



## Collaborative and Interactive Learning

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**Abstract:** Conventional teaching in professional courses such as real estate curriculum requires classroom teaching or small group tutorial discussions where the teaching staff can interact with students directly to convey the necessary knowledge and to understand how students are absorbing the latest changes in professional practices. In order to maximize learning experience in these professional curricula in an ever-changing society, it is necessary to draw on different international resources of knowledge to add value to the programme, but this is usually constrained by timetabling and availability of students, guest speakers and staff. In this paper, we will illustrate how teaching technology helps to create an online collaborative and interactive discussion platform that enhances the learning outcomes of real estate students in a Hong Kong university by promoting an interdisciplinary and internationalised learning platform. Our experiment illustrated in this paper shows that with the help of the innovative online discussion system, constraints such as physical contacts can be circumvented. Our analysis shows that technology-supported online teaching and discussion platform in real estate education allows students to understand academic and professional knowledge in other curricula as well as other city in a more time-effective way. This teaching mode also enriches their learning experience in an internationalized and interdisciplinary environment via a virtual platform. Applying technology in building up an interactive discussion platform makes inter-institution and inter-discipline collaboration more easily and efficiently. Without the hurdle of coordinating timetable clashes and meeting arrangements, this online interactive and collaborative platform provides a flexible discussion forum on which students from different discipline or even city can join together in their most comfortable way at the prescribed time of meeting. It is shown that virtual learning platform can help to promote internationalisation of learning outcomes.

**Key words:** online learning platform; student-based learning; inter-disciplinary education; collaborative online discussion.

### 1. INTRODUCTION

Traditionally, professional curricula offered in universities training finance; real estate, and medical personnel combine both vocational and academic knowledge in the syllabus for enhancing employability of the students. Professional undergraduate programmes at universities are particularly challenging as real estate markets move in cyclical pattern such that real estate curriculum needs to cater for local market requirements to prepare for their students to face real-life market changes (Adair, et.al., 2000; Weeks, 2003; Kampamba, et.al., 2017). Moreover, “real estate” as a stand-alone academic subject area usually faces an identity problem to define itself as a traditionally established discipline compared to other subject areas such as Physics, Math or Economics due to the so-called “ill-defined mutation” problem in this discipline (Diaz, 1993). In most of the North American higher educational institutions, teaching real estate is usually part of the business study programme and this trend is also beginning to be evident in other countries. Real estate education therefore is more often seen as a multi-disciplinary subject which is built on the understanding of other core subject fields such as economics, building technology, urban planning and legal studies. In any case, teaching real estate studies requires both the teaching staff and the students to be knowledgeable in the changing environment in other sectors of the society. For example, students need to understand how changes in foreign exchange rate of their own currency may lead to changes in foreign buyers’ interest in their

local housing market, or how the change in their government's monetary policy might impact on the availability of real estate finance and hence local housing demand, or how the growing awareness of conservation may affect the rate of urbanization and urban regeneration policies. All of these issues need the teaching team to constantly create a learning environment that will stimulate students to think more laterally while providing conventional lecture-type knowledge in courses such as advanced valuation, urban planning or construction technology.

Real estate education entails both academic and practical training that require a much more interactive and multidisciplinary learning environment for students to understand the ever changing market environment, as well as various institutional constraints pertaining to real estate development. Moreover, real estate students need to be exposed to the latest development in these different principle fields to gain the most updated knowledge in their understanding of the essence of the economics of real estate development, which transcends more than financial calculations of development projects. Very often, experts in these other subject areas tend to scatter among different teaching departments within the same institution, or even across different cities or countries.

On the other hand, the vocational component of real estate education usually requires students to be well-versed in local land use and planning regulations as well as market practice. Very often, the syllabus is also monitored by the local professional association to ensure this. After all, real estate is an immovable asset that is physically produced, transacted and utilized insitu, and stakeholders basically work around the built structures locally. Given that traditionally graduates from real estate undergraduate programmes will tend to work in the local market, there has been a limited urgency in internationalising the contents without compromising local knowledge. However, this situation tends to change as globalisation tends to draw markets, even the immovable real estate markets, closer and closer as corporations are all diversifying internationally in their real estate portfolios. Students are also getting more mobile as emerging markets always require seasoned overseas real estate professionals to explore investment opportunities before relying on local consultants. In this way, there is a growing demand for such real estate undergraduate programmes to be able to equip students with a more global view and versatile culturally.

In this paper, we will illustrate how teaching technology helps to create an online interactive and collaborative learning environment that enhances the learning outcomes for real estate professional undergraduate students in terms of internationalization and multi-disciplinary contents in Hong Kong. Applying a case study approach, we will discuss our experiment in this online internationalisation course to highlight the outcomes that students in three different academic programmes from two institutions in two cities enjoyed such interactive learning process with their peers. The learning process stimulated their interests in knowledge taught in other courses and enhanced their understanding of intercultural interaction. In the followings, literature review will be discussed on two main issues, namely internationalisation and online collaborative learning environment, pertaining to the objective of this paper. A case study of our experiment will then be explained, followed by the analysis of the learning outcomes. Case study approach is a well-established research framework and should not be seen as a mere description of the facts. Case study approach is more appropriate when the "focus is on contemporary phenomenon within some real-life context"(Yin, 2013).

### **1.1. Internationalisation of University Curricula**

In the recent decades, "internationalisation" has become a key performance indicator in global universities as international profile of the institutions helps to attract more international students which will eventually also contribute to the strategic development of the institutions (Berry and Taylor, 2013). Internationalisation of higher educational institution is built on the long tradition of regional as well as international collaboration and partnership among the global institutions (Nelson, 2013). Internationalisation of higher education is also demand-driven as it has become important that culturally diversified and competent graduates are getting more and more employable. Nevertheless, "internationalisation" in higher education is not easy to delineate clearly with consensus and the concept can be even regarded as ambiguous (Castro et.al. ,2016). Using Knight's definition, internationalisation is a process "of integrating an international, intercultural or global dimension into the purpose, functions or delivery of post-secondary education" (Knight, 2003). Hence, internationalisation goes beyond simply attracting more foreign students (visiting or permanent) and sending students out for exchange, though student mobility is the most preferred activity in the internationalisation process (Berry and Taylor, 2003). In fact, Yemini and Sagie (2016) find that

student mobility has gained tremendous increase in emphasis in relation to the concept of “internationalisation” in the last three decades. Trahar and Hyland (2011) provide a more comprehensive definition for internationalisation as “associated principally with an ethos of mutuality and practices geared at strengthening cooperation...”. Internationalisation therefore should explore intercultural interaction among academic staff, students and researchers on teaching, learning as well as research activities.

