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Table of Contents

On Campus Support and Satisfaction of International Students: A Review of Japanese Literature

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Abstract
Japanese universities are popular destinations for international students. A lot of efforts have been made to provide supporting services and activities to international students such as Japanese classes, counseling and consultation, job hunting and career education, exchange events, summer school, culture experience tours etc. These activities bring satisfaction to international students, which is contributed indirectly as a pulling factor for attracting international students into Japan. However, little has been known about the approaches used by different universities for supporting international students as not many reports are published in English regarding this topic. This study investigates the variety of on campus supporting services and activities provided to international students in Japanese universities and satisfaction of international students as recipients of these services. The literature for review was mainly collected from Japanese sources using Google Scholar. Data was reviewed qualitatively by comparative analysis, comparing approaches applied by different universities with regards to the elements of 300,000 international students plan and other pull factors. The results showed specific approaches, results in providing campus supporting services by different institutions. The results also imply obstacles and potential solutions to the Japanese universities to attract international students.

Keywords: Study in Japan, International Student, On Campus Support, Pull Factors, Satisfaction

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Introduction

Until before the outbreak of COVID-19 pandemic, the number of international students studying in Japan, especially students who come from Asia, has increased drastically, making it one of the top host countries in the world. In 2021, Japan was ranked the 8th top host country of international students, with 218,783 students enrolled in undergraduate, graduate and non-degree courses at its higher education institutions (HEIs) (IIE, 2021). As the host of international students, the HEIs in Japan have put a huge number of efforts to prepare the infrastructure, human resources, and managerial system for better supporting international students to enjoy their study in Japan. The international students' policies of Japan are strongly government-driven (Lassegard, 2016) with approval and implementation of national-scale programs. To name a few, it should mention the "Plan for 300,000 international students" to be achieved in 2020, considered as a part of a global strategy for increasing global competitiveness of Japan and cultivating global human resources of domestic students. The Global 30 is also a major government project aims to internationalize higher education of Japan, investing in a selected 13 member universities to take the lead. This project was succeeded by the Top Global University project since 2014, supporting 37 leading universities to reforms for becoming the world and national leaders in education and research (Takagi, 2016; Tran & Jin, 2021). The reforms made by these flag-ship universities could be seen as lessons to the other universities to plan their campus internationalization.

As specified by the Plan for 300,000 international students, the globalization of Japanese universities could be realized by promoting study in Japan by activities such as Japan study fairs abroad or establishing foreign offices. Then comes the facilitation of the recruitment process such as promoting admission by EJU, facilitate procedures for acceptance and arrival of students. The campus then to be transformed for a global image with more foreign staff and English-tough courses. Then providing supportive environment to support campus life of international students. Finally, the international students can get employment in Japan as the final products of higher education. For the concepts, we simplified the MEXT's outline into the conceptual framework in Figure 1 (MEXT, 2008).

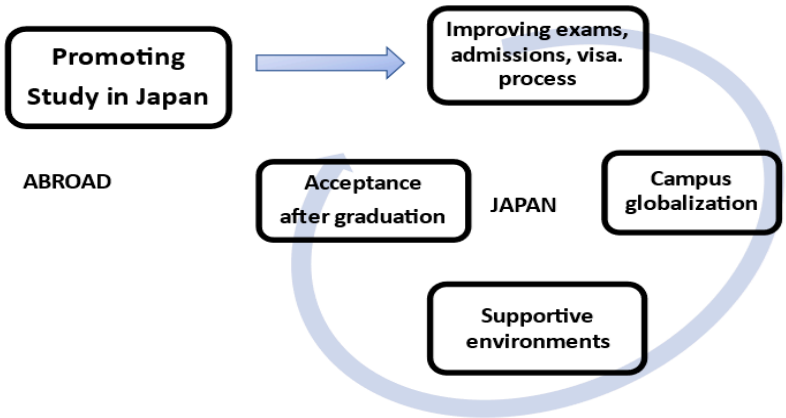

Figure 1: Attracting international students according to the Plan for 300,000 international students (drawn and simplified by the authors)

It was reported that for maintaining competitiveness, universities should deliver their services very well for satisfying their students, as the satisfied students will help to attract more potential students to the respective university (Arambewela & Hall, 1994). Students' satisfaction may come not only from academic achievements, but also from how they could enjoy the campus life apart from their study. It was reported that satisfaction of campus life

and the studying abroad outcome may be strongly related to the level of support the international students received. Moreover, in case of international students who have different cultural background, their satisfaction is not only depends on how good the university's services are provided, but also depends on how they adjust to the new environment (Hamzah & Abdullah, 2017). Therefore, supportive environments may not mean merely delivering services, but it also includes helping international to adjust well to the settings.

In our previous study, we investigated the pull factors that attract international students to Japan (Tran & Jin, 2021). There is still little understanding about the connection between the support services provided to international students and the pull factors that make international students to choose a particular university in Japan. In this paper, we pay attention on the supportive environments to international students in Japan as specified in Figure 1. In this context, the supportive environments mean the service systems and initiatives of a particular HEI to provide support to international students during their campus life. In Figure 2, we suggested a conceptual framework that we could use to systematically look for evidence from the available literature. By looking at the evidence from different perspectives, we may understand more about the challenges, potential solutions, and implications for better providing services for international students.

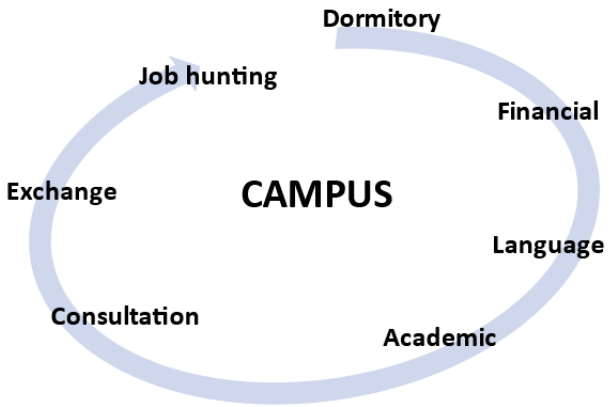

Figure 2: On campus support for international students (proposed by the authors)

Method

We investigated the facts related to on campus support to international students from available literature. The literature search was conducted by Google Scholar as well as by other search engines. The search ranged mainly from 2000 to present. We did a literature review from documents, publications and reports published in Japanese language by Japan's public institutions, research institutions as well as public media, new articles, study abroad forums and other internet sources. We found a huge number of papers by the keywords selected. Then we selected the papers that have full text that met our needs.

Results

Services provided to international students vary by every site, but they may share some common features for being a Japanese university. A study conducted at Kanazawa University on the satisfaction of international graduate students was shown that regarding academic and research life, 48% answered "satisfied", while 11% of the respondents answered, "somewhat dissatisfied" or "dissatisfied". Regarding the international student service, 41% choose

"satisfied". Some respondents reflected that it was difficult to receive services such as information, events, and dormitory for international students. When talking about "international student services" some students may think about something more general, such as closeness of the relationship with the academic advisor (Kishida, 2004).

Dormitory

Dormitory is the first place that a university could offer to newly enrolled international students, who have little experience of Japan. Basically, most of the universities provide some limited number of dormitory rooms for arriving international students. Dormitories could be international student-only, female-only, or mixed types. Based on room availability, students may be allowed to stay only for the first year or longer. Living in dormitory offers some advantages such as cost-effectiveness and convenience. Although ensuring dormitory for international students has long been an issue, little has been reported about the situation.

Shared house was one of the schemes aiming to increase cross-cultural experience among international and Japanese students in a mixed type of dormitory. Okayama University, a national university placed among the Top Global Universities group, operates share house dormitory since 2016 (Uzuka et al., 2018). The lead role played by Japanese students in daily problem solving. In addition to giving detailed guidance and advice, the university's vision to utilize dormitories as educational resources was emphasized with an aim to foster Japanese students for the new role. In this environment, international students grow from a resident to a sense of autonomy, gain understanding of Japan, Japanese culture, and cross-culturalism.

Resident Assistant (RA) system is another scheme utilized for promoting autonomy of students living in dormitory. At Ritsmeikan APU, a private university with over 3000 international students, the international house host about a half of the international students, while a major of the residents are first year student. For RA system, experienced students are recruited, trained for helping to manage dormitory. In 2018, 83% respondents reported that they could deepen their multicultural understanding, had friends from over five 5 countries, and 90% satisfied of dormitory (Tsujii, 2000). In Shizuoka University, a national university, international students appraised the advantages of living in International House such as having furniture, can move in before admission, can cook, and has a manager. However, it was reported that very few students choose living in a shared unit with multiple people, as long as single rooms are available (Matsuda, 2021). Regarding satisfaction about living in dormitory, a report from Konan University, a private university showed 48% "satisfied", 23% "very satisfied", in total 71%. However, this satisfaction rate was lower than staying in homestay (T. Harada, 2012).

Providing on campus ethnic food is also considered a part of the services. There are about 10,000 Islamic international students, mainly come from Indonesia, Malaysia, Bangladesh, Saudi Arabia, Turkey (JASSO, 2019), who have specific needs in terms of foods and praying. It was reported about efforts put in providing halal foods, as well as arranging the time and place for praying as part of the efforts to enhance the interaction with Muslim students at Yamaguchi university (Nakano & Tanaka, 2017). Since 2014, Doshisha University as well as the other Top Global Universities were reported to start introducing halal foods in the COOP (Abe, 2019). However, in some instances, it seemed that for economic reasons, religious reasons, self-catering and alternate cooking are the most common among international students, as observed at Shizuoka university (Matsuda, 2021).

Scholarship

From economic perspective, for students in neighboring countries, study in Japan is becoming more and more affordable while domestic education becomes more expensive, which may drive more students to choose study in Japan. In near past, high living cost is the biggest challenge of self-funded students in Japan (Fujii & Masami, 2003). However, recently, a smaller number of international students perceived a high living cost, and economic situation of international students seems improved, as number of international students need counseling on financial problems is declining. A study conducted at Okayama university in 17 years has shown that among 465 cases who came for consultation, 255 international students had complained about having financial problems, while 193 of them complained of constant living difficulties such as admission fee exemption, tuition exemption, and scholarship (Oka, 2018).

In accepting international students, the scholarship system plays a major role as part of the strategy. Japan is well known for its generous variety scholarship for international students (JASSO, 2022). Besides the famous MEXT-type scholarship (Huang, 2016), international students could apply for many public-funded scholarship schemes such as JDS (for young officials from developing countries), JICA (under various schemes), Japan-Korean scholarship (for Korean students in science), JSPS (for Ph.D. or postdoctoral study), EPA (for nurses from Indonesia, Philippines, Vietnam) etc. Basically, only a few scholarships, such as MEXT, cover full costs of study; most aim to cover just a portion of the student's living expenses and/or tuition fees. Furthermore, while some scholarships scholarship can be applied before actual arrival in Japan, most of the scholarship are open for application only after the students being enrolled. As most international students come to Japan as self-funded students, the private organization scholarships and on-campus scholarships are very important. With government's policy, number of international students received scholarships and covered their expenses with scholarships increased, and the number of respondents claimed about "I had difficulty finding a good place to live" decreased (Y. Sato, 2010). Some localities implement policy of giving scholarship to students for regional revitalization (Funyu & Watanabe, 2019). Although improvement, there are some criticisms about the system of scholarships for self-funded international students has not changed radically since the 80'. This delay in reforms may put Japan at a disadvantage in the competition for human resources (Zhu & Takahashi, 2016). The status of receiving scholarship also influence the satisfaction of students. It was reported that students who had made efforts to apply for scholarship but could not get it could experience dissatisfaction and some sense of injustice (Maki, 2006).

Tuition exemption system is another support scheme for international students in Japan, while most of whom are self-funded students from Asia, who are qualified for a full or a half tuition exemption depending on their income status (Yasue, 2018). In case of public university, the tuition in Japan is relatively high at about US$5000 (Huang, 2016), but the self-funded international students usually can get a half of the tuition fee exempted, which is in some case is still being perceived high for some students from abroad who may have intention to go to Japan (Morita, 2020). A survey revealed that Bulgarian students hope to get MEXT scholarship for study in Japan, but they may not go self-funded to Japan (Tran & Marinova, 2020).

Japanese Language Education

Interest in learning Japanese is increasing over the world. International students are often motivated to learn Japanese priorly to their actual arrival in Japan. A study in university students in China had specified some motivation factors for learning Japanese such as "for study in Japan, interesting in language learning, for job hunting, for self-esteem, Japanese pop culture, knowing about Japan" (Guo & Quan, 2006). However, students studying Japanese abroad often face difficulties in later stage, which eventually decreased motivation. In a study in Ukraine, students shown various patterns of motivation in learning Japanese including for study or employment in Japan which decreased over the time (Onishi, 2010). Similarly, a study in Thailand, data have shown some learners have difficulty catching up with Japanese, and even if they have a high motivation to learn at the beginning, their enthusiasm may decrease. In addition, there are some learners whose motivation to learn decreases as the learning period becomes longer (Consatler, 2021).

After arrival in Japan, basically, most of international students in Japan enjoy some sort of Japanese language courses provided free-of-charge by the host university. General Japanese language class are being provided at all levels of proficiency, from beginner class to advanced class (Hashimoto, 2017), in addition to some special purpose classes such as kanji, medical Japanese, business Japanese, Japanese for job hunting. Besides general Japanese courses, the intensive Japanese is being provided in a preparatory course to students who expected to enroll in a degree course. Motivation for studying Japanese after arrival is usually high, even for students who enrolled in English-tough programs or graduate students who can use English for doing research at laboratory. A review of 30 papers has shown that although these students may not need to study Japanese, they still want to study Japanese (Takahashi & Hirayama, 2014). At more advanced level, it was reported that Academic Japanese using task-based language teaching (TBLT), or classes for accomplishing the tasks of writing reports and giving presentations in Japanese were given in Japanese courses for international students in the first year of the undergraduate program (Okuyama, 2020).

