to be certified is to transform the learning record into a transcript NFT.

A similar concept has gradually been established where senior high school students would import E-Portfolio before applying to college. The purpose is to try to allow the data that students submit to the colleges to be more closely representing who they are and show their personality, as opposed to a short-term pitch for the application. Without a doubt that every movement of the policy will bring countermeasures at the same time. Currently, the E-Portfolio is to be uploaded once every semester. Users who do not comply to the discipline still can take chances to upload information that is not real. This relies on the self-discipline of units of all levels and the moral compliance of students.

Extending the E-Portfolio and combining the concept of blockchain, from uploading data every semester to uploading every performance in detail may cause students afraid to make mistakes. However, no one is perfect. What educators care about the most are the changes they make and how they amend to the right path as students face difficulties. What can show the potential of students is not dependent on how many things they did open and aboveboard but dependent on whether they could hold their will when met with difficulties and frustrations.

To educators, the processes of giving knowledge, completing the credits (learning tasks), or giving digital certificates to learners can also accumulate their own teaching energy according to the teaching experiences. Of course, the premise is that there is

still a decentralized supervision system to avoid refreshing teaching records through loopholes in the system.

2.5.3 Freedom

Today, the public discussion of distance teaching with no space limitations should not only focus on transforming traditional teaching materials into online audio but to consider the audience's misunderstanding of the meaning of certain vocabularies.

Maybe the cause of tired hearing is because of the long time required analyzing language connections. Random video learning lacks support from the system, and the learners lack motivation and self-discipline, so it is easy to lead to poor learning effectiveness.

Full digital distance teaching is not restricted to the teaching method to teachers. On the contrary, there are many multi-media or digital interfaces that appear to enhance traditional teaching progress. It allows educators to realize what changes are happening in the teaching field through replacing the slide machines (traditional slides) with digital lecterns. It is also time to accept that the way of learning is no longer limited to showing slides on the stage, but a multidimension distributed knowledge system architecture.

Autonomous control of the learning period is also a reason that metaverse is gradually built. Teachers provide pre-recording courses and a complete learning verification system for students to learn online in their free time. Although there are many private companies that have built digital teaching platforms that already fulfill the vision above, there are still many limitations to practical operation in formal schools.

Take courses; for example, it has a start and end time such as one semester, one school year or credits lessons, whole course hours, and single week hours. There is still a concept of "interval" in human life. Under normal physical and psychological conditions, it is still customary for teachers and students to arrange work or study in "weeks."

Let students decide when they want to do self-learning in units of weeks. Teachers could allow more time limits like handing in two learning progress within two weeks. For those who delayed learning or late submission, there should be rules or systems to respond and remedy. It is also recommended to arrange face-to-face QA sessions after pre-recorded courses. No matter what students do in real courses or online courses, they need opportunities to return to reality. It is important to get a balance between self-learning and checking their learning effect, in order not to fall into the cliché for the purpose of completing.

2.5.4 Boundless

Gaining knowledge is boundless. Even if someone finished the specified scope of courses or earned a degree, it is just understanding part of the knowledge. If we regard knowledge that we should learn as an ontology, going through all nodes does not equal to getting a full picture. Having the basic ability to understand the whole picture is the most important significance in the learning progress.

Knowledge can be traded. It is the same way that educators interact with each other nowadays. Teaching and learning enhance each other. If one uses metaverse technology systematically, such as blockchain transcript or NFT transaction mentioned above, to exchange what each other has learned, boundless teaching content can be found on today's Internet. As long as the learners are willing to give time and passion, they are bound to receive everything they want to learn.

2.6 Conclusion

Metaverse virtual classroom or the so-called the virtual realm of classroom order should have several characteristics:

- Asynchronous and synchronous teaching at the same time.
- Learning both off-site and on-site at the same time.
- Verifiable teaching index and completion rate of partners.
- Traceable teaching contents and completion rate of partners.
- A knowledge system with the function of teaching, self-learning, verifying qualifications, and trading of knowledge.

There are more options for distance online teaching and more possibility of interaction without a software interface framework. However, there is limits to modern technology, as it is still impossible to transmit 100% of information through the internet compared with face to face. Compared to field teaching, online teaching or virtual technology must have some sort of information distortion or barriers of emotional judgment, that is the reason why visual avatars are used.

The teaching process relies on facial expressions, voices, and on-site interaction to obtain immediate responses from students. Students cannot concentrate on distance online teaching because it is not real enough. Field teaching can appeal to the audience through face-to-face presentation. However, if it is an online video conference service, the interaction with each other will turn from space sharing to a single screen sharing, from a space to a window. By establishing the classroom order in virtual social space, the educators' sense of immersion and participation can be rebuilt.

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