Kirk et.al. (2018) note that among various internationalisation activities, the issues of internationalisation of curriculum and global citizenship seem to be the most difficult to define due to a lack of consensus of institutional understanding of what it entails. Course design that targets at bringing students outside of their own environment and learning other cultures and practices therefore would help to enhance the internationalisation process.

It has been noted that intercultural interaction among different groups of students in the process of internationalisation of higher education can be best achieved through causal, relaxing and comfortable environment (Estacio and Karic, 2016). Group discussions that promote collaboration among students from different backgrounds may therefore help in this way. Internationalisation of curriculum needs to promote inclusive mentality among students, that students living different socio-political environment should be able to appreciate the complete cultural development of their counterparts without being too judgmental. In the other words, there is a need of promoting reciprocal cultural understanding in the contents or teaching activities (Whitsed and Volet, 2011; Mertova, 2013). This is especially important when the interactions involve students from very different cultural backgrounds such as the Western and traditional Asian ones (Kim, 2016).

Given that internationalisation of university education entails interaction among students from different socio-cultural background to discuss academic issues that will be of interest to all of them, it becomes necessary for the institutions to create opportunities for students to meet and interact, and hence, student mobility is a major factor contributing to internationalisation as evident from the literature above. However, due to various reasons including financial viability as well as teaching schedule, it is not always easy. The latter is more a problem for professional programmes as their teaching timetables are usually very packed. In this respect, the application of online learning platform will enhance immensely to allow flexibility in the mobility of students in the virtual learning space.

The advent of internet-based online technology has expanded education creativity substantially in the recent two decades. Internet-based networking creates a virtual space that allows both teachers and students to breakthrough physical distance and join together to work collaboratively in real time. This enlarges the extent of collaboration and discussions among teams from different fields of expertise and from different geographical locations with almost no or very minimal constraints except for the need for all participants to login simultaneously and participate in the discussion. A more crucial technical problem becomes the limitation of time zone difference if the participants are from geographically far-apart locations.

Stockleben et.al. (2017) note that there are two drivers for the increasing popularity of online-platform learning environment in higher education, namely the increasing trend of international collaboration among universities in teaching and learning activities and increasing expectation from students in their learning process to equip them with a more variety set of skills so as to be more employable. Developing an online student-based studio teaching course therefore maximizes these two outcomes.

In most professional education programmes such as medical or engineering training, a tacit knowledge or soft skill known as “collaboration” is usually embedded in the curriculum, especially in the form of inter-disciplinary or inter-profession collaboration as graduates from these programmes will need to work in a team-based project with a number of stakeholders from different backgrounds and training. Collaboration can be regarded as an action or interpersonal relationship between professionals to achieve a specific purpose (Schrage, 1995). To achieve this, an ability to understand the roles of all different stakeholders in their business operation is of prime importance. Collaboration means bringing people from different fields or locations together to work as a team to maximize synergy through joint efforts. However, collaborative training and learning environment may be constrained by physical space that accommodates all these different groups of people as well as the logistics of bringing them together at the same time.

Such constraints are released when an online platform can be put in place instead of the physical space of a meeting room. Online collaborative platform allows information, especially visual information, to be shared and analysed together simultaneously by a team of experts for decision making, which is getting more and more attention in scientific field such as Immersive Analytics (Klapperstueck et.al. 2017). Technology that enhances commercial outcomes from more effective collaboration among team-members can therefore be also applied in educational training as a first step of developing a good culture of collaboration.

### 2. CASE STUDY - SURVEYING STUDIO IN REAL ESTATE EDUCATION IN HONG KONG

Real estate education is a multi-disciplinary subject that requires students to have an all-round training and knowledge in such other core academic areas as outlined above. These subject areas are dynamic in the sense that they keep evolving with changes in the socio-economic, political as well as technological variables in the society. In addition, while real estate development itself is a geographically fixed commodity which implies local knowledge and regulations dominate the outcome, real estate analysis can be a much more global issue when local developers and investors are ready to make an overseas investment decision should opportunity for good investment return arise, and hence knowledge about regulations and cultural constraints in any other market also becomes important.

In the BSc Surveying Programme at the University of Hong Kong (HKU) in Hong Kong<sup>1</sup>, an interactive studio-based course known as the Surveying Studio provides such an interactive learner-centred opportunity in real estate education. Surveying Studio has been an integral part of real estate and construction education at HKU that engages students, under structured and complete staff guidance and supervision during the discussion sessions, in the exploration of issues which are essential to the training of real estate and construction professionals locally in Hong Kong. It is built on a problem-based learning model (PBL) through which students embark on a quest for knowledge through self-initiated research, discussions, debates and presentations among the students themselves under the close supervision and guidance of a teaching staff acting as the facilitator in the discussion sessions.

The key aim of the course Surveying Studio is to allow students to undertake research-oriented study on their own initiative under appropriate guidance from experienced teaching staff who provide a series of scenarios in a sequential manner that unfolds a simulated real estate development and construction management process based on an actual project with materials provided by the teaching staff, sometimes with the assistance of the actual developer who built the project. It serves as a virtual environment for students to foster and develop their interests in learning and examining core issues pertaining to the various socio-economic aspects of the real estate economy. The emphasis here is on the different important socio-economic aspects. This helps to transform real estate education from a conventional one-direction model of teacher-centred to an interactive nurturing student-centred multi-disciplinary problem-based learning mode.

Under such teaching philosophy, studio-based teaching represents a shift from an “instruction-based” to a “self-learning-based” delivery process. It is believed that learning is more effective when students are actively involved in the learning process and are able to apply the knowledge they learnt in conventional classrooms (Intansari, et.al., 2017). The studio teaching team conducts a diagnostic analysis on the real case first, then identifies important issues that are academically worth-exploring for students in this real development project case. The team then designs problem scenarios with respect to this selected case study under various hypothetical situations. Student learning groups work through the problem scenarios progressively every week in the semester to achieve the desired learning objectives. Interactions among students in the weekly Surveying Studio meetings are crucial for a successful Surveying Studio course.