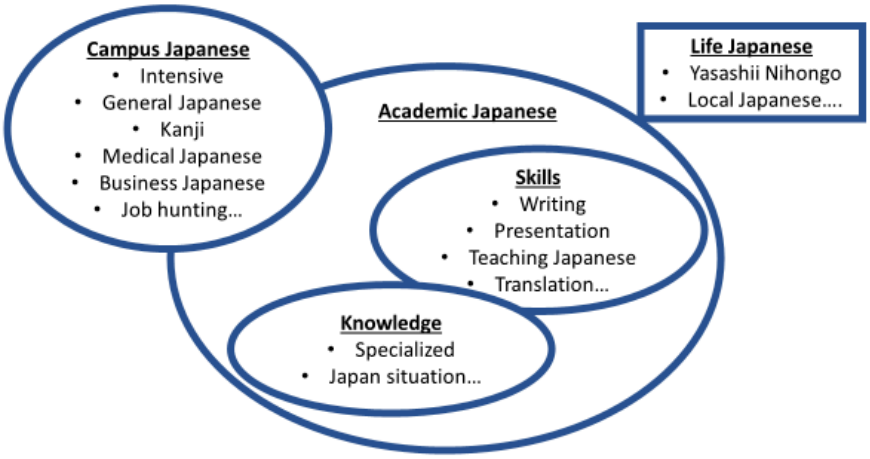

Figure 3: Japanese language education for international students

Sometimes, students also enjoy Japanese classes tough by teachers or organizations outside campus, or classes using adapted materials for disaster prevention such as simple Japanese (yasashii nihongo), which was thrived as a universal language during disasters after Kobe earthquake 1995 (Sugiyama, 2019). In local settings, to help international students to integrate with local life, it was reported that local Japanese learning materials for international students in Sendai city at A1/A2 level was used to help them become familiar

with Sendai, and to have a more active life (Hotta & Sugaya, 2017). Figure 3 summarizes the types of Japanese courses or learning contents that international students can join during their time in Japan inside or outside the campus, based on the concept by Horii (Horii, 2002).

Besides providing Japanese classes, autonomous learning is encouraged at some sites. An example is the International Student Support System at Waseda University, which aims to create a personal learning environment in which all international students can realize autonomous Japanese learning by self-accessing Japanese language learning resources. The International Student Support System is challenging to open up new learning opportunities for international students outside the classroom (Kuroda, 2012).

Academic Support and Tutor System

Usually, academic supervisors are responsible for the international students during their graduate study. In case of undergraduate students, this responsibility could be beard by the faculty head. At some universities, international students are assigned in pairs with Japanese students for group activities. It was found that this initiative, which started with the improvement of the Japanese language ability of international students, has had a positive effect on Japanese students from the perspective of international understanding (Qiu, 2020).

In some cases, tutor system is used to facilitate the job of the academic supervisor as well as to promote cross cultural mindset of the students. Ideally, one of the reasons for the existence of the tutor / international student system is to expand opportunities for communication with other students. And it can be of great benefit to both international students and tutors. Specifically, international students will be able to meet more Japanese people through tutors, and Japanese people will also be able to make more international friends with her. In some cases, especially if the international student does not speak Japanese, the tutor's presence is invaluable, as the tutor is the only Japanese acquaintance to the international students. Tutor activities include "cross-cultural understanding and building relationships", "promotion of interest in language", and "approach to self-study", "reflection on teaching methods" (Tanaka & Wataru, 2019). Tutors are Japanese students assigned to support international students in their daily lives in Japan in tasks such as filling out paperwork, guiding on campus, help with housing decisions, and giving advice and explanations when needed. Tutors also help international students with their academic tasks such as practicing Japanese, doing homework, and preparing for tests and presentations. In a study about the relationship between tutors and international students at Akita University, some international student may show a positive or a negative reaction regardless of their language ability. This showed that achieving human relationship is not so easy, even with high language skills, interaction, and good intentions. The relationship between tutors and international students does not always seem to be good. Understanding each other and gaining insights into other cultures needs a mutual effort. It can be achieved with proper attitude and by adapting well to the other party with compassion. Sometimes it is difficult to develop such a relationship into a natural friendship (Ioana, 2019).

Consultation and Counseling

University students in Japan, as anywhere in the world, face many challenges during their campus life, including stress. Studies had shown that factors related to acculturative stress among Asian international students are being female, stay length 2-3 years in Japan, studying in vocational school, self-funded student, low Japanese proficiency (Park, 2012), age (Nguyen et al., 2019). How international students can cope with stress during their studying

abroad has been in the focus of many studies. In Japan, consultation and counseling services for international students are part of the internationalization, which is considered an important task of the university. At Hokkaido university, the counseling service is provided by a special unit – the Institute for International Collaboration (IIC), including individual counseling, crisis services, group work, and psychoeducational programs to international students and scholars. It also provides consultation and training for the faculty and staff to support international students. Most frequent issues raised in individual counseling were psychological, mental health, academic career, interpersonal problems (Ishii, 2019). Most of the universities provide similar services to international students and supporting staff.

Since 2020, university students in Japan, including international students are exposed to the impacts of COVID-19 pandemic (Kondo, 2020). With unprecedented transformation of higher education, we have observed international students to become prone to the impacts of the pandemic in terms of physical and mental health (Chen et al., 2021). A study has shown that international students are worrying about their career (advancement / employment), education (cannot keep up with online classes, etc.), lack of communication with friends and seniors, shortage of income (no money), poor physical and mental conditions, can't visit home country temporarily (Ozaki & Kuno, 2021). So far, institutions and organizations in Japan have designed and implemented numerous schemes for supporting international students in Japan to cope with COVID-19, including providing daily life support, consultation, information (Nishiura, 2021). It has been reported that international students need more life skills and enhancing the activities experience of international students studying in Japan would lead to improved life skills (Chen et al., 2021). During the pandemic, international students experience impacts on their study and daily life, and therefore adjusted their social network into online (Murata, 2022). Universities also adapt to this situation and provide online, phone, e-mail consultation services during the lockdown periods. The impacts of the pandemic on counseling and communication with international students may urge for new measures for crisis situation (Nishiura, 2021). Stress Coping Seminar was an initiative model for supporting international students to strengthen their mental health status and increasing their motivation in the prolonged pandemic period. These seminars were designed for students to learn simple skills that could help them to cope with various stresses. These seminars are potentially to be an effective strategy, in addition to individual counseling and other activities, to improving stress resilience of international students for long term (Inosaki et al., 2022).

Exchange Activities and Culture Experience

In recent years, many students have become attracted to Japanese culture and decided to study abroad in Japan. Many international students are interested in Japanese subcultures such as anime, manga and cosplay, they are also interested in traditional cultural properties such as tea ceremonies and calligraphy, and other cultural properties such as Japanese architecture (Baba, 2021). People study Japanese because they are interested in manga, anime, J-Pop, history, literature, culture, sightseeing (Japan Foundation, 2012). Among international students who already enrolled, Japan has an image of easy life, anime, Sakura, beautiful house, politeness, cuteness (Yang & Yasuhisa, 2019). In order to meet the needs of international students in experiencing Japanese culture, universities provide various services such as cultural tour, industrial tour, disaster prevention tour, by which students can visit famous sites, temples, shrines, factories, museums, hot springs, disaster centers at no fee. These tours also create a chance for multicultural exchange among international students and sometimes with Japanese students. Students reported to learn a lot from these cultural tours

and the tours can trigger their motivation to learn about Japanese culture (Tran & Jin, 2019). For conducting events such as kimono festival, tea ceremony, calligraphy, it needs to establish volunteer groups with necessary know-how for conducting the events (Kumai, 2021).

Countryside of Japan are rich of nature and tradition but need human resources for revitalization. Studies have shown that foreign residents enjoy more exchange activities, human relations, and Japanese learning in rural areas, however there are also inconveniences such as transportation (Fukada, 2019). Recently in countryside, Japanese people became more active in leaning diversified foreign languages and cultures, while providing community support to foreigners in Japanese language, culture exchange, disaster, job hunting (Tran & Matsuura, 2020). Exchange activities with local people such as homestay is highly appreciated by international students. Short-term students tend to be more eager in experiencing Japanese culture. It was reported that 86% short-term foreign students hosted by Konan university satisfied with homestay, evaluated their homestay as an opportunity to learn intercultural understanding and intercultural adaptation and participate in a warm and kind family environment, to communicate in Japanese and to understand culture (N. Harada, 2012). A report from short term Eastern Europe international students has shown that Japanese students may not be interested in foreigners, but their attitude changed afterwards. Japanese people seem reluctant to interact with foreigners but become very kind to foreigners when they are in trouble (An, 2018).

During COVID-19 pandemic, many universities conducted international exchange activities online. However, these events are mainly targeting students joining online study abroad programs with foreign university partners. Involving international students in online exchange events seems still a challenging task.

Job Hunting Support

The need of international students about for job hunting is on an increasing trend. In 2017, 63.6% of international students wanted an employment in Japan, but only 30.1% found job (JASSO 2017). Various measures are being implemented to support international students to find employment in Japan. Since 2016, the program for promoting employment of international students has been implemented in 12 universities, aiming at increasing the employment rate of international students in Japan from the current 30% to 50% (MEXT, 2017).

Business Japanese class is considered as an important part of job-hunting support (Horii, 2013), as it was introduced in "Asia Human Resources Fund" in 2007 and in "300,000 Plan" in 2008 to promote the employment in Japan needs to be revised (Kame 2019). According to a survey, international students want to learn about honorifics, knowledge about business operations and practical things for job hunting (Fukutomi & Sato, 2019). Some universities provide comprehensive career program support as a package to international students from the 1st year to the last academic year, including business Japanese courses, business and industry know-how courses, guidance sessions, internship, on campus job fair, a typical example of such a program is the program of Ritsumeikan APU (T. Sato et al., 2014). For job hunting in Japan, the highest hurdle seems to be the Japanese proficiency needed for getting an employment, regardless of the technical skills students may possess. Job hunting support program needs to start intervention as early as possible. In Figure 4, we propose a framework for job hunting support that already implemented fully or partly by many universities. This

support continues from the first to the last academic year and will cover all language, communication, business skills as well as job hunting skills and information needed.

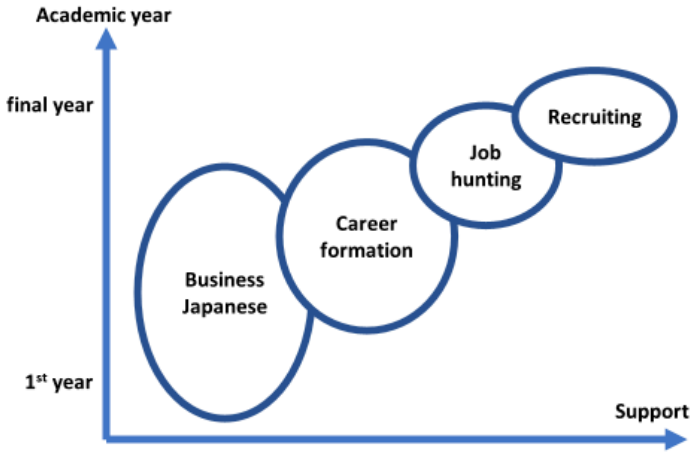

Figure 4: Job hunting support framework (drawn by the authors)

Previous studies reported some of the challenges that international students may face when working at Japanese companies such as gaps in cross-cultural understanding, discomfort when working for a Japanese company, dissatisfaction with complicated recruitment process, not considering the previous experience, abilities and job expertise (Moriya, 2012). For job hunting, social support from local communities to international students has become an important factor for promoting job-seeking intention of international students. Studies have shown that who succeeded in employment had won the social support and they were able to hunt job similarly as Japanese students (Fujimoto et al., 2014). There is an increasing trend of job hunting in Japan 35% of the respondents have found job in Japan in 2017 compared to 25.2% in 2010. However, most of the graduated students have found job in metropolitan areas. This fact shows a need for supporting employment at rural areas to international students.

Students also have a choice to work for a Japanese company at their home country. A boom of Japan investment and Japan-owned companies has led to higher chance for employing student-returnees with higher salaries (Hirasawa, 2019). The open economic market in foreign countries brings better economic conditions for returnees.

Conclusion

The quality of education in Japan is not only including the high level of training and research at the campus but it also encompasses the on campus supporting services. Enormous efforts have been made to provide supporting services and activities to international students such as Japanese classes, counseling and consultation, job hunting and career education, exchange events, summer school, culture experience tours etc. These activities bring satisfaction to international students, which is contributed indirectly as a pulling factor for attracting international students into Japan. Our findings include a review of approaches and cases used by different universities for supporting international students. We looked at the variety of on campus supporting services and activities provided to international students in Japanese universities, satisfaction of international students as recipients of these services, as well as gaps, difficulties and challenges that Japanese universities need to consider in the future in order to provider better supporting services to international students in Japan.

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STEM Interest Among Rural Youth in an Informal Program

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Abstract
In order to develop science, technology, engineering, and math (STEM) knowledge and solutions that address global concerns, there is a need to develop pathways to strengthen STEM interest among rural youth, especially girls. Previous research suggests that informal STEM programs can stimulate participant interest due to the absence of pressures from external assessment (Rogoff, et al, 2016). However, little is known about which instructional methods in an informal STEM program focused on place-conscious programming in a rural community will support the development of youth STEM interest. The purpose of this study was to examine the impact of three instructional methods (hands-on, role models, and culminating projects) on STEM interest development for rural youth, ages eight to twelve, in an informal place-conscious STEM program. Data were collected through observations, focus group interviews, and STEM interest surveys. Participants included youth (N=31) in grades 3rd through 5th grades attending two local schools in one rural community. Results indicated STEM interest increased through collaborative work, new knowledge, and action research. Results also showed gender differences in STEM interest development. Girls' STEM interest (n=16) was heightened through seeing the personal relevance to their community, whereas boys' STEM interest (n=14) was heightened through actively working together. This study contributes to the empirical literature regarding STEM interest, informal education, and instructional methods for rural youth. Recommendations are made for future studies.