Surveying Studio places a much stronger emphasis on student-initiated research on issues that were raised in the previous meeting. In this way, a momentum is kept throughout the semester in the following manner: in the first session every year before the Surveying Studio commences, students are required to watch a video or conduct research on such issues as building teamwork, avoiding free-riders in group discussion, or negotiation technique. This first session serves as an ice-breaker between staff and students, as well as among the students themselves. Following this, students are then given the basic background of the important issues pertaining to their solving the real estate

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<sup>1</sup> For reference : <https://www.rics.org/hk/>

development problem in the first meeting on a hypothetical story. The facilitator guides the students in the general direction of their own discussion, highlights and steers them towards the residual issues that need to be resolved in the next meeting. Before the next meeting, students are to carry out their own research to discover the relevance of these issues, debate among themselves, and bring their conclusion, problems or the reasons for a lack of consensus back to the small group meeting a week later. During this interim period, teaching team of the Surveying Studio will sometimes post additional information on the teaching site, Moodle, for extra useful information, or for twisting the course of events that mimics the real world. Examples of these extra information include planning guidelines and development controls on the site, cash-flow or financial situation of the hypothetical company for which the students work in the Surveying Studio scenario, or unexpected increase in interest rate or drastic geopolitical crisis, etc. This weekly momentum progresses when more discoveries and discussions leading to more issues to be researched on each week.

Each session will usually be followed by a week of progress meeting, and hence these four sessions will cover a total of at least eight weeks of student-led discussion sessions in one semester. This progression will then be repeated in the second semester to represent the second stage of real estate development to encapsulate more focused issues such as construction management, corporate social responsibility in real estate development process, marketing scheme, and eventually long term investment strategy. As can be seen here, a core element for a successful Surveying Studio learning outcome is for the facilitator to be able to meet with the students on a weekly basis to assess and guide their progression. The physical presence of all members of the group and the facilitator dominates the logistical arrangement of the weekly meeting. This requirement, however, has been made less rigid with an attempt to move the whole discussion process into a virtual platform that relegates the constraints of classroom availability and meeting time that suits everybody to a much lower level of importance. In the following, we will explain and explore such possibility with our initiative on a refined version of the Surveying Studio: Studio-without-borders.

As described above, as real estate development has become a more globalized business with investment fund actively flowing from low return markets to the ones with higher return, students in real estate programmes are finding themselves more and more likely to be working in a new and unfamiliar market a few years after graduation. In the recent years, this new market is Mainland China. Real estate education that can prepare students with a more inter-disciplinary and internationalized basis of knowledge will be able to attract good students who aim at increasing their competitiveness in the global job market. The online collaborative learning platform can serve to underpin the pedagogical outcomes of Surveying Studio in a cost-effective manner that will achieve this objective.

As urban development involves the use of land, it invariably intertwines with other aspects such as economics, construction management and law. Real estate students when dealing with urban development issues will certainly need legal knowledge on matters such as legal procedures and town planning regulations. As a matter of fact, cooperation between property and legal professionals is more than common in practice and such professional interactions can be initiated and enhanced as early as in the undergraduate education. The involvement of law students will therefore not only bring in new insights to studio learning for the benefit of real estate students, but also provide law students themselves an invaluable learning opportunity to nurture their lawyering skills, in terms of communication with clients, legal research and writing, as well as application of legal knowledge concerning land use in a real-life setting.

To allow such interactions without compromising the existing tight teaching schedules of both the real estate and law programmes, an experimental online mechanism is created using the Realtimeboard platform<sup>2</sup>. This online educational platform builds the foundation of our interactive and collaborative learning project known as the Studio-without-borders, in two stages. Before going into the details of the learning project, let's explore briefly on the technical background of the platform.

### **2.1. Technical Description of Studio-Without-Borders Project**

To create this online collaborative learning environment, we need an online platform with technology that allows multiple users to participate in real time mode. Each user (student and staff) should be able to post their questions/comments and also be allowed to provide answers to questions from other

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<sup>2</sup><https://realtimeboard.com/company/>

students and to edit others' comments in real time. Entries should not be limited to texts, but also graphics, web page links as well as video. Versatility of participation formats on the discussion platform is imperative for maximizing students' learning outcome as students' technological literacy today sometimes exceeds teachers', and the virtual classroom created by this online collaborative platform needs to provide an interesting arena in order to stimulate the interactions among students. Due to government regulations in Mainland China, Google's platform is not steady in terms of accessibility by students in Mainland China. Eventually, we turned to Realltimeboard which provides comparable functions but with much better accessibility in Mainland. In general, Realltimeboard works as a virtual whiteboard that allows participation of students in discussion invited by the administrator, who is usually the teaching staff in charge. The administrator can therefore control the membership of participants in each discussion forum, or to split the participants into different "boards". During the discussion sessions, all participants can visually identify other participants on their board as they can actually see the cursors of other participants move, each tagged with their identity. In addition, they can also see who starts to write, and who is reading which comment on the board. In this way, students may wait until the other student has completed posting or editing a comment before reacting. They could also identify who is more active in posting or editing comments on the platform, and who is more like an "observer". This virtual environment establishes an interesting and sophisticated interactive and collaborative learning behaviour among the participants. Our study (to be elaborated later) shows that students learn very fast in adapting to the teething problems of the Realltimeboard at the beginning and are able to circumvent these problems with their innovative ideas. Fig. 1 below illustrates how the system was set up at the beginning in general. Fig. 2 illustrates how visually how Studio-without-borders operates.



**Fig. 2.** An ongoing online discussion between a) students from University of Hong Kong (HKU)'s Department of Real Estate and Construction and Faculty of Law, and b) students from South China University of Technology (SCUT)'s Department of Construction Management. As the HKU students write down their inquiries about Guangzhou's property market and construction industry on the board, the SCUT students would type their answers below the questions.

Having described the technical setting of the Studio-without-borders project, we now turn to elaborating on the development of the project in the following two stages. In this studio-without-borders project, there are a total of three groups of students, namely HKU Surveying students, (a total of 23 students participated, SURV); HKU Law students, (a total of 19 students participated, LAW); and South China University of Technology Construction Management students (a total of 12 students participated, SCUT-CM).

### **2.2. Stage One: Inter-Disciplinary Collaboration**

In this stage of experiment, LAW students will act as a legal counsellor for the SURV students under the supervision of teaching staff from the Law Faculty at HKU during the interactive discussions. They will be asked a number of legal questions and to give legal advice to their "clients" (SURV students) on urban development controls and land use regulations issues during the sessions.

Students from both sides were given some guidance on the extent as well as likely boundaries of the questions from their counter-parts. Hence, they could prepare for the discussions with some background research before coming to the actual session takes place.