Keywords: Place-Conscious Pedagogy, Informal Education, STEM Interest, Rural, Instructional Methods, Gender Differences

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Introduction

This study proposes an answer to the worldwide issue of developing Science, Technology, Engineering, and Math (STEM) solutions to current and future issues. The focus is on developing interest in STEM through informal programming for youth. This study's youth participants were eight to 12 years of age. It was speculated that the youth of this age group would be more likely not to have developed peer groups and, therefore, more malleable in developing STEM interests that may be sustained throughout their academic journey. Additionally, rural areas were selected due to the underwhelming financial support these areas typically receive from dominant out-of-school time (OST) programs. Furthermore, a focus on gender differences was examined due to the unequal distribution of STEM career development in our current society.

Pilot Work

Qualitative community pilot interviews were conducted alongside a review of forward-facing documents to identify STEM issues in rural communities that need resolutions and are of importance. This qualitative research was based on a participatory-based research methodology. Key rural community members were identified through convenience sampling. Conversations were recorded, transcribed, and analyzed for codes, categories, and themes. These were triangulated with state legislative primer topics for the upcoming year. The data was viewed with a lens based on the Cultural Learning Pathways Framework (Bricker & Bell, 2014). The issues were evaluated based on places, positions, and actions important to communities. The identified STEM issues were utilized to inform the curriculum development of an informal rural program. The data revealed an overarching theme of Climate Change. Climate Change was categorized by discussion around water and the issues of flood, drought, and wildfires. The issues selected for curriculum development were based on STEM relevance to their possible solutions.

Climate Change was central to discussions, but other issues were also noted. A primary concern was the sustainability of rural communities. Each interview revealed additional concerns about the retention of the population. Specifically, youth outmigration from rural communities was a concern. It was considered that youth involved in learning about STEM solutions based on their community might generate maintained interest (Hidi & Renninger, 2006). The approach to solve this issue was a place-conscious curriculum design (Greunewald, 2003).

Problem

An informal STEM curriculum was developed alongside local university scientists following the pilot work that identified STEM issues. These original curriculum units were focused on engineering around water, temperature data related to wildfires, and planting geography based on water sources. The lesson outlines were based on Gruenewald's (2003) place-conscious design principles. Place-conscious design differs from place-based by considering other sociological factors essential to a place other than location. These factors include socioeconomic, political, and cultural influences. The lessons developed were focused on natural history, cultural journalism, and action research.

Place-Conscious Curriculum Framework

In the development of each curriculum unit, each lesson was focused on the three topics outlined by Greenwood. For the natural history lesson, the purpose is to provide "firsthand experience with the living world outside the classroom" (Gruenewald, 2003). Participants are oriented to the community through a question series based on the STEM topic. Another lesson focuses on cultural journalism. The lesson's objective is accomplished by inviting local community members or role models to their space. The participants are provided a space to ask questions to gain insight into their community and their interaction with the STEM topic. The final lesson is based on action research. Action research provides the opportunity for participants to take action about the STEM topic based on their newly acquired knowledge. Gruenewald's purpose for action research was to provide space to "potential engage teachers and students as problem solvers and place-makers" (2003, p. 640).

Solution

In order to incorporate place-conscious design into an informal program, attention was given to proven instructional methods. These instructional methods were then purposefully coupled with each place-conscious method to gain an enhanced methodology for increasing STEM interest in rural youth. The instructional methods that demonstrated the highest potential were hands-on, role models, and culminating projects.

The hands-on lesson was intertwined with the natural history of the community. The lesson developed engaged participants in recalling where they saw water being moved in their community. Participants should be encouraged to take notes during the lesson. Following the opening discussion, bags of PVC pieces are handed out. A challenge is presented in an inquiry-based approach to building a water pump. Participants are provided a bag of precut PVC parts and a video on how to assemble a pump. No other instruction was provided, only the challenge of building the pump to move water from one five-gallon bucket to another. The participants are allowed to watch the video as many times as they want, encouraged to take notes, and given minimal troubleshooting tips from the facilitator. The main problem is examining the valve and positioning it in the correct orientation. In groups of three, youth work together to pump water from one bucket to another. Afterward, participants are invited to document any other notes they may have.

The role model lesson was designed in alignment with cultural journalism. The researcher identifies and invites local community members with STEM topic knowledge to speak to the group. This session is intended to be more of a dialogue than a presentation of knowledge. Participants are provided pre-written interview questions to ask the invited community members. Community members are provided some training on interacting and relating with youth to bridge the age gap and build comfortability. After introductions to the group, youth are invited to ask their pre-written question and any follow-up questions during the time. Youth are curious and will ask other questions as it occurs to them during the session. These questions are spontaneous and generate stimulating conversation. Youth are encouraged to take notes about what they learned or found interesting concerning the STEM topic. After the first two lessons, youth are invited to take local community pictures before the final lesson.

A culminating project is intended to bridge the previous lesson and provide an opening for action research. The culminating project allows the youth to express local rural knowledge

(Avery, 2013) and their thoughts and reflections on the hands-on experiences and community member discussions. With those thoughts, photos from the community they selected are added to their presentation. Some youth can submit photos for inclusion in the culminating project. The researcher takes some photos. The researcher/facilitator takes requests from the youth for subjects and locations they would like photos. Many youths do not have access to technology to take photos or a way to send them to be integrated into the submissions. Their ideas are incorporated into photo subjects by including youth in photo solicitation. During the culminating project session, draft poster templates in PowerPoint format are provided. The templates include writing heading prompts and space for photos. Youth fill in their interpretation of what they have learned during the program. They also articulate what they think others viewing the poster should know. School and sponsor logos area added during editing for appearance purposes. The extra-large (38-inch by 46-inch) posters are printed and delivered to the youth. See Image 1 for a sample poster.

In some cases, the posters will be displayed by sponsoring organizations. One local sponsor has proposed that the youth present their posters to local community members during a program focused on water. A presentation would be ideal for action research integration within the culminating project but was not within the scope of the current study.

Image 1: An example of a culminating project from the final lesson.

Interest Effects

Harackiewicz et al. (2016, p. 1) defined, “Interest is both a psychological state of attention and affect toward a particular object or topic, and an enduring predisposition to reengage over time.” All research questions examined interest effects based on each instructional method. The methodology was accomplished through qualitative methods of non-participant observations, focus group interviews, and self-report surveys. The findings were analyzed through deductive codes, attribute codes, and in vivo quotes. A priori qualitative codes were predetermined and used for observation protocol and coding focus group interview data.

The main findings for each instructional method are as follows. The hands-on instructional method’s central theme was based on opportunities for collaboration. One participant stated,

"Like sometimes we get things wrong and then it is like, oh, I got it right, you kind of feel like YAY!" The role model instructional method's central theme was based on discovering new community knowledge. A participant was noted, stating, "Yes, it's clean for animals now, OK, but it's not it's not cool for people. Well, it was farther down, people want that water farther down." The culminating project instructional method's central theme was determined to be action research, a component of the place-conscious framework. One participant states, "knowing that like the whole, like a lot of people could see it." The figure 1. below depicts the overlapping interest indicators by each instructional method and where all three show the same interest indicator.

STEM Interest Major Indicators

Figure 1: The Venn Diagram illustrates the overlap in major interest indicators for each instructional method.

STEM Interest Between Genders

It was also determined that boys (N=16) and girls (N=14) were affected differently. Boys were more interested in the instructional methods due to activity level, sociability, and group work. It was noted that boys wanted to work in groups and be actively engaged in each instructional method. They enjoyed the building, asking questions, and typing their posters. Girls were more interested in the instructional methods due to the personal relevance and awareness of the topic. The girls would make connections to their own experiences and personal knowledge of water. It was also noted that girls expressed they did not like when someone took over during group work and preferred autonomy to working in a group.

Significance and Recommendations

The significance of this study on educational research is essential. In this upper-elementary age group, youth, especially girls, have not been well represented in the literature. Most work in STEM education focuses on middle and high school grade levels. The significance of this study is that peer groups form during these years and could lead to STEM interest that is sustained throughout the middle and high school years. Therefore. One recommendation is for longitudinal studies to follow the more prolonged-term effects of programs such as these at earlier grade levels.

Additionally, the observation of interest could be improved. This study is one of the first interest non-participant observations made in the literature. More information from behavior analysts could improve future findings. The informal STEM program should be implemented in other rural communities, including reservations, to validate these findings further.

Conclusion

This research study examining STEM interest development through an informal place-conscious STEM program for rural youth demonstrates how three different instructional methods can facilitate STEM interest for upper elementary-aged youth and offers insights for differentiating instruction for gender. Specifically, boys were interested in actively interacting, and girls were interested through their awareness and personal relevance to the STEM content. These findings also indicate a desire expressed by younger participants to be actively involved with STEM lessons and not passively watching.

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Upskilling as an Internationally Recognized System of a Resilient Education Society

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Abstract
The objective of the research project is a comprehensive look at the international requirements of further education and its pain points in the age of digitalization. The Prior work of the upskilling survey serves the aspect that society is becoming more individualistic and less predictable in terms of educational opportunities. It is the biggest challenge in the organization of continuing education for adults to achieve their interest and benefits for larger target groups by taking into account their individual situations. The approach of the panel study series, which has been published annually since 2019, is based in its 2021 edition on a partially standardized questionnaire of 2000 participants, in which 10 countries were represented. Each European, African, Asian, or South American country participated with 200 respondents each. The results show that digitization is playing an increasing role in the acceptance of continuing education because nowadays teaching with flexible teaching via online teaching is the clear preference. The implications of this upskilling study are that a large proportion of respondents are looking for personal fulfillment as a basis for professional change. Not the primary perspective on job openings is relevant in education because skills and individualistic preferences lead to a change of sectors or a higher position being achieved. The value of the paper lies in the proof of the connection that remote-controlled and flexible continuing education courses are an opportunity to integrate personal and professional development into the everyday life of modern and individual society.

Keywords: Digitalization, Panel Study, Upskilling, Skills, Learning Preferences

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Introduction

For digital educational offers to have an effect as a contribution to current social changes, generational shifts must be understood. Changed self-understandings in dealing with the participation of the majority, self-determination of the individual but also technological entry into everyday life leads to new information acquisition and processing. Meta-shifts in today's world of work can be determined with the so-called "Society 5.0", which the Japanese government defines as follows: "A human-centered society that reconciles economic progress with the solution of social problems through a system that highly integrates cyberspace and physical space" (Cabinet Office, Government of Japan 2021).

The focus of social reform since the 2010s has been on innovation, so learning opportunities must be established "on demand" that support the increasingly demanded dynamic behavior towards new complex challenges in a practical way.

Methodologically, therefore, courses must be designed that focus on "domain-specific usable learning outcomes" through interactive design of learning progress. In this way, learning processes must be considered that are committed to the recognition of a shared responsibility of teaching-learning relationships. Partial achievements and learning successes or progress must be visually experienced for each learning objective and designed to be evaluated by learning analytics software. The in-service continuing education market is becoming more attractive from digital teaching through the points of flexibility and individualization of the learning and teaching offer (see Handtke, 2015).

Main Perspective

In the higher education of many democratic states, the goal of social added value can be found in research and teaching (see Berthold et al., 2009). This so-called "Third Mission" means that research and teaching should take place with socially relevant questions and, if possible, their inclusion at events. Another level of the interweaving of higher education and vocational training is the conception of innovative in-house continuing education as part of the survey and optimization of work processes.

Conceptual Basis

To support society's mission using technology with added value, it is like the task of local authorities to build digital infrastructures, to make data usage concepts and applications tangible with citizen participation. An educational mission can also be derived here by introducing the topic of intelligent data analysis and automated data preparation for improved decision-making. This concept of the "Smart City/Smart Region" in the municipal sector can be discussed to adapt it to the higher education sector due to the comparable intention. This assumed starting point of a "smart university" is to interpret the public mandate in such a way as to create added value of services via online services (see Schachtner, 2020).

The project priorities to be identified within the framework of public opinion formation on a municipal "digital agenda" offer the possibility of acquiring skills within the framework of an informal learning and participation format with different target groups.

Other socially relevant topics outside of digital aspects can also be accommodated in these formats, e.g., topics of sustainability or social change. In turn, research can also benefit from

this, as new target groups for empirical surveys are created. At the same time, a new strategic level of maturity of colleges and universities can be achieved, which is why the four core areas of the "Smart University" concept are presented below:

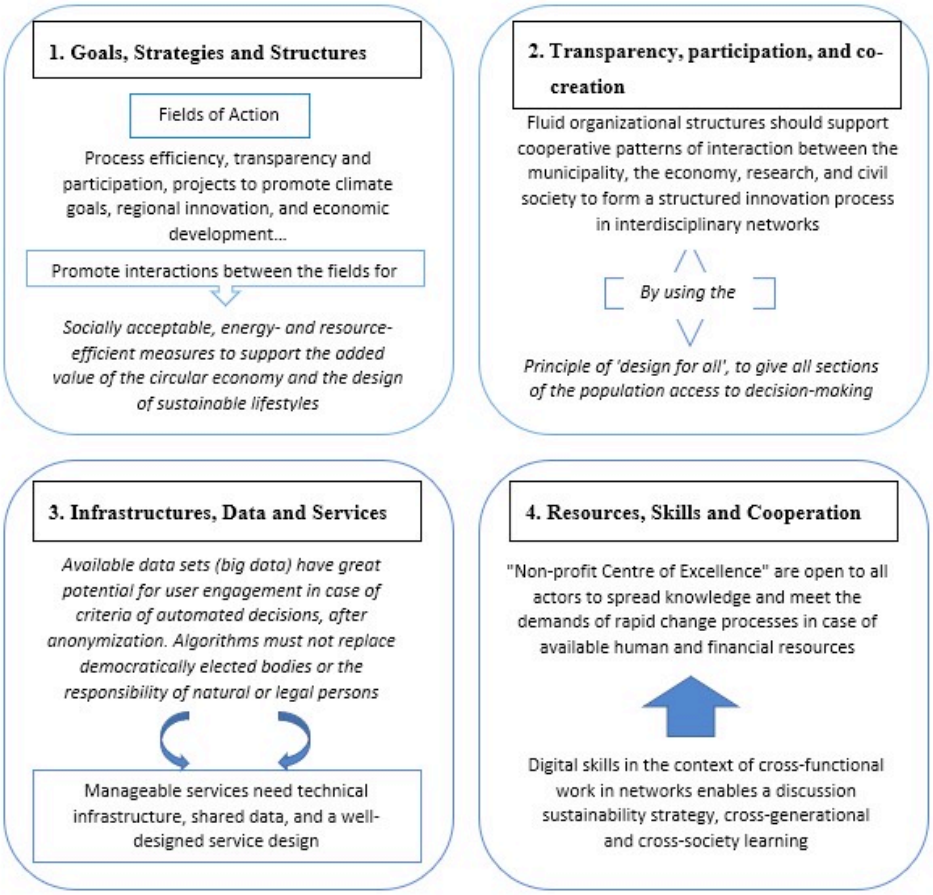

Figure 1: The Concept of the Smart University

In addition to application-oriented questions of the content orientation of the seminar concept based on the digital transformation, planning and decision-making processes about dealing with the neoliberal paradigm of the "human capital of the actors" (Stewart, 1999) can also be combined in a basic scientific orientation. In this respect, economic concepts can also be discussed for the internal control of public institutions such as lateral leadership or open innovation management and the learning needs of specialists and managers in public administration.

Research design

Based on the previous remarks, empirical consideration is based on a full-standardized, anonymous Online-Survey in the closed-question metric procedure. In this context the Chances in adult education should get identified with a comprehensive look for international requirements of future education and its pain post in the age of digitalisation.

The aim of the study is to show, what conditions of learning the business professionals are expecting of modern education. In this context, there may be several factors that are addressing the referencing of learning topics, learning formats, synchronous or asynchronous teaching, classroom- or online-teaching and so on. The focus of this work therefore is that the

participation in the main demanded courses is subject to restrictions under the given conditions. The period of collecting data for the survey was from 3rd June.2021 to 7th June 2021. The conclusion was published on the 14th of December 2021.

Data Sources

The Focus group of the survey was n=2.000. The study was internationally designed, so that different education systems were intended. Ten countries were included, each with at least 200 respondents. These were: Spain, Italy, France, Poland, India, Pakistan, Nigeria, South Africa, Brazil, and Mexico.

The research data collection group consists of scientifically educated adult professionals and is heterogeneous in terms of teaching experience, gender, and age. The sample was assembled of half of the participants in each country were male and half female. Their ages are evenly distributed over the range of 26 to 55 years. The target groups qualifications are varying in degrees and years of professional experience. Most respondents are in employment. There are also several self-employed people among the respondents (17.8%). The detailed group characteristic could be detected form the following chart:

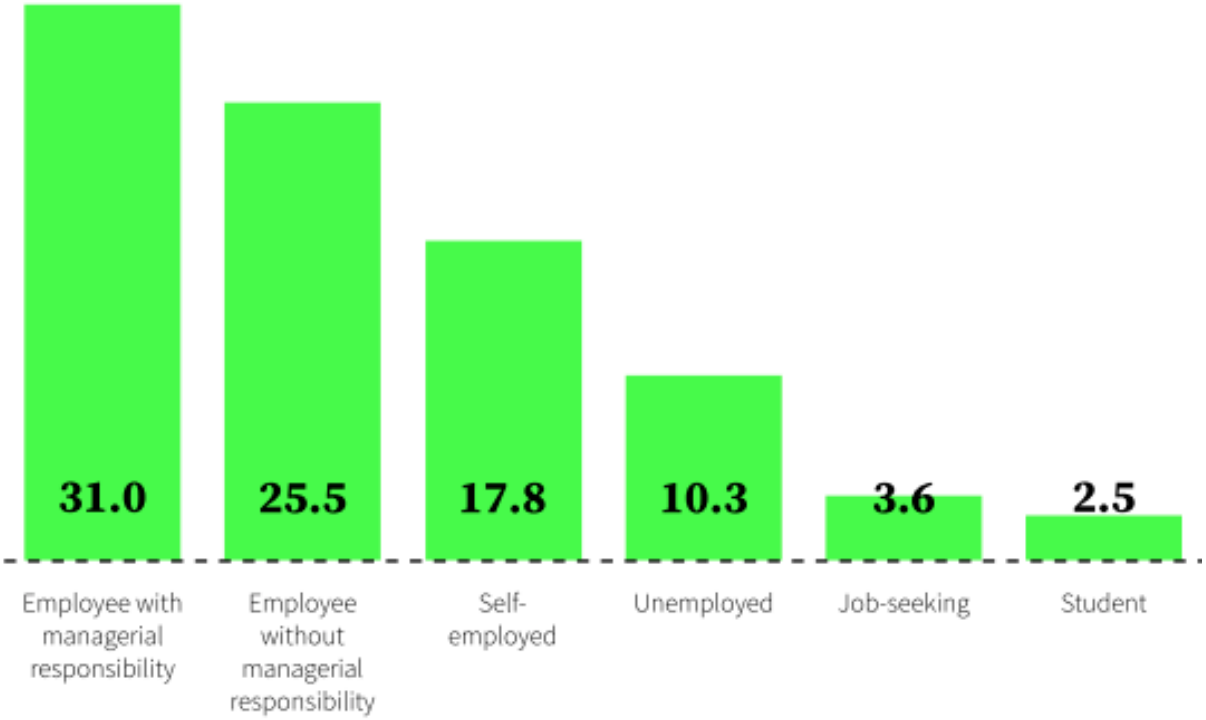

Figure 2: Professional Position of Participants in %

Results

Internationally, business & management as well as marketing & communication are the cases besides digitalization for further education. The question of the panel study related all to skills, that are securing the ability to stay competitive in the business field the participants are into. So private and personal skills are not in focus in this context.

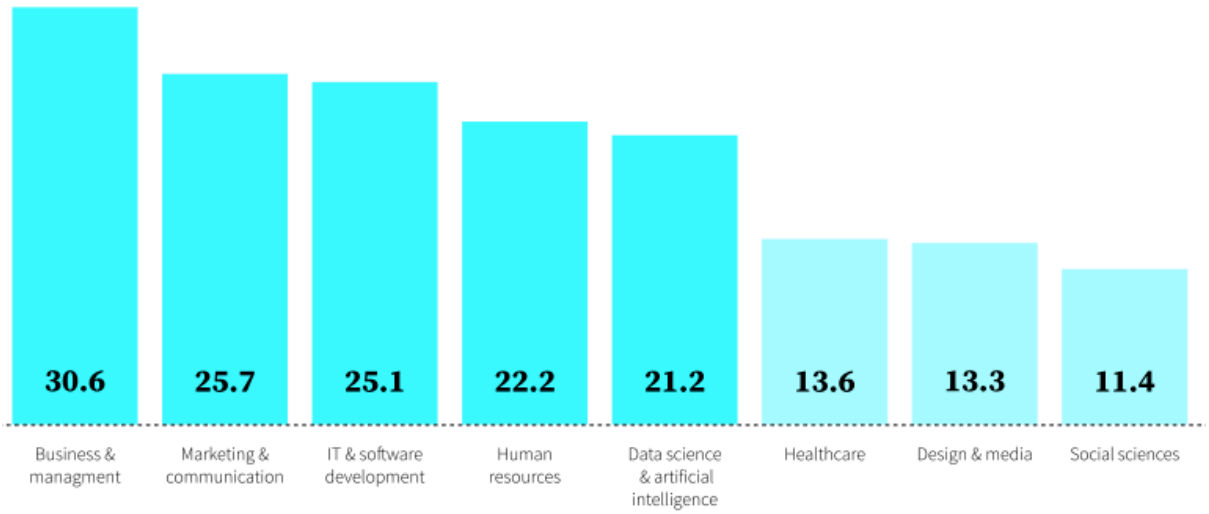

Figure 3: Needs of Business & Management Skills in Upskilling in %

For many people, lifelong learning is the be-all and end-all, where personal development is on focus. The main goal for educational institutions is to develop programs, which fit professionally to people's needs and keep up with technological advancements. Topics of the future must be identified. Although there are a lot of insecurity, interesting is to see, that two thirds already know exactly what knowledge they want to acquire.

Figure 4: Needs of Business & Management Skills in Upskilling in %

60 % of those surveyed consider it important that further education content is taught live. Both flexible online teaching and events at fixed times are popular. Very important is also flexibility of training session times regarding learning ability. 69,3 % of participants see this aspect "very important", while nearly the rest (25,8 %) see at least slightly importance. These aspects show that there is a strong desire for flexible online teaching internationally. Only very few participants prefer a face-to-face teaching. For respondents in countries such as South Africa (51.8%), Nigeria (50.7%) and Pakistan (46.5%) in particular, online teaching with flexible time scheduling plays the most important role.

Figure 5: The Importance of Training in real time in %

Additionally, above 30 % of the participants either prefer flexible online teaching with or without fixed time schedules. Even the combination of classroom and online teaching is not very popular because of not even every 7th participant would choose that model. Fixed times at classroom teaching is even behind it on the last position.

Conclusion

Based on the deductively developed hypotheses of success chances for the concept of "Smart University" were mainly confirmed with the survey's statements on commutated level:

FURTHER EDUCATION. A PERSONAL MATTER. Further education is important, there's no doubt about that. Even though one in two people would like to continue their education for professional reasons, there is one thing that is most important to most respondents, and that is personal further education – regardless of their profession. Simply because they are interested in a particular subject.

POSITIVE EXPERIENCES. More than two thirds of those surveyed have already had very good experiences with further education. For more than half, the curriculum perfectly matched their own personal goals. The quality of the learning content and the professional approach of the specialist staff also ranked highly among 46.9% of respondents.

INFORMATION IS EVERYTHING. Well over half of those surveyed internationally have already found suitable further education courses. The rest are still looking. Those who have already investigated it but have not yet found anything are primarily concerned about the lack of flexible courses with suitable content.

MORE FLEXIBILITY - WITH ONLINE LEARNING. Even further education is influenced by current trends: online teaching is generally preferred internationally. Best of all with

flexible, self-deter-mined scheduling or in a virtual classroom online at fixed times. In contrast, only very few people want face-to-face teaching.

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Teacher's Twitter Levels of Participation and Depth of Reflection on Pedagogical Practices

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Abstract
Teachers need to be connected to other teachers for their professional development and some do this through social media sharing that can be seen through educational hashtags across Twitter. Teachers from different cultural experiences, states, and countries communicate and reflect on educational topics. The purpose of this study was to explore how nine K-12 teachers' levels of participation on Twitter influenced their reflection on pedagogical practices. The conceptual framework was based on a depth of reflection model and Fischer's richer ecologies of participation model. The data were collected from interviews, reflective journals, and teachers' Tweets. Then, two levels of coding (a priori coding and emergent codes) were applied to analyze the data collected. The results showed how teachers participated on Twitter and the different levels of participation. The levels of participation included the following teachers' roles: lurkers, contributors, consumers, curators, meta-designers, or moderators. The teachers' Tweets about building professional identity, exchanging ideas, learning new skills, and professional connectedness were also described and analyzed. Teachers' connectedness on Twitter showed a depth of reflection among the following levels: critical reflection, reflection, understanding, and non-reflective/ descriptive. The study can help districts and school administrators to evaluate the power of teachers' tweets on social media as a tool for personal growth, professional engagement, and learning.

Keywords: Twitter, Teachers, Reflection

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Introduction

Teachers are part of a profession that participates actively in a variety of professional developments (PD). The teachers' learning process can be seen by their use of technology in education, digital literacy skills, and social media. Some studies showed how Twitter could become an opportunity for teachers to interact, communicate, and collaborate (Akella, 2014; Rosenberg et al., 2017; Ross et al., 2015; Tan & Hew, 2017). In this case study, the purpose was to explore how 9 K-12 teachers' levels of participation on Twitter influence teachers' reflections about teaching practices. There was a gap in the literature about the relationship between teachers' levels of participation and depth of reflection. Teachers' experience on Twitter has been researched from different perspectives, including collaboration, communication, personal learning networks, and sharing resources, among others (Britt & Paulus, 2016; Carpenter & Krutka, 2014; Carpenter & Krutka, 2015; Noble et al., 2016). Also, time for reflection (Fernandez Campbell, 2018) and feelings of isolation can impact teachers during their careers (Davidson & Dwyer, 2014; Hartman, 2017). The use of Twitter by educators can have a positive impact that allows them to share and connect with other teachers from different countries or states (Carpenter & Krutka, 2015).

Research Questions

- In what professional activities do teachers participate on Twitter?
- How do teachers use Twitter to help them reflect on pedagogical practices?

The conceptual framework included two models Depth of Reflection (DoR) (Kember et al., 2008; Harland & Wondra, 2011) and Fischer's (2011) Ecologies of Participation (EP).

Depth of Reflection (DoR)

Reflection is a valuable experience that teachers can benefit from and can allow them to transform their perspective on teaching and learning. When teachers reflect on their daily work, lesson plan, or activities in class can bring a new dimension to the teaching experience. The four levels of reflection included were nonreflection, understanding, reflection, and critical reflection (Kember et al., 2018; Harland & Wondra, 2011). The levels of reflection were related to the engagement on Twitter chats. For example, nonreflection can be related to a teacher that retweets a Tweet. The level of understanding was when the teacher could add a link or share a resource. In reflection, the Tweet relates to the teachers' personal experience, and in critical reflection, the teacher transformed their idea about the topic discussed on Twitter.

Fischer's Ecologies of Participation (EP)

Fischer's ecologies of participation (2011) included five levels, from level 0 to level 4. Each level showed a different description, for example, *level 0* unaware consumers (lurkers), *level 1* consumers (interact with Tweets), and *level 2* contributors (add content, share resources). *Level 3* included collaborators, facilitators, and curators with different roles in the Twitter chats, and meta-designers were moderators in level 4.