In the first session, all students were new to the online interactive environment, Realltimeboard.com, and it took them some time to be self-organised. At first, discussions were piecemeal and sporadic on the online collaborative platform as there were six students from each group, and each real estate student almost asked questions simultaneously (Fig. 3). Despite these chaos, this serves as a

wonderful learning curve for students. Viewing this unsatisfactory communication mode, students started to concentrate on reformatting their dialogue mode first before looking at the questions pertaining to legal issues. Eventually, they agreed on a sequential format (Figs. 4 and 5) which controls and limits the questions from the real estate students to a “one at a time” basis by creating a number of Q&A boxes. All students were to concentrate on the question as well as any related queries arising from the earlier answer first before creating a new question box.

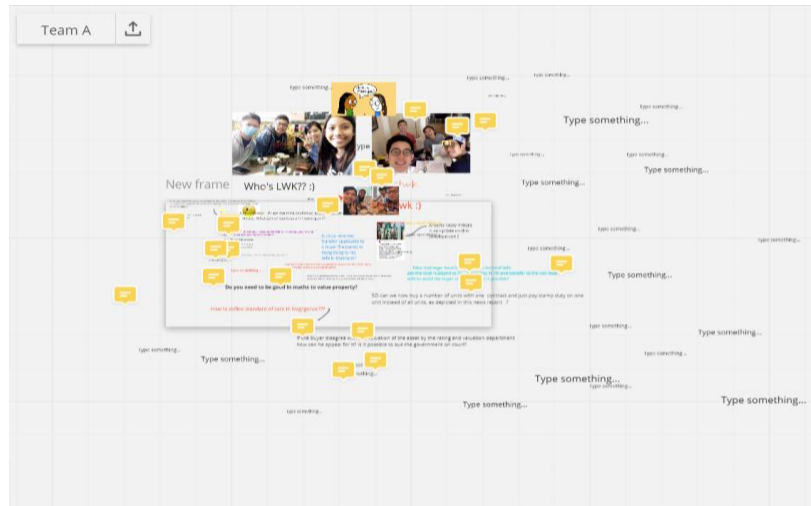


Fig3. The first session experience: comments were all over the place

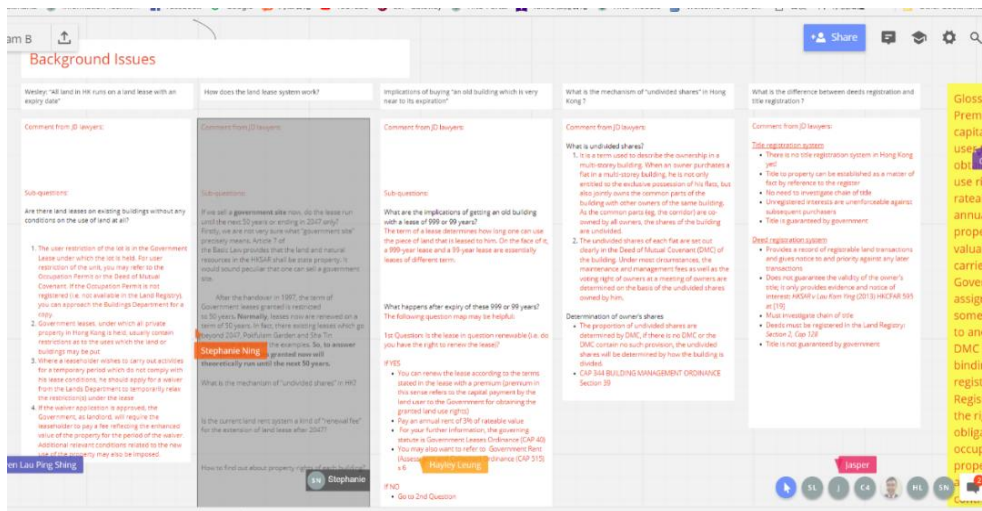


Fig4. A more structured format was developed by students themselves in Session 2

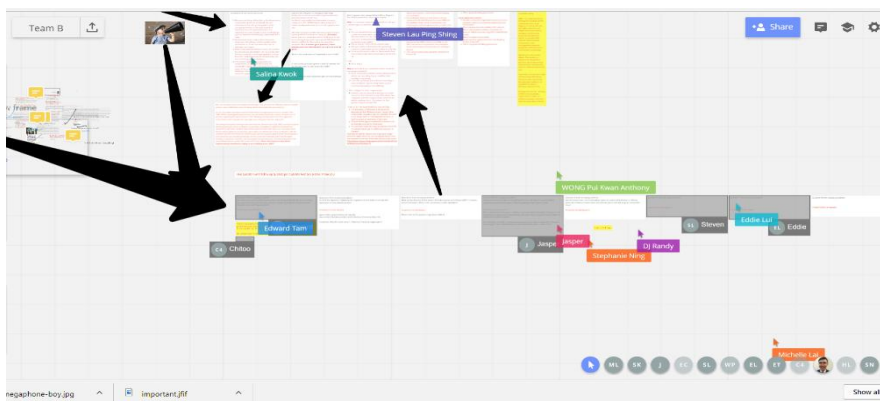


Fig5. Students developed their optimal discussion format students after Session 2

As they progressed to the second week, they had grown accustomed to the format. Facilitator has found that they logged in at least 10 minutes before the scheduled start time to upload some basic questions, or latest information extracted from the public domain that will help the discussion (Fig.6).

Some students just wanted to socialize with students from other programmes beforehand, as seen in the figure. Before of the e-learning environment, students are not confined to come together in a physical classroom, and they tend to multi-task in the discussion session, mainly lunching and working on other projects (Fig.7).

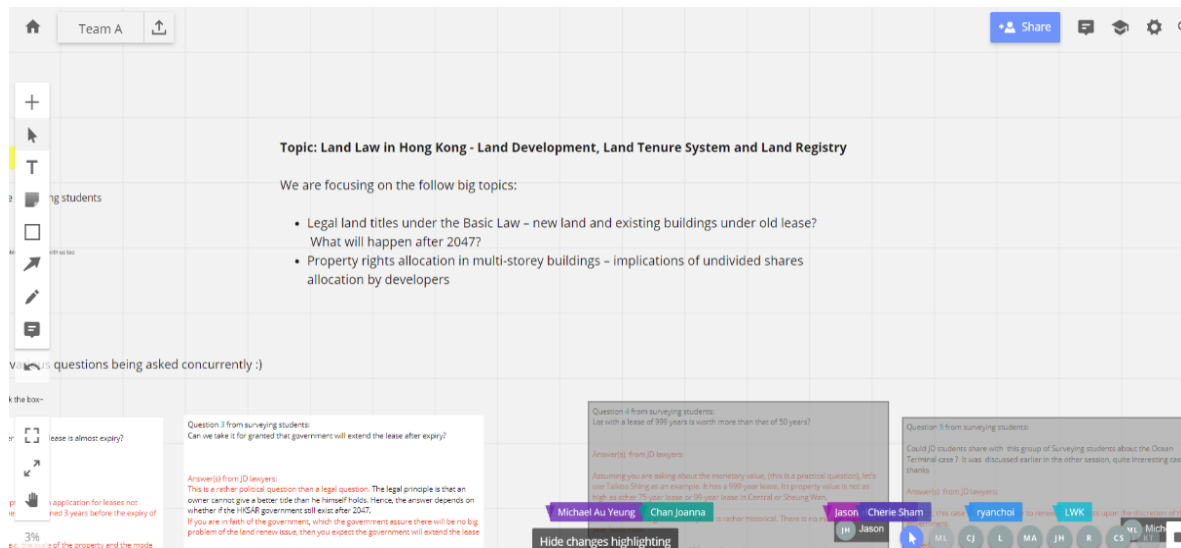


Fig6. Students preparing for the actual discussion before the prescribed studio session

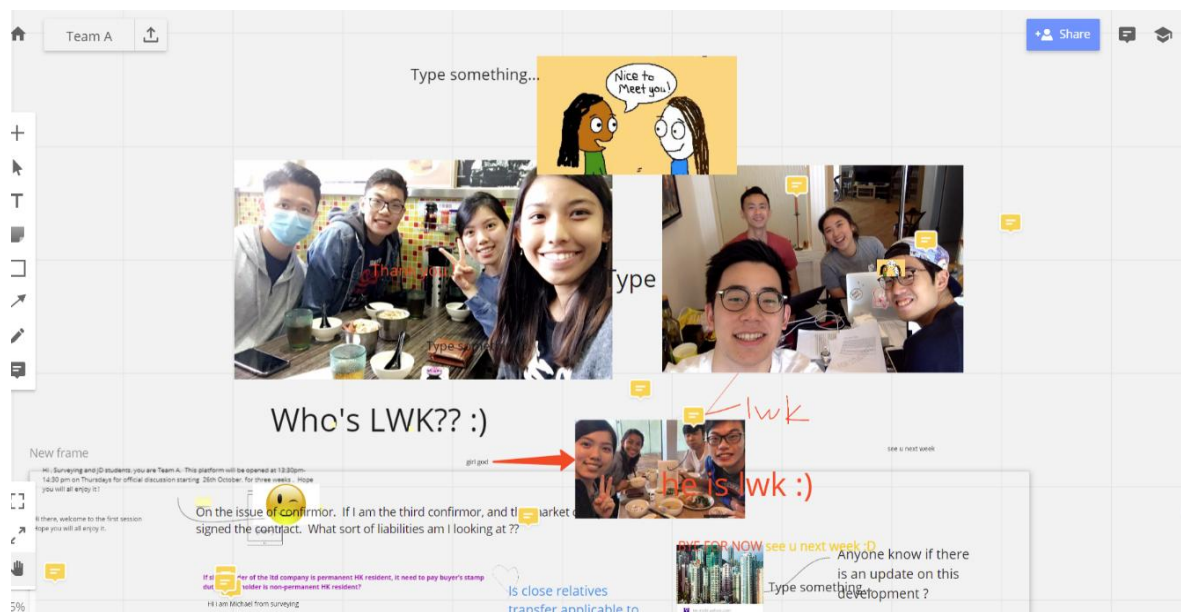


Fig7. Flexibility of multi-tasking in studio-without-border sessions

After the second weeks, the momentum tended to be maintained and sustained. Students became more self-aware in raising questions and follow-up questions on issues pertaining to their Surveying Studio tasks. Interestingly enough, some law students also raised interests on the contents of real estate curriculum, as one them even asked about the basic principles of property valuation, and tried to figure out how legal knowledge may help in the valuation process. The other law student actually asked the facilitator about the daily work of a surveyor (real estate professional in Hong Kong) just out of curiosity (Fig.8 and Fig. 9). This platform thus allows both academic and professional interchange between different disciplines. It also bridges students from different disciplines on a social-academic network, who otherwise would not have the opportunity to know and collaborate with each other. By collaborating as team-to-team support throughout the discussion sessions, we find that students have developed a team-spirit with students from the same programme, as well as those who participated in the same session (Fig.10 and Fig. 11)