Methodology

A single case study design was applied for this qualitative research. A purposeful sampling strategy was used for the participants' selection; nine K-12 teachers were selected. The inclusion criteria included the participants being inservice teachers engaged in the following Twitter chats #ELAChat, #Langchat, # istechat, #nt2t, and #mschat.

Table 1 *Educational Twitter Chats*

Hashtag	Name	Description
#ELAChat	English Language Arts chat	Educational topics, reading, writing and literacy
#istechat	International Society for Technology in Education chat	Educational topics, Educational Technology and ISTE standards
#Langchat	Language Chat	Educational topics for world language teachers
#mschat	Middle School	Educational topics related to Middle School
#nt2t	Educators new to Twitter	Educational topics for teachers that are new using Twitter

Table 2 *Participant Demographics of Teaching Experience, Gender, and Current Position*

Participant	# of Years Teaching	Gender	Grade Levels	Content Area Specialization
P1	17	M	6,7,8	Social Studies, Fabrication Lab/TV Production
P2	17	F	7	Language Arts
P3	12	F	2	Language Arts, Science, Math, Computer Science
P4	13	F	11	Language Arts
P5	5	F	9, 10, 11, 12	World Languages
P6	15	F	6	Language Arts
P7	12	F	11, 12	Spanish
P8	14	F	9, 10, 11, 12	World Languages Spanish
P9	13	F	9, 10, 11	World Languages Spanish

Table 2 shows the participants' experience, gender, and content area. The participants' selection brought a variety of perspectives that allowed exploring in-depth the case study.
The interviews were by email based on Hawkins' (2018) research. Also, I applied reflective journals and a Tweet content analysis form. The data collection was triangulated and analyzed to find the relationships between the DoR and levels of participation in the teachers' engagement on Twitter chats.

Data Analysis

Data analysis from the email interviews showed how teachers began using Twitter, their experiences and reflections on Twitter chats (Appendix A). A teacher shared that "Participating in Twitter chats and just on the platform in general puts me in the environment of thinkers and learners - creatives, like me, who want to enhance their craft and see their students benefit from all their learning as well." The interviews brough an in depth perspective of the teachers' experience using Twitter chats.

Data analysis of the journal entries showed how teachers could identified themselves in different roles as moderators, contributors, active or passive participants. Giving an insight about how they felt their connections within the Twitter chat and their personal experiences. Also, in the journals, teachers shared words like inspiration, collaboration, and the importance of building relations when using Twitter chats. A participant shared "I felt recognized and respected for my contributions."

Data analysis of the Twitter posts showed how teachers reflect about their experiences in Twitter chats. For example, participants shared about the role of a teacher, the school culture, educational technology, and connectedness. When teachers shared about their experience with technology other teachers can relate and learn from their connections.

Table 3 *High Levels of Teachers Participation on Twitter*

High Level of Participation	Frequency	Percent
Collaborator	21	55%
Curator	6	16%
Meta-Designers	11	29%
Total	38	100%

Table 4 *Low Levels of Teachers Participation on Twitter*

Low Level of Participation	Frequency	Total Percent
Unaware Consumer	47	48%
Consumers	28	29%
Contributors	22	23%
Total	97	100%

Table 3 and Table 4 showed High and Low levels of participation. A high level of participation described a teacher that participated actively on Twitter could be a meta-designer or moderator, collaborator, or curator. A low level of participation was seen through less active participation, sharing resources, lurking, and searching for resources on Twitter. Table 3 and Table 4 included data from the interviews and journal prompts.

Table 5 *Depth of Reflection Codes from Interviews, Journals, and Tweets*

Codes	Frequency	Total (Percent)
DoR- Critical	85	11%
DoR - Reflection	182	23%
DoR - Understanding	235	30%
DoR – Non reflection/ Descriptive	285	36%
Total	787	100%

Table 5 included the DoR a priori codes from interviews, journals, and teacher tweets. The frequency showed how the data collected represented the DoR – Critical (11%) and DoR Reflection (23%). Participants shared how their engagement on Twitter chats made them reflect on their practice, find other teachers to connect with, and improve their professionalism and career because of the information, reflection, and learning shared.

Conclusions

The case study's key findings showed how teachers participated on Twitter in different levels of engagement, from unaware consumers to meta-designers, allowing them to create a professional identity from their connections on Twitter chats. The study results indicated that teachers were able to reflect on their teaching practices in different levels of reflection, from a non reflection/ descriptive to a critical reflection. The results showed how teachers could reflect on educational topics and even change their point of view, feeling part of a community that allowed them to learn, share, and collaborate. There were limitations to the research design that included the number of participants and email interviews. Sharing on Twitter educational chats can help them feel less isolated. Also, teachers can develop a digital professional identity that could promote leadership roles and opportunities to create an educational change. School districts and administrators could encourage teachers' participation in educational Twitter chats to create a learning community and promote professional development among them. It is significant for teachers to connect, create a learning community, and grow in their profession, and all this could happen when they reflect on their experience and share content on the Twitter educational chats.

Appendix A: Research Questions Aligned to Data Sources

Research Question	Data Collection Tool	Data Source Questions
Research Question 1: In what professional activities do teachers participate on Twitter?	Interview	IQ#1: How did you first begin participating on Twitter? IQ#2: How has your participation on Twitter evolved over time? IQ#3: Describe your experiences with Twitter chats.
	Journal Reflection #1: Types of Twitter participation	Directions: Place an X in the column to indicate which Twitter roles describe your past experiences. Then describe a specific example.
	Journal Reflection #2: Post Twitter Chat: DM	1. Why did you choose to attend the chat? 2. Describe your participation in the chat. 3. How well did the chat meet your expectations? 4. How did you feel during the chat?
	Tweet Content Analysis Form	Form will allow me as the researcher to categorize tweets into types of participation.
Research Question 2: How do teachers use Twitter to help them reflect on pedagogical practices?	Interview	IQ#4: How has your participation influenced what you do in the classroom, if at all? Share an example. IQ#5: How has your participation on Twitter made you reflect about your teaching practice if at all? Share an example. IQ#6: Describe a teaching topic that you are passionate about that has been discussed on Twitter. How has your Twitter participation influenced your views on the topic? IQ#7: Describe a time when something you heard about education on Twitter made you rethink the topic.
	Journal Reflection #2: Post Twitter Chat: DM	5. As you pause now, and reflect on the topic of the chat, what insights do you have about your own teaching? 6. After the Twitter chat, what comment made you reflect about education in general. Share an example and how that impact your previews ideas.
	Tweet Content Analysis Form	Form will allow me as the researcher to categorize tweets for depth of reflection on pedagogy.

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The Impact of Cultural Development of Disabled Identity on Special Education Systems in the US and Japan: A Comparative Analysis

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Abstract
This paper presents a comparative case study of the history of special education in the United States and Japan along with an overview of contemporary public education in each nation. Are the same populations considered disabled in each system? Which, if any, disabled people receive special education services? American culture veers sharply towards individualism and in the classroom emphasis is often placed on preparing for standardized assessments of academic achievement. In contrast, Japanese public education focuses initially on developing the classroom as a unit and creating a strong community in which children are not othered for their differences, positive or negative, before the more competitive academic years begin. Particular attention is paid to the Japanese phenomenon of hikikomori, teenagers and young adults who have undergone voluntary withdrawal from society, as well as the increased diagnosis rate of ADHD in the US, two circumstances that appear to be highly culturally specific.

Keywords: Special Education, Disability, Hikikomori, ADHD, Social Model

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Introduction

Disability is influenced and defined by social factors as much as by physiological ones— a person who is disabled in one context may be abled in another. To draw on personal experience, I am not disabled on the Internet. I am able to type quickly, navigate web pages, read text, and engage with visual media without accommodations such as screen readers or dictation software. In the physical world, I am disabled. I use a cane to walk, medication to manage symptoms, and have to carefully plan my daily routines to assess what accommodations I will need. My level of ability is heavily contextual and often determined by things having nothing to do with my body and individual capabilities. A dyslexic child may be disabled in an American classroom, which relies heavily on reading and writing as a mode of communication, but abled in social contexts where they are able to communicate verbally and visually. This is the social model of disability, which relies on context and interpersonal factors much more than the medical model's analysis of a person's diseases or disorders.

As the field of disability studies increasingly shifts to the social model over the medical model, there is an opportunity to reanalyze existing systems such as that of special education. The fact that different populations are eligible for special education in different countries is a strong point in favor of the social model because it allows for a culturally contextual history and analysis of such education systems. In many Western countries, the first instances of special education initiatives were founded by religious institutions: schools for the blind and deaf, institutions for intellectually disabled people, and other organizations maintained as charitable endeavors by different denominations. This early association between charity and disabled people is still a persistent factor in the stigmatization of disability, particularly as it relates to social services, including public school accommodations.

Because of my personal background as both a student and educator in American public schools, I chose the US for further exploration in this case study. I attended public school in the Dallas, Texas area from kindergarten until I graduated high school and received services through the gifted and talented program, which was administered separately from special education services. As a graduate student, I work part-time as a classroom aide in an integrated special education/mainstream preschool run through a local public school district. Through this work, I have learned much about the process through which students, some as young as two years old, are assessed and entered into the special education program to receive services such as occupational, physical, and speech therapy as well as classroom support.

After examining the accessible literature on international special education, it seemed that discussion of Japanese education systems would provide the deepest well to draw upon for comparison. The work of Kayama and Haight in particular provided valuable examination of Japanese school culture and the recent restructuring of the Japanese special education system as well as historical context on the development of special education in Japan. Additionally, the research of Kato and Teo into the *hikikomori* phenomenon has given insight into a uniquely acculturated facet of disability.

A note on language: I have made an effort throughout this paper to use language that is accessible to those who are not in academia by limiting jargon and explaining terms that might otherwise be undefined. This is a part of my personal pedagogy of demystifying academic literature in light of the limited access many people have to higher education.

The Arc of American Special Education

How American Public Education Works

In the United States, public education systems are managed at the state level and overseen federally. While exact requirements vary from state to state, students are generally required to attend school through age sixteen or until they obtain a high school diploma or equivalent (National Center for Education Statistics [NCES], 2017). Primary school typically focuses on literacy, arithmetic, and civics education, and forty-six states use standardized tests to assess student capabilities in these areas before students reach third grade (NCES, 2018). Elementary students are generally instructed in reading, writing, mathematics, science, social studies, music, art, and physical education, although the emphasis and time devoted to the latter four subjects varies widely from state to state. Increasingly, states are implementing a STEM or STEAM curriculum (science, technology, engineering, (art), and math) from an elementary level onwards. When students reach junior high or middle school, instruction in history, foreign languages, drama, and more specialized electives may be added to the curriculum. Historically, high schools offered vocational training in the form of home economics, automobile or wood shop, and cosmetology classes, along with work-study and work-release programs (Dreilinger, 2021). After a sharp decline in such classes associated with the rise in college-readiness as a focus of high school, many states are once again instituting vocational training as one curriculum track for students in their last years of compulsory education (Cantor, 1989; Lewis, 2007).

While compulsory education was implemented in some form as early as 1642, and all states had a law on compulsory education by 1918, there was no federal legal mandate on special education until the passage of the Individuals with Disabilities Education Act (IDEA) in 1975 (Katz, 1976; Kauffman et. al, 2014). This is not to say that all disabled children were excluded from the classroom- schools for the education of blind students and deaf students were established by social reformers during the 19th century, and some of the most famous disabled Americans were educated there (Winzer, 2009). Deaf-blind student Laura Bridgman was taught at the Perkins Institute for the Blind beginning in 1837 and was widely touted as the first deaf-blind person to be taught language (Freeburg, 2001). However, these schools did not have the capacity to educate every deaf or blind student in the US, and students with other disabilities were routinely institutionalized in asylums or hospitals and denied access to education in any form (Winzer, 2009). There are anecdotal cases of students with cognitive or physical disabilities being accommodated in their neighborhood schools, at least in terms of being allowed physical access, but this physical access rarely correlated to appropriate education that accommodated the specific needs of the student (Kauffman et. al, 2014).

The 1954 Supreme Court decision in the case of *Brown v. Board of Education,* which ruled that the 'separate but equal' doctrine decided in *Plessy v. Ferguson* was unconstitutional and mandated the end of school segregation based on race, allowed for disability activists to challenge the exclusion of disabled students from public schools by extending the Due Process Clause of the Fourteenth Amendment to encompass discrimination based on ability. Two specific cases, *P.A.R.C. v. Commonwealth of Pennsylvania* and *Mills v. Board of Education*, established that public schools had to make every effort to accommodate disabled students in their local schools and that "Placement in a regular school is preferable to placement in a special school class is preferable to placement in any other type of program of education and training" (*P.A.R.C. v. Commonwealth of Pennsylvania,* 1971). These precedents and those from subsequent court cases became codified in IDEA the first federal

legislation concerning the right to free, appropriate public education regardless of disability status, as well as the right of the student to be educated in the least restrictive environment (LRE) and to receive an IEP, or individualized education plan (Kauffman et. al, 2014). IDEA underwent revisions in 1990 and 2004 and remains the primary legislation on the topic of special education.

Special Education In Practice

In the 2019-2020 school year, 14% of public school students aged 3-21 received some form of special education services, with the largest percentage (33%) of those students receiving services for a specific learning disability (NCES, 2021). Students can be referred for evaluation for special education services at any point in their education, and there are systematic screenings in place to identify disabled students whose needs are not being accommodated (Kauffman et. al, 2014). Once they are approved for special education services, their guardians and school district personnel have regular meetings to set an IEP and assess how well it is accommodating the student's needs as they move through the education system. Generally, special education students are mainstreamed, or included in general education systems, as much as possible. As part of their IEPs, they may have an aide who works with them one on one, or they may be part of a program in which special education teachers and general education teachers run a classroom together (Kauffman et. al, 2014). Most public schools also have one or more classrooms designated specifically for special education; students may spend their entire school day there, or use the room as a space for therapies, studying, or specific classes. These rooms are typically staffed by a full-time teacher and a number of aides, paraprofessionals, and part-time staff (Kayama & Haight, 2014).