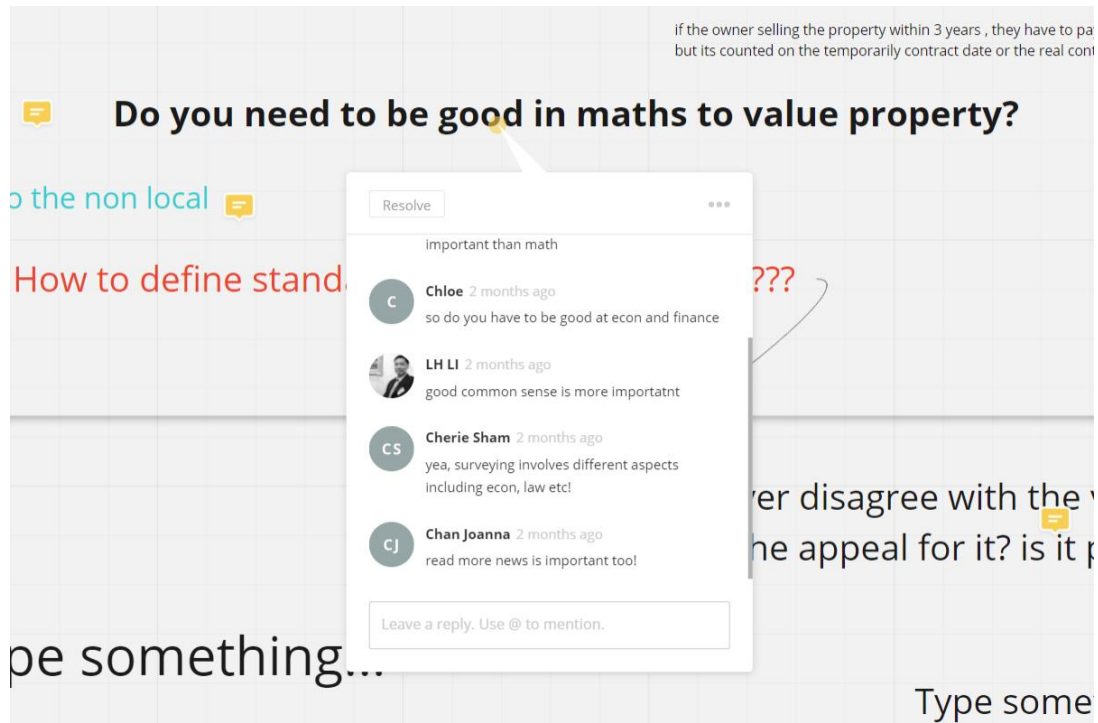


Fig8. Students become more interested in other discipline after a few sessions

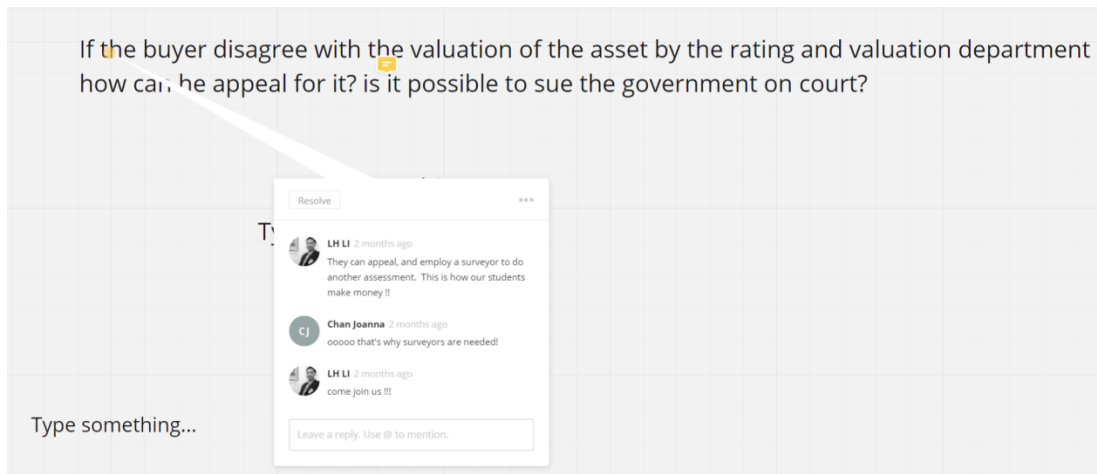


Fig9. LAW students trying to understand professional valuation knowledge from real estate students and staff

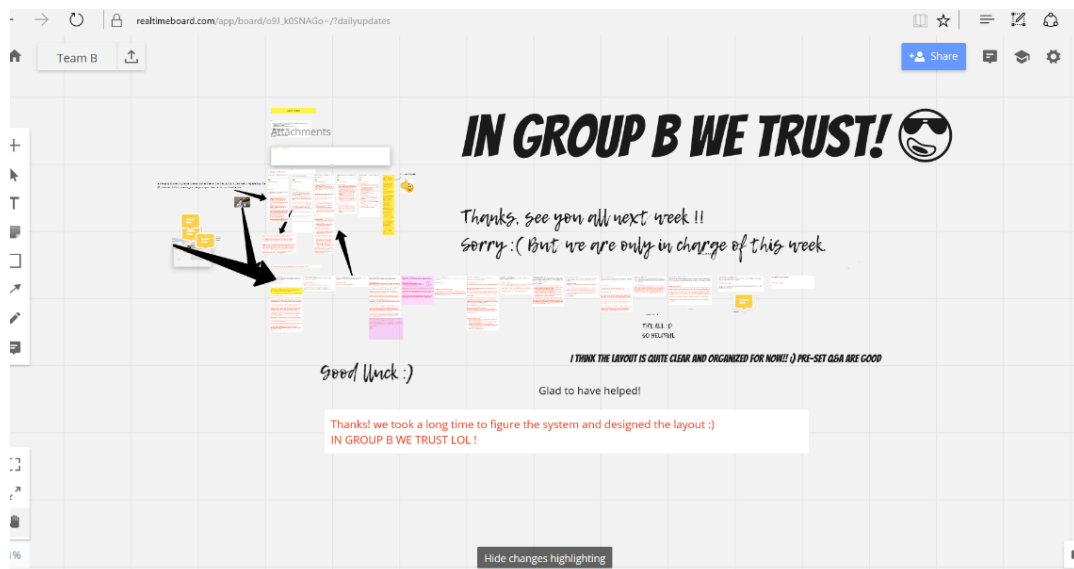


Fig10. Team identity being developed by students from different programmes on the same board

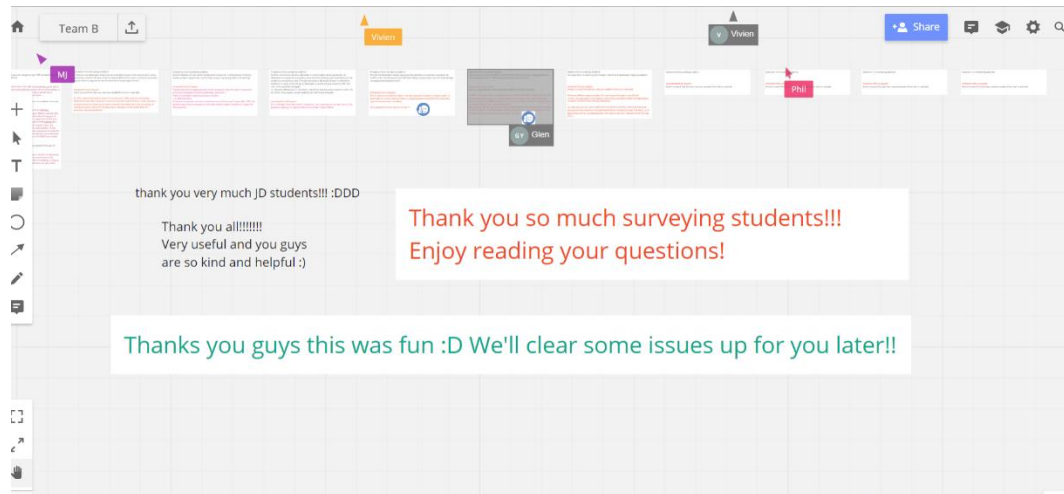


Fig11. Friendship being established across different academic programmes

### 2.3. Stage 2:

In this stage, we further developed our experiment with an additional partner, construction management students from the South China University of Technology (SCUT). A debriefing session was held in December 2017 between the research team and the SCUT-CM students to let them know the experiences in Hong Kong. SCUT-CM students' comments were invited for the development of the second stage. An RA was employed to work on case studies in Guangzhou for that matter at the same time. After working out the logistics with the SCUT staff and students, the following scenarios were designed for the second stage:

### 2.4. Background of the Scenarios:

The same development company (represented by HKU Surveying students, SURV) in Stage 1 now wants to explore development opportunities in Guangzhou and approaches one of their business partners (represented by two teams of SCUT students) in that city for comments. In this scenario, there will a triangulation of interactions among the three groups of students, namely HKU Surveying students (SURV); HKU Law students, (LAW); and South China University of Technology Construction Management students (SCUT-CM). In the first session, interaction over Realtimeboard.com between SURV and SUCT-CM students commenced first, followed by interaction between LAW and SCUT-CM, and then all parties.