Disability in the American school system is highly formalized and medicalized; in order to qualify for services, a student must be evaluated and diagnosed and the impact of their disability on different aspects of academic and social performance must be put in writing. This emphasis on the medical model has been heavily criticized by disability scholars (Abberley, 1987; Bickenbach et. al, 1999; Winzer, 2009; Kauffman et. al, 2014). Pathologizing disability does a disservice to students who are disabled but lack the resources or the knowledge to seek a formal diagnosis, or to those students whose disabilities are sufficiently rare enough as to be mysterious to medical professionals. Additionally, the emphasis American culture places on individual exceptionalism and academic achievement may cause disabled students who struggle academically to feel frustrated, depressed, or have low self-esteem (Silverstone & Salsali, 2003; Trani et. al, 2020). As with many aspects of American society, the special education system is affected by the legacy of racist laws and policies as well as pseudo-scientific ideas of how race impacts intelligence and academic ability. Students of color, particularly Black students, are statistically more likely to be diagnosed with a disability and placed in special education than their white peers (Skiba et. al, 2008; Fish, 2019).

One positive effect of the American approach to special education is the relative ease in attaining accommodations. Particularly with higher-incidence disabilities, there is already a system in place that recognizes the disability and has evidence-based education practices. For example, students with learning disabilities such as dyslexia have access to several decades' worth of research into how learning disabilities impact brain function, alternative methods of teaching literacy, and a higher rate of teacher understanding of their disability (Winzer, 2009; Kauffman et. al, 2014). This can allow students who might struggle in another national

education system to access accommodations that allow them to thrive academically and socially.

ADHD Diagnosis Rates: Creating An Adderall Nation

ADHD, or attention deficit hyperactivity disorder, has catapulted to the national and international spotlight since the turn of the twenty-first century. While some aspects, particularly hyperactivity, have been described in medical literature for centuries, the modern diagnostic definition is a relatively recent evolution (Winzer, 2009). Rather than a constellation of behaviors, ADHD is now understood as a neurological processing disability that causes these behaviors and can be remediated with psychiatric medication. Matthew Smith (2017) argues that the international proliferation of ADHD is less an indicator that ADHD is a universal disorder and more a product of American psychiatric colonization and the aggressive marketing of stimulants by large pharmaceutical corporations by correlating countries with high incidence of ADHD to countries where companies such as Eli Lilly and Johnson & Johnson have a strong presence. To look at the numbers, ADHD emerged first in the United States and is now diagnosed in as many as 15% of all American children (Schwarz, 2016). The US accounted for 93% of all spending on ADHD medication in 2000 and 88% in 2010, indicating that other countries may be beginning to take a more American approach to ADHD treatment, i.e. the prescription of stimulants (Hinshaw & Sheffler, 2014).

In addition to potential colonialist implications of the proliferation of ADHD as a diagnosis, there is concern that the diagnosis is being used to label children when not clinically indicated as a way to explain 'difficult' behavior (Lange et. al, 2010). This has a racial component- students of color are far more likely to have their disruptive behaviors attributed to ADHD or other behavioral disabilities than their white counterparts- as well as a regional one- students in the American South are much more likely to be diagnosed with ADHD than those in other regions (Centers for Disease Control [CDC], 2020). Boys are as much as three times more likely to be diagnosed than girls, although this gender gap has been closing in more recent studies (Smith, 2017). Untangling the cultural influences in different diagnosis rates across specific demographics from the possibility of real physiological traits that impact incidence rate is a puzzle that may never be solved. It is impossible to define ADHD behaviors such as hyperactivity without assigning a cultural definition of normal behavior that is intrinsically and inescapably tied to national and historical constructions of social norms.

Another way of understanding the "ADHD epidemic" comes to us from disability scholarship: the increased rate of diagnosis is a result of increased understanding of the possible clinical presentations of ADHD as well as increased awareness by medical and educational professionals. For example, boys were historically diagnosed at much higher rates than girls, which is now understood as a difference in presentation, not in diagnosis. Boys are more likely to have hyperactive-type behaviors that are disruptive in classroom settings while girls are more likely to have inattentive-type behaviors that did not necessarily draw the attention of adults (Smith, 2017). This focus on classroom behaviors as a signal for assessment may go a long way towards explaining an American or Western bias in diagnosis- the American educational emphasis on standardized testing and individual academic achievement creates an environment in which teachers are encouraged to "control" disruptive behaviors, whether with medication, removing the student from a general education classroom, or other punitary measures. As discussed below, this is not a universal attitude,

but a cultural one. Students are expected to be individuals without straying too far from the behavioral norm; deviation is cause for assessment and possible medical intervention.

The Arc of Japanese Special Education

How Japanese Public Education Works

In Japan, students are required to attend school through eighth grade; high school is not required. Japanese primary school, which consists of grades one through six, focuses much more on social-emotional learning than the equivalent American grades (Kayama & Haight, 2014). Students are instructed in Japanese language, social studies, arithmetic, life studies, music, arts and crafts, science, home economics, and physical education. When they reach secondary school, art, technical arts, and foreign languages may be added to the curriculum, along with integrated studies and special activities. Moral education is interwoven into other subjects and students may occasionally have specific lessons only on morality ("National Curriculum Standards" 2017-2018).

Historically, students with disabilities have been excluded from Japanese classrooms to varying degrees, often depending on the type and degree of their disability. While compulsory elementary education was enacted in 1886, with an amendment providing for segregated schools for blind and deaf students in 1890, students with physical, cognitive, and behavioral disabilities were often given legal exemptions to these compulsory years due to lack of resources and understanding to set up classrooms for them and thus were left out entirely. After World War Two, the Japanese education system (which had been languishing in a state of some neglect due to the economic crisis of the Great Depression and the subsequent militarization of all aspects of Japanese society) was completely overhauled and provisions were made for educating disabled children in special education classrooms. The number of special education classrooms in mainstream schools began to steadily increase in the post-war years as the Ministry of Education began to offer specific guidance and as societal awareness and acceptance of disabilities increased (Kayama & Haight, 2014).

Schools for blind students and schools for deaf students are somewhat of an outlier to the overall special education system: the first such schools were set up before the implementation of compulsory education and benefitted from robust advocacy groups made up of both parents and blind or deaf people. While people with other disabilities, particularly cognitive disabilities, have been considered uneducable or 'non-people' at various points in Japanese history, blind people and deaf people were recognized as educable populations very early on (Kayama & Haight, 2014). This may be due in part to the existence of such cultural figures as the *biwa hoshi* and *goze*, two types of blind itinerant musicians, and the corresponding associations between blindness and ability (de Ferranti, 2009).

While American children are typically educated in their local schools as much as possible, regardless of the severity of their disability, Japanese children with severe disabilities may be enrolled in a school only for disabled children that has a separate curriculum and more staff who are specifically trained to work with disabled children ("Special Needs Education" 2021). Children with less severe disabilities, including many on the autism spectrum or with ADHD, are mainstreamed in general education classrooms as much as possible. General education schools may have a special education classroom, but it is more typically used for only part of a child's day or as a place for them to seek respite when overwhelmed or frustrated (Kayama & Haight, 2014). Children may be referred for special education services

at any time, but with milder disabilities, there is a cultural practice of accommodating students in an informal way in general education settings (Borovoy, 2008).

Accommodation In Deed, Not In Writing

As in many cultures, disability is a historically stigmatized category in Japan. While acceptance and awareness are rapidly increasing, there is still a sense of shame and a loss of face associated with having a disabled child, particularly one who is enrolled in special education services. Thus, teachers may work to accommodate students' needs in an informal way. In one example, a student on the autism spectrum was accompanied by his mother on school trips at the request of the staff, even though he had no formal IEP (Borovoy, 2008, p. 567). Teachers may also work with students one-on-one outside of formal school hours or alter assignments to be accessible to the student. While this allows for increased mainstreaming of students, it may also increase feelings of frustration or helplessness for students who are later formally diagnosed with a disability (Leedham et al. 2019).

This frustration can lead to social isolation, a major cause of concern for Japanese teachers. Teachers are often more concerned by isolation and refusal to engage in group activities than by hyperactivity or disruptive social behaviors (Borovoy, 2008). Disruptive behaviors are not punished, but used as a learning opportunity for the entire classroom community. This can be attributed in part to the idea that "The self is understood as primarily relational and contextual." (Kayama & Haight, 2014, p. 12). Rather than a student's disruptive behavior being a reflection on their independent self, it is a reflection on the peer group as a whole. Students are encouraged to help one another regulate behavior and conform to age-appropriate standards of etiquette and interpersonal relationships. This inclusive classroom model has its pros and cons; as Borovoy (2008) states:

"The emphasis on equality can be seen as very much a double-edged sword. On the one hand, historically it has sustained an ideology of inclusion. The strong belief that Down syndrome children should be accepted in the ''normal'' classroom was associated with the idealistic belief that inclusion would allow stronger children to overcome their discrimination, and allow disabled children to benefit from mingling with mainstream peers. At the same time, inclusion is undeniably linked to an ideology of ''sameness''—and the pressure to hide problems and assimilate into mainstream values." (p. 560)

Peer groups cannot be the sole source of support for a disabled student. The impetus is often placed on caregivers, be they teachers, parents, or other adult family, to shift their lives to accommodate a student's disability, rather than using intervention strategies or targeted therapies to alter the student's behaviors. For example, parents of a child on the autism spectrum may be advised to change to a routine and schedule that is most beneficial to their child rather than trying to help the child adapt to an existing routine and schedule. Parents are often told, whether implicitly by societal norms or explicitly by friends and family, that problem behaviors are a result of a dysfunctional parent-child relationship rather than any underlying psychology (Borovoy, 2008).

One interesting phenomenon is that according to Kayama and Haight (2014), many Japanese schools are willing to remodel buildings to be accessible to physically disabled students, but do not do so until such a student enrolls. This may be taken as an unwillingness to change until forced by circumstance, or it may be the quintessentially Japanese attitude of not wanting to assume that accommodations are needed until they are requested. Kayama notes

that once a Japanese person had accepted her wheelchair, "lack of accessibility became their concern as well as hers." (p. xi) The notion that inaccessibility is not a societal problem but a personal one is very different from American society, where the Americans with Disabilities Act mandates systemic changes in the name of accessibility.

The Japanese cultural attitude towards autism spectrum disorders, ADHD, and other behavioral disabilities is one that provides a great deal of leeway in accommodating children's disabilities without ever acknowledging them as disabled. This construction of disability identity leads to many people with these disabilities being left out of the special education system, whether in an effort to reduce stigma by not formalizing their disability or as part of a belief that their disability is not severe enough to require accommodations.

Hikikomori: Japanese "Hermits"

The term *hikikomori* refers to a form of social withdrawal in which an individual voluntarily retreats from the wider world to live in self-imposed hermitage, often supported by family. This Japanese phenomenon was first described in the 1970s as an epidemic of school refusal, or *futoko,* among adolescents and was later redefined in the 1990s as hikikomori (Kato et. al, 2019). Saito, the first to use the term hikikomori to describe this occurrence, defined it in 1998 as "those who become recluses in their own home, lasting at least six months, with onset by the latter half of the third decade of life, and for whom other psychiatric disorders do not better explain the primary symptom of withdrawal." Estimates of the number of hikikomori range from .9% to 3.4% with an increase in recent years (Koyama et. al, 2010). There are support centers, both state- and private-run, designed to help hikikomori reacclimate to society (Ogino, 2004). There is a trend among mental health professionals to use terminology that describes withdrawn behaviors as a temporary state rather than an ongoing condition; this relates to the reluctance to medicalize conditions that are seen as the result of societal factors rather than biological ones (Borovoy, 2008).

There are a few cultural factors that allow for the existence of hikikomori in Japan. First, it is not only common but expected for children to live with their parents past their secondary school years and well into adulthood. This blurs the line between childhood and adulthood and independence and interdependence (Borovoy, 2008). This also goes towards explaining the gender imbalance in hikikomori (three times as many men as women have been identified as hikikomori); it is far more socially acceptable for women to retreat from society as housewives or family caretakers without being labeled. Second, the previously discussed reluctance to stigmatize children by diagnosing them with psychiatric or behavioral disabilities creates a population of adults that have never received formal treatment and may turn to social withdrawal to manage their symptoms (Kato et. al, 2019). This is particularly apparent for those with depression, social anxiety, and related conditions: the Japanese attitude towards psychiatry is very different from the American perspective. In Japan, emphasis is placed on self-reliance and community support as treatment rather than medication or therapy. Even those patients who self-report psychiatric symptoms are much less likely to request psychiatric medication as a primary form of treatment (Borovoy, 2008). Third, the technology boom of the twenty-first century allows for a person to get nearly everything they need to live via the internet- one can work, shop, socialize, and travel via a secure internet connection and a VR headset (Kato et. al, 2019; Twenge, 2017). Hikikomori are no longer forced to go into society or rely on family members for their basic needs. They can turn a tiny studio apartment into their entire world (Borovoy, 2008).

There is increasing discussion and analysis of hikikomori as a global phenomenon rather than a culture-bound syndrome unique to Japan (Kato, Tateno, et. al, 2012; Teo & Gaw, 2010). As the body of literature on hikikomori grows, clinicians in non-Japanese settings are noting patients who seem to fit the diagnostic criteria without the cultural component (Teo et. al, 2015). There is as yet no consensus on whether social withdrawal in non-Japanese settings can fully meet the criteria of hikikomori because the initial definition and analysis was wholly centered on a Japanese context. For example, a study of hikikomori-like individuals in Spain revealed a distinct difference in age at onset, with Spanish hikikomori trending older than their Japanese counterparts (Malagón-Amor et. al, 2014).

Conclusions

This direct comparison of American and Japanese special education systems as analyzed through the social model of disability shows that just as disability is culturally contextual, so too is the idea of special education. Students with the same disability may receive entirely different accommodations, or no accommodations at all, in different countries. Cultural attitudes around the purpose of education (especially primary education), the root cause of mental and behavioral disabilities, and the role of legislation in education play a major role in the development of special education systems. If, as in Japan, primary school is focused on developing social-emotional skills with a classroom peer group, behaviors associated with ASD, ADHD, and cognitive disabilities are far less disruptive to the classroom environment and the student is far less likely to be entered into the special education system. If, as in the US, primary school is focused on acquiring academic skills as assessed by standardized testing, these same behaviors may earn the student a special education referral. Every aspect of a student's identity can potentially impact their experience with both the medical and education systems, and national context is one aspect that has not been fully explored in the literature.

This analysis has its limitations; one is that I am not a Japanese speaker and so had to rely on works that had been translated into English. Japan is relatively racially and ethnically homogenous when compared to the US, so I was unable to draw direct comparisons to the racial demographics of special education students in the two countries. Another is that this is a very brief overview; each aspect of this analysis has on its own enough material for a book-length examination. Finally, I was not able to perform any ethnographic research; a future version of this analysis would be greatly aided by interviews with individuals in each country with some of the discussed disabilities.

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Best Practices for Graduation Thesis Instruction for Undergraduate Students: Comparing and Contrasting Experiences of Thesis Writing in Japan and Abroad

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Abstract
The purpose of this paper is to provide readers best practices for undergraduate thesis instruction in Japan and abroad through review of literature from 2019 and 2020 on writing graduation theses. Peer-reviewed journals written in Japanese and English were searched in February 2020 related to graduation thesis instruction. The following database were utilized to obtain literature: CiNii for Japanese and ProQuest and ERIC. Reference books related to writing graduation theses published in Japanese and English were also surveyed. Review of literature related to writing thesis for graduation suggest five key points for supervisors and three key points for administrators at any tertiary institution in terms of the best practices to follow to support their students with their graduation theses. Recommendations for future research based on an analysis of current literature on graduation thesis writing are also noted. Faculty and administrators at universities not only in Japan but abroad will acquire a deeper understanding of how thesis writing as a graduation requirement are taught around the world and ideas to apply the best practices at their own institutions.

Keywords: Thesis, Graduation Requirement, Higher Education, Curriculum, Instruction, Supervision, Administration, Japan, Abroad

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Introduction

Are educators employed at their tertiary institutions well-aware of how graduation theses are taught in contexts aside from their own? This paper attempts to inform educators and administrators at tertiary institutions how graduation theses are currently taught and provide an analysis of effective instruction. In particular, the paper may be of help to those who are asked to supervise students' graduation theses at both the undergraduate and graduate levels. The paper focuses on how graduation theses of undergraduate students are taught in Japan, a context that has not been much explored. Kushimoto (2019) claims that there are a few studies on graduation requirements written in English, so more qualitative and quantitative studies are worth exploring. However, prior to undertaking those types of studies, a careful literature review and analysis is of benefit, particularly for educators who are interested in applying the ideas gained from a comprehensive review to their own teaching contexts. The paper is organized into four sections: (1) students' and supervisors' experiences related to graduation theses at tertiary institutions in Japan, (2) students' and supervisors' experiences related to graduation theses at tertiary institutions abroad, (3) similarities and differences between students' and supervisors' experiences at tertiary institutions in Japan and tertiary institutions abroad, and (4) an analysis of effective instruction of graduation theses deemed applicable to tertiary education context of any location.

Experiences related to graduation thesis writing of students and supervisors in Japan

Three recent peer-reviewed journals, one written in English (Kushimoto, 2019) and two written in Japanese (Asada & Koike, 2020, Nagura, 2018) shed light on the thesis writing experiences of students and supervisors in Japan. Kushimoto (2019) provides an idea of the amount of time undergraduate students spend on their graduation theses. After distributing two national surveys, Kushimoto (2019) found that undergraduates devote 430 hours annually in the humanities and 312 hours in the social sciences for graduation research (hereafter GR). Additionally, according to Kushimoto (2019), GR is more prevalent in national universities compared to private universities; and degree programs with compulsory GR is 87.8 percent in the humanities and 50.6 percent in the social sciences. The majority of respondents spent fewer than 11 hours on GR per week for humanities, although 8.3 percent devoted more than 30 hours per week. Using the median of each class examined, the average per week was 12.3 hours (Kushimoto, 2019). For social sciences students, the majority of students spent less than 6 hours on GR per week with only 2.5 percent allocating more than 30 hours. The median of each class examined was 8.9 hours per week (Kushimoto, 2019). Asada and Koike (2020) wrote a paper together, with Koike writing a separate graduation thesis based on literature review and incorporating a high school teacher's training experience at a high school that Asada teaches. Because teacher training sessions are required prior to undergraduate students obtaining their national teaching licenses at elementary, middle, or high schools in Japan, Koike is receiving training from Asada to become a high school teacher after graduation and receiving support from the supervisor at a tertiary institution where Asada at the time attended. At the same time, Asada is writing a paper as the first author for professional development. Asada and Koike's (2020) paper suggests that undergraduate theses of Japanese university students involve not only support from supervisors at university but also from those outside of the university such as teachers (i.e., in this case a high school teacher) and students (i.e., in this case high school students of Asada's class who Koike assisted providing lessons for). Similarly, Nagura (2018) analyzed the author's own undergraduate-level seminar's theses in terms of how the undergraduate students in Japan were able to apply their fieldwork in China to their theses. Nagura (2018)

points out that the successful theses reviewed the literature carefully prior to fieldwork in China, whereas the unsuccessful theses jumped to conclusions without careful consideration of the preexisting literature. Nagura (2018) claims that although supervisors need to provide advice on what students were not able to come up with and have students think critically on points that need reflection, upon reflection after examining the students' final thesis, she admits that there was a student in her seminar who she thinks did not receive sufficient advice or encouragement to think critically.

Experiences related to graduation thesis writing of students and supervisors abroad

While current literature written on graduation theses abroad do not mention time taken for theses nor shed light on specific cases of how theses are completed, much of the literature emphasizes the importance of collaboration among students and supervisors (McCartney, Clements, Cahalan, Johnson, & Pace, 2020; Sulandari, Prihartanti, Ali, Marida, Savitri, & Wijayanti, 2020. In particular, research on students' experiences of thesis writing point to the importance of supervisorial support (Jiang & Yan, 2020), and includes specific suggestions for how supervisors can provide support effectively, particularly through the teaching of literature review (Herrström, Larsson, Einberg, Nilsson, Blomqvist, & Garmy, 2020; Suwito, Purwanto, Parta, Irawati, & Dika, 2019) and through understanding each of their students' uniqueness in educational background, interests, and abilities (Arif & Huda, 2019; Zhang & Pramoolsook, 2019). Additionally, at a broader level, past research suggests the importance of each institution's stakeholders being aware of how the curriculum and coordination among the administrators, faculty and staff influences the students' quality of their graduation theses (Herrström, Larsson, Einberg, Nilsson, Blomqvist, & Garmy, 2020; Kalpokaite and Radivojevic, 2020; Perrella, Dam, Martin, MacLachlan, & Fenton, 2020; Rosyidi, Budiningsih, & Wakhid, 2019; Sun, Graves, & Oliver, 2020). Finally, research related to graduation thesis writing of students and supervisors abroad suggest that weaknesses in graduation theses of graduate students may be ameliorated if students build a solid academic foundation in their undergraduate programs (Ebadi & Pourahimadi, 2019; Farahian, Parhamnia, & Avarzamani, 2020; Ravari & Kok, 2019; Shahsavar & Kourepaz, 2020). Detailed explanation of those points will be provided hereafter.

First, much of the literature on graduation thesis requirements abroad at the undergraduate level emphasizes the importance of collaboration among students and supervisors. With collaboration among students, Sulandari, Prihartanti, Ali, Marida, Savitri, & Wijayanti (2020) used a quantitative data collection approach involving 719 Indonesian undergraduate students and found that students who chose independent research as their type of research were able to finish their undergraduate thesis faster than those who chose joint research. The researchers point out that collaboration with other students might have encouraged the development of more thoughtful and creative theses, and in return, the final product may have taken more time for completion compared to theses based on independent studies. Insights from the researchers suggest that more efficient independent study is not always better than working on theses in groups, as the group projects can encourage discussion, creativity, and better quality. Considering the pros and cons of group work, supervisors, after considering the curricula that students learned from and the purpose of the thesis for their institution, need to ultimately decide whether their theses will be group work or independent work. To encourage collaboration not only within the group of students supervised under one main faculty member, McCartney, Clements, Cahalan, Johnson, and Pace (2020) suggest that institutions need cost-effective and impactful ways to advance undergraduate research (UR) initiatives. The researchers reviewed the creation of an interdisciplinary Undergraduate Research Club at

Townson University, a four-year state institution north of Baltimore in the United States with just over 19,000 undergraduates, and claim that the faculty, students, and staff all need to cooperate for undergraduate research initiatives to function effectively. In particular, the researchers emphasize that meaningful faculty guidance and staff support is essential, especially because students are providing academic advice to each other. Faculty members and administrators need to be careful about how the size of the undergraduate programs can affect how undergraduate research initiatives are executed at individual institutions.

Second, the importance of supervisors' support, specifically in terms of taking the time to provide feedback for the students on their papers, and helping undergraduate students build a strong foundation is suggested from current research. As for providing feedback on students' papers, Jiang and Yan (2020) analyzed supervisor feedback on 32 undergraduate thesis revisions from eight students in terms of error feedback and non-error feedback and found that both types of feedback can significantly improve the overall expressions of papers for Chinese students writing their theses in English. This finding from the researchers suggests that if papers are written in English by those whose native language is not English, feedback from faculty who are competent in the language can lead students to improve expressions on their papers. Similarly, faculty members who are more used to publications and writing academic papers than students can allow students to develop the academic writing skills necessary for undergraduate students, which is helpful for students particularly should they decide to attend graduate school in the future.

Third, existing research associated with graduation thesis writing of undergraduate students abroad suggest the importance of supervisors in assisting students conducting literature reviews well for their theses. For example, Suwito, Purwanto, Parta, Irawati, and Dika (2019) reviewed the development of research-based learning applied in Indonesia at the undergraduate level and claim that because thesis proposals are not easy, a learning model for students oriented towards reviewing journals as the main activity needs to be applied. Specifically, the researchers note that the following components integrated into teaching to make proposals can help students overcome obstacles: (1) recognizing the concept of the research journal at hand, (2) obtaining sources that are reputable and up to date, (3) facilitating guided discussion on the journal's results, and (4) facilitating the formulation of research ideas. Herrström, Larsson, Einberg, Nilsson, Blomqvist, and Garmy (2020) recommends that search documents are used in both formative and summative assessments to evaluate students' search strategies. Synthesizing the ideas from Suwito, Purwanto, Parta, Irawati, and Dika (2019) and Herrström, Larsson, Einberg, Nilsson, Blomqvist, and Garmy (2020), for instance, it is reasonable for faculty members supervising undergraduate students to make part of their grading students' notes and contribution to discussion, if supervisors are assigned an undergraduate thesis writing course at their institution. It would also be reasonable for faculty members to consider arranging time with the institution's librarian to assist students with conducting their search.

Fourth, past research on graduation thesis writing of undergraduate students abroad emphasize the importance of supervisorial support through understanding each of their students' uniqueness in educational background, interests, and academic abilities. In support of the importance of considering individual uniqueness of students, Arif and Huda (2019) explored the process by which undergraduate students select their research topic and design by purposive interviewing ten Indonesian graduates from different educational backgrounds and found that self-reflection of their past interests, perceived competence, friends' preferences, input from past courses, level of curiosity, library research, autonomy, and

supervisors' expertise and suggestions were major factors associated with their motivation to work on their theses. The researchers' findings suggest the benefits of getting to know students in terms of the aforementioned factors of motivation during the first session of their undergraduate thesis writing course can enhance the overall quality of the supervisor's feedback towards their students.

Additionally, research conducted by Zhang and Pramoolsook (2019) suggest the importance of supervisors in noting the differences of each student's ability to: summarize and transmit information they learned clearly, provide sources to support their claims, and synthesize, analyze, and critique the information they retrieved from their search. Zhang and Pramoolsook (2019) analyzed how 40 highly-rated undergraduate theses written by English majors at a Chinese university were written, and found that reports were most extensively used by the thesis writers to transmit the knowledge they learned, and the writers also tended to use arguments that signaled critical evaluation of documents they referred to for writing their theses. The analysis the researchers provided showed that reports, arguments, and text responses made up 84 percent of their entire corpus. While the percentages may be different for students in other cultural contexts, the value of reporting information clearly, making sound arguments based on critical evaluation of texts are important components of thesis writing.

Fifth, in addition to the crucial role of supervisors in enhancing students' graduation theses writing quality, past research suggests the importance of each institution's stakeholders not limited to supervisors to be aware of how the curriculum and coordination among the administrators, faculty, and staff influences the students' quality of their graduation theses. In terms of faculty coordination with other staff, Herrström, Larsson, Einberg, Nilsson, Blomqvist, and Garmy (2020) conducted a retrospective qualitative study in which two librarians and four faculty members randomly examined selected 89 theses from the years 2012, 2014, and 2016, and found that significant improvement was shown over the years regarding the use of a sufficient number of synonyms, matching search terms to the respective database, use of the Boolean operator OR, and the use of subject headings and free text searches. The searches became more structured with increases in block searches. The findings from the researchers suggest the value of the faculty collaborating with librarians in assisting undergraduate students with research, not only for just one year when faculty members are assigned to teach an undergraduate thesis writing course but collaborating over several years for them to refine their ability as working members of the institution in facilitating students' learning.