Scenario one is about market analysis, and each SCUT-CM team finds a development site of their choice and will deliberate the investment potential to SURV students. Students will interact on the discussion forum and clarify issues pertaining to development potential of each site (Figure 12).

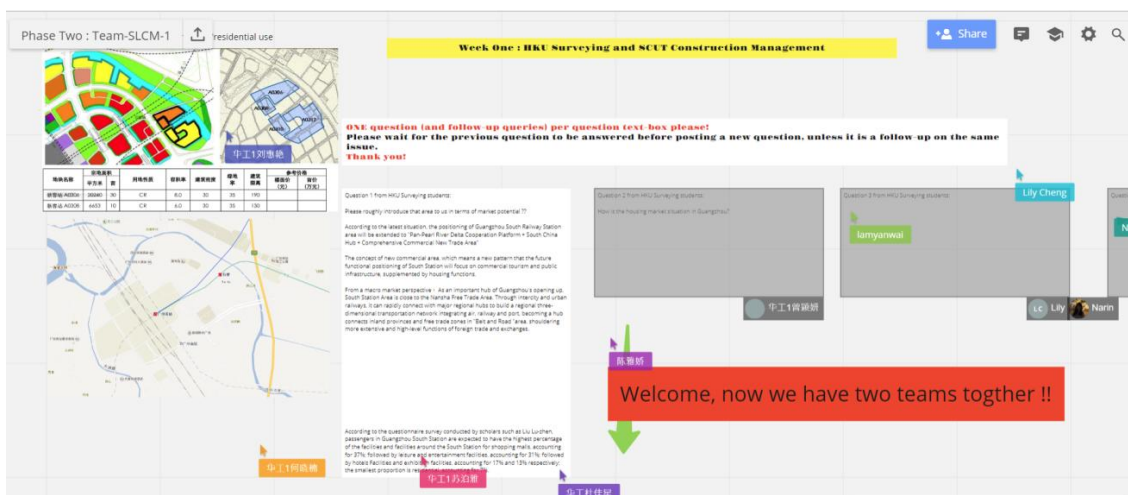


Fig12. Cross-city inter-disciplinary discussion on the platform

Scenario two is an interacting between SCUT-CM students and LAW students. The latter act on behalf of the SURV students to clarify regulatory framework on land development involving outside

investors, property rights issues in Mainland China, as well other legal concerns pertaining to real estate development in this city.

Scenario three is the final stage when all the three parties (SCUT-CM, SURV and LAW) meet together on the Realtimeboard (which works with a higher degree of stability in Mainland China than other similar platforms), and finalise which site SURV students want and how to proceed in the next stage. This is also the opportunity for SCUT-CM students to finally sell their ideas to SURV students by clarifying whatever concern they had in the previous discussions, such as selling of properties by an external investor, remittance of Chinese currency outside the country, property rights, governmental controls on land development, etc.

### 2.5. Studio-Without-Borders Experience

Coincidentally, stage two of this experiment was carried out during the Chinese New Year break in Mainland China in 2018. The Chinese New Year or commonly known as the Spring Holiday in Mainland China is a major holiday period for university students who will normally go back to their home town for a month or so. Under normal circumstances, it is impossible to gather students or staff together for any simplest form of teaching activities. With this Studio-without-borders project underpinned by the online interactive discussion platform, we were able to achieve this truly no-border interaction among students and staff. Figure 13 below shows the distribution of the SCUT students during the second phase interaction. All students participated in the online discussions at the prescribed time from wherever they were. Some students were back to their hometown as far North as Henan Province and Sichuan Province in China, but for the Realtimeboard platform, they were able to participate in real time. This collaboration could not have been realized in the conventional Surveying Studio format which requires physical meeting among students and staff altogether.

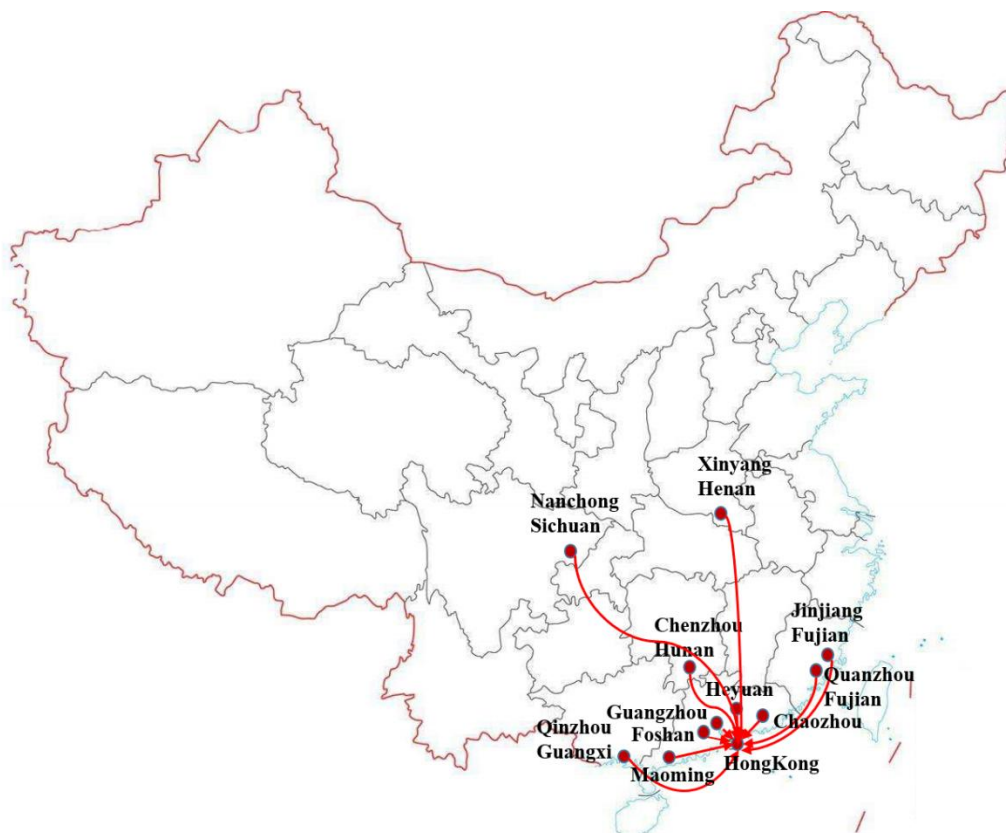


Fig13. Geographical distribution of SCUT-CM students during the second phase of the project

### 2.6. Evaluation of the Outcomes

To assess how this model of interactive and collaborative cross-discipline and cross-institution learning experience worked out, all the three groups of students (a total of 54) were given the evaluation surveys after the experiment, and the results are shown in Table 1.

What becomes interesting is that most of the questions got a relatively high score showing high satisfaction in all groups with the exception of question 2, which is about the organization of the

discussion platform. This was expected from the first session when it was found that the core problem with this online technology is the flexibility for multiple questions to appear simultaneously in different places on the online whiteboard which works as a double-edged sword for the students. Nevertheless, it came as a surprise to the teaching team that because of this problem, it stimulated and appealed to the self-discipline nature of the students such that after the chaotic round one discussion, the students themselves came up with a controlled environment within which they could interact more effectively and orderly. This turned out to be very effective in the subsequent discussions. For SCUT-CM students, even though when they joined in the second semester, this controlled discussion format had already been in place, the relative dissatisfaction on the organization of the studio discussion might be due to the fact that they were not familiar with such student-led discussion forum. In fact, during the process, they had more than once made request for the exact questions to be sent to them beforehand and discussion to be entirely limited to these questions, to which the facilitator explained that it would defeat the purpose studio pedagogy.

**Table1.** Student evaluation outcomes of Studio-without-borders

Questions	LAW			SURV			SCUT -CM			ALL		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
1. I was clear about the interdisciplinary and collaborative expectations of the studio.	19	3.75	0.687	23	4.17	0.65	12	4	0.74	54	4.01	0.68
2. The discussion platform was organised in a way that helped me achieve its learning outcomes of interdisciplinary and collaborative learning.	19	3.53	1.01	23	3.82	0.57	12	3.15	0.62	54	3.70	0.79
3. I was able to develop lifelong learning skills (research, communication, collaboration, teamwork etc).	19	3.95	0.71	23	4.04	0.77	12	3.83	0.72	54	3.96	0.73
4. I was able to learn new professional and/or academic knowledge beyond my own curriculum.	19	4.32	0.82	23	4.30	0.76	12	3.92	1.08	54	4.22	0.86
5. The interaction with other students (especially those from the other faculty) was both academically and socially intriguing.	19	4.05	1.17	23	4.34	0.57	12	3.67	0.89	54	4.09	0.9
6. I feel that I now understand my professional and/or academic field better from a different perspective.	19	4.1	0.74	23	4.12	0.58	12	3.92	0.90	54	4.09	0.7
7. The studio	19	3.84	1.01	23	4.17	0.65	12	4.0	0.85	54	4.02	0.84

inspired me to pursue further learning and/or research in my own professional and/or academic field.													
8. Overall, the studio was effective in enriching my learning experience in an interdisciplinary environment.	19	4.3	0.89	23	4.4	0.5	12	4.2	0.9	54	4.3	0.75	

In general, the analysis also shows that with the assistance of teaching technology, this experiment achieved the two main objectives of allowing students to understand academic and professional knowledge in other curricula in a more time-effective way(question 4), and of enriching their learning experience in an interdisciplinary environment via a virtual platform(question 8). Interestingly, SCUT-CM students were relatively less satisfied with the outcomes than SURV and LAW students. One reason to explain this outcome is that both SURV and LAW students participated in both stages of the experiment, and they had grown accustomed to the momentum of the platform. As students became more familiar with the platform, they enjoyed more the learning environment created. On the other hand, SCUT-CM students only participated in one semester. In the future research, we can empirically prove this hypothesis with a longer time span of experiment.

### 3. CONCLUSION

Problem-solving skill has become more and more important in modern days as a core learning outcome in almost all academic programmes. Problem-solving skills are much preferred than solely technical skills as the former are multi-angled and multi-layered. More and more multi-national mega corporations are looking for new recruits not just from specialized undergraduate programmes in the universities. Students who are well-trained in problem-solving skills are well-adapted in the logical thinking process of identifying the problem, followed by general as well as focused research and then analysis of various solution options before coming to the final recommendation for their employer. One way to enhance this problem-solving skills is to allow students to have maximum exposure to international knowledge and practices, so that they can explore as many options as possible when facing problems.

Conventional teaching in professional courses such as real estate requires direct classroom teaching or small group tutorial discussions where the teaching staff can interact with students physically to convey the necessary knowledge, and to understand how students are absorbing the information. This is even so with innovative teaching pedagogy such as flipped classroom approach where at the end, physical contacts between the teaching team and the students are necessary. Our experiment illustrated in this paper shows that with the help of technologically innovative online system such as the Realtimeboard, such constraints of physical contacts can be circumvented. An online interactive discussion platform adopted in our Studio-without-borders project allowclassroom teachings and group discussions with students in real estate education to transcend the normal confinement of timetabling issue of getting all students together at the same time in the same place. More importantly, it allows teaching arrangements to be made more effectively and with a higher degree of flexibility evenduring holiday break when students leave the campus, if such timing is necessary and essential. More importantly, our study shows that applying technology in building up an interactive discussion platform makes cross-city inter-institution and inter-discipline collaboration more easily and effectively. Without the hurdle of coordinating timetable clashes and meeting arrangements, this online interactive and collaborative platform provides a flexible discussion forum on which students from different discipline or city can join together in their most comfortable way at the prescribed time of meeting. In our experiment, because of the tight class schedule, students in Phase One actually met when they were all having lunch in their own way while discussing with the team. The facilitator monitored the whole discussion and steered them into property direction while he is also having his own lunch in his own office! Such flexibility is a luxury only because of this virtual environment

created by technology. Our student evaluation shows that students did enjoy this experiment and acknowledge wonderful inter-disciplinary learning experience.

Technology advancement in educational field therefore should concentrate more on creating a flexible learning environment in terms of teaching and discussion arrangements so that more innovative pedagogies can build on this environment. This will enhance the learning outcomes of not just the existing curricula, but increase the feasibility of more interactive and collaborative design of cross-institution and inter-disciplinary programmes to capture the collective knowledge of expertise in different academic fields over different institutions and even cities, and this will make higher education more globalized and internationalized in the future.

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