In terms of the administrators' coordination with other faculty, Kalpokaite and Radivojevic (2020) conducted a descriptive qualitative case study, exploring students' experiences in a qualitative research course for undergraduate psychology students and found that the students who participated in the course perceived the course to provide new knowledge and skills they felt would be useful for their professional and personal lives. The students also recognized that the qualitative research course was an important complement to their predominantly quantitative curriculum. According to Kalpokaite and Radivojevic (2020), many students shared that they initially thought that qualitative research was less scientific than quantitative research, but after they experienced qualitative research for themselves, they appreciated the usefulness and importance of analyzing rich data. Students initially felt that the research diaries they were asked to keep were not useful but found that they were useful in the analysis phase after data collection through interviews. Their research suggests that depending of the aims of each department, the administrators need to offer qualitative and

quantitative research courses comprehensible for the students that can help students move beyond reviewing existing literature when deemed appropriate.

In terms of the administrators coordinating the broader curriculum, research encourages institutions to be mindful of how the curriculum is structured to prepare students to write their graduation theses at the undergraduate level. Perrella, Dam, Martin, MacLachlan, and Fenton (2020) conducted a qualitative exploratory research at McMaster University, in Ontario, Canada, that employed one on one interviews with key faculty members and focus group discussions with undergraduate students and found two principal models that characterize undergraduate research and inquiry: the scaffold model and the bookend model. In the scaffold model, inquiry was described as formulating a research question and finding an answer. As Perrella, Dam, Martin, MacLachlan, & Fenton (2020) argue, in the scaffolding model, one of the benefits is building resilience, as students often experience failure and need to troubleshoot, which students perceive as a valuable skill that can be applied after graduation. As opposed to the scaffolding model in which inquiry is scaffolded throughout the students' undergraduate years, the bookend model has a standalone course in year one and reintroduced in year four. The bookend model is valued to have skills transferred beyond students' undergraduate education and help build critical and analytical skills. In contrast to the two effective models that have been mentioned, in an abstract model, there is a lack of culture of student contribution and utility and minimal values are identified. Administrators clearly conveying to the faculty members what model their institutions operate and with shared knowledge of how the courses fit together to support students' thesis writing, the faculty members will be informed to guide students to write their theses well.

Successful examples of coordination are also mentioned in literature pertaining to undergraduate students' thesis writing experiences abroad. In terms of coordination of the faculty's schedules in evaluating students' theses, Rosyidi, Budiningsih, and Wakhid (2019) developed a mathematical model to solve scheduling problems for undergraduate thesis examinations in the Industrial Engineering Department of Universitas Sebelas Maret in Indonesia. The authors claim that the model is more efficient than manual scheduling done by the coordinator. The model developed by Rosyidi, Budiningsih, and Wakhid (2019) is planned to be developed by the coordinator so that the scheduling process will become more efficient. Evaluation of theses by a committee instead of only one supervisor can encourage students to exert the effort to write theses with care, as the Achilles heel of students' theses may be pointed from various perspectives. Furthermore, feedback from the committee with varying ideas provides students with a rich educational experience, that can encourage students to examine their own work critically. As with an example of coordinating the curricula effectively, Sun, Graves, and Oliver (2020) reviewed the state of undergraduate research opportunities (UROs) in the life sciences across various institutions, and the survey data gathered in 2019 from 20 departments in 14 universities showed that all responding departments offer well-established forms of research that include credit-based directed studies or honors-thesis courses. Paid research opportunities are offered by 80 to 95 percent of the responding departments (Sun, Graves, & Oliver, 2014). Additionally, According to Sun, Graves, and Oliver (2014), some institutions offer a subset of awards for students with international status. Departments need to develop their vision and exert their energy towards their vision in order to continue enhancing the educational services provided for students and to successfully coordinate services that involve multiple stakeholders.

Sixth and finally, research related to graduation thesis writing of students and supervisors abroad suggest that weaknesses in graduation theses of graduate students may be ameliorated

if students had built a solid academic foundation in their undergraduate programs. For example, Ebadi and Pourahimadi (2019) interviewed 40 EFL postgraduate students and ten supervisors selected randomly based on availability from five major Iranian universities and found that both the students and supervisors feel the students' lack of research knowledge including the inability to write academically using academic vocabulary, lack of research design knowledge, and choosing a researchable topic. According to Ebadi and Pourahimadi (2019), postgraduate students cannot choose their topics easily because they either believe it is the supervisors' responsibility or they need to select a topic that has not been previously selected. Furthermore, postgraduate students reported that they think writing theses is time-consuming, impractical, and compulsory. Supervisors noted that many postgraduate students are not capable of managing time properly by balancing their theses and their life. Experiences of students abroad at the graduate level suggest the importance of supervisors preparing undergraduate students by keeping in mind the possibilities of their students deciding to enroll in graduate school after completing their undergraduate program. Not only should administrators consider curricula so that research design courses are offered but also, research suggests the importance of supervisors pointing out the value of conducting research starting at the undergraduate level, so that some students who think that graduation thesis writing theses are compulsory can understand the value in conducting their own research.

Research related to graduation theses of graduate students also points to the importance of allocating the time and energy to provide clear and specific feedback in order to motivate students, starting from the undergraduate program. For example, questionnaires administered by Farahian, Parhamnia, and Avarzamani (2020) found that 84.9 percent of the respondents strongly believed that supervisors do not adequately supervise students' thesis. In addition, Farahian, Parhamnia, and Avarzamani (2020) examined perceptions of Iranian university instructors related to the reasons for prevalence of plagiarism in Iranian students' theses. With a self-designed questionnaire competed by 291 instructors and a semi-structured interview that followed, the perceived reasons for plagiarism were: students' unfamiliarity with the concepts of plagiarism, inadequate training regarding citation rules, lack of decisive action against academic dishonesty, lack of motivation among postgraduate students, and instructors' lack of adequate care regarding the process of thesis development.

Research related to graduation theses of graduate students also point to the value of educating undergraduate students to review existing literature carefully to succeed at graduate school. For instance, Shahsavar and Kourepaz (2020) examined 40 completed master theses at a university abroad, had 10 postgraduate students take part in voluntary semi-structured interviews, and found that students mainly focused on summarizing other researchers' findings and interpretations and were not able to synthesize, critique or explain the literature in writing. Additional issues that emerged were lack of sufficient knowledge and time to complete their literature review and deliberate dereliction of some supervisors who did not provide students sufficient feedback. According to Shahsavar and Kourepaz's (2020) research, some of the students argued that their professors rarely focused on writing an effective literature review. Additionally, while most students were good at summarizing each work and lining the work with the purpose of their own study, they had major weaknesses in reporting the gaps in the previous studies.

Past research also suggests the importance of having students collaborate with those aside from their supervisors. However, collaboration, as previously argued with graduation thesis writing experiences of undergraduate students, can be time consuming, and can prevent additional mental challenges. Because of these additional challenges and multiple channels of

feedback, supervisors need to pay close attention to the state of each students' progress on their theses and provide clear feedback. Research by Ravari and Kok (2019) interviewed 50 MA English majors from 11 tertiary institutions in Tehran and found that through the master's theses write-up phase, the non-native students learned not only to interact with their supervisors but also with members of various academic communities via networking in person and online. Time management skills and mood management skills were reported to be perceived challenges of those students. According to Ravari and Kok (2019), most of the students reported that unclear and general feedback made the process of writing the MA thesis time consuming and did not contribute to producing meaningful content.

Similarities and differences: Japan and abroad

Prior to identifying and analyzing the similarities and differences between graduation thesis writing experiences of students in Japan and abroad, a summary of experiences related to graduation thesis writing in Japan and abroad will be provided. For experiences related to graduation thesis writing in Japan, (1) specific amount of time spent on writing graduation theses are stated (Kushimoto, 2019); (2) collaborative style by faculty members in getting students connected with outside sources of support such as incorporating fieldwork abroad and teacher training sessions as part of obtaining teachers' licenses into their students' theses are evident (Asada & Koike, 2020; Nagura, 2018); (3) the importance of supervisor feedback particularly in terms of getting students to think critically is emphasized (Nagura, 2018); and (4) the importance of having conducted a thorough literature review for students' undergraduate theses are emphasized (Nagura, 2018). As for experiences related to graduation thesis writing abroad, (1) collaboration among students and supervisors are emphasized (McCartney, Clements, Cahalan, Johnson, & Pace; Sulandari, Prihartanti, Ali, Marida, Savitri, & Wijayanti, 2020); (2) the importance of supervisors' support, specifically in terms of taking the time to provide feedback for the students on their papers to build a strong academic foundation is emphasized (Jiang & Yan, 2020); (3) the importance of supervisors' support, especially in terms of helping students to conduct literature reviews well is emphasized (Herrström, Larsson, Einberg, Nilsson, Blomqvist, & Garmy, 2020; Suwito, Purwanto, Parta, Irawati, & Dika, 2019); fourth, the importance of supervisors' support through understanding each of their students uniqueness in educational background, interests, and academic abilities is emphasized (Arif & Huda, 2019; Zhang & Pramoolsook, 2019); fifth, the importance of each institution's stakeholders not limited to supervisors, to be aware of how the curriculum and coordination among the administrators, faculty, and staff influences the students' graduation theses quality is emphasized (Herrström, Larsson, Einberg, Nilsson, Blomqvist, & Garmy, 2020; Kalpokaite & Radivojevic, 2020; Perrella, Dam, Martin, MacLachlan, & Fenton, 2020; Rosyidi, Budiningsih, & Wakhid, 2019; Sun, Graves, & Oliver, 2020); and sixth, current research suggests that weaknesses in graduation theses of graduate students may be ameliorated if students had built a solid academic foundation during their undergraduate years (Ebadi & Pourahimadi, 2019; Farahian, Parhamnia, & Avarzamani, 2020; Ravari & Kok, 2019; Shahsavar & Kourepaz, 2020).

The similarities and differences, based on the summary in the previous paragraph is as follows. As for the similarities: (1) the important role of the supervisors in facilitating student learning is emphasized, particularly with the role of getting students to think critically, having students conduct a thorough literature review and providing clear feedback; (2) the importance of students' collaboration not only with faculty but with other sources of support are emphasized. As for the differences; (1) no specific amount of time spent for undergraduate students writing their theses abroad is mentioned for graduation theses writing

abroad, and collecting data for national or regional surveys may be of merit for practitioners guiding students in those nations or regions; (2) students' perceptions of the quality of supervisors' feedback has not been documented in Japan and can merit investigation particularly for faculty members in Japan to refer to in order to improve the quality of supervision in Japan; (3) there is an absence of literature focusing on graduation thesis instruction within the institutions' curricula in Japan, and research into how graduation theses are taught and analysis of the differences in the quality of students' output may shed light on the improvements tertiary institutions in Japan can make for thesis instruction; (4) there is an absence of literature on how graduation theses of graduate students are taught, and understanding how graduate students in Japan are taught can help inform faculty members teaching undergraduate students how to prepare students for graduate school.

Conclusion: Best practices for thesis instruction at the undergraduate level

While much remains to be researched to develop best practices for thesis instruction at the undergraduate level, implications based on available literature is worth noting for supervisors facilitating students to write graduation theses at the undergraduate level and administrators refining their institutional curricula for optimal student learning. First, current literature across the globe suggests the importance of the role of supervisors. It is advisable that each supervisor: (1) identify each students' academic background including research courses taken, abilities, and interests; (2) identify opportunities to collaborate with other sources of support aside from themselves for enrichment of students' learning; (3) train students to understand what to look for in their literature review search, have students examine previous literature critically and explain the literature in writing; (4) be conscious to provide clear and frequent feedback; and (5) carefully consider whether an independent thesis or having students write a thesis as a group is more appropriate considering the academic experiences, abilities, and interests of the students and the curriculum and the mission of the institution. For administrators, it is advisable to (1) continue to examine and refine how each course in the institution's curricula relates to aiding students' completion of their graduation theses (2) consider faculty development opportunities for supervisors and staff to guide students to complete their thesis writing, and (3) consider how collaborating with sources of support outside of their own institution can support students with their thesis writing development.

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Creative Learning Environment: A Collaborative Study Defining the Characteristics and the Adaptable Prototype

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Abstract
In teaching-oriented academic institutions, the focus is often mainly on teaching requirements rather than research components. Frequently, faculty have limited time to engage in research activities, and one of the strategies is to integrate empirical research into the teaching component. The purpose of this two-fold qualitative study was to generate creative learning environment characteristics and an adaptable prototype while engaging students in undergraduate research. The study took place at CIDA accredited interior design department, at American University in Dubai in the United Arabs Emirates. Two sections of twenty-two undergraduate Interior Design students in junior level studio voluntarily participated in the study led by two course instructors. The first step was to introduce the project and its relevance, and to provide background knowledge. Herman Miller Research Center contributed with contents and resources. Students participated in a variety of data gathering. Based on the analysis of the data, spatial layouts were elaborated, facilitating the faculty's definition of creative learning environment characteristics and adaptable prototypes, shaped as regular modular forms allowing further module addition as the learning identity and its needs grow. As a creative learning environment needs to accommodate a variety of learners and adapt to different learning topologies (Hoy, 2013), three major characteristics were identified: flexibility; comfort and wellbeing; and technology. Students were exposed to an advanced level of research study that has provided preparation for a senior thesis project, while fulfilling program learning objectives.

Keywords: Creative Learning Environment, Learning Experience, Adaptable Learning Prototype

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Introduction

Creative Learning Environment (CLE) is a study on formulating creative learning environment characteristics and producing an adaptable prototype. The focus is on creative Studio learning environment that is applicable to any major that employs active learning student center model of teaching.

In teaching-oriented academic institutions, the attention is often predominantly placed on teaching requirements rather than research components. Frequently, faculty have limited time to engage in research activities, and one of the strategies is to integrate empirical research into the teaching component. Certainly, there are other strategies, but this methodology is allowing to perform effective teaching activities in a more efficient timely way.

In addition, this approach allows faculty to participate in academic research while providing valuable lessons to students (Shields et. al, 2020). The strategy is focused on undergraduate components in an academic environment. With the abundance of available information, it is important to educate students as early as possible on the methods of retrieving the research information, on the quality of resources and data, and most importantly, on how to analyze and apply located data. Undergraduate research is an element that is being woven in any undergraduate courses, for any major, not just English learning course, but also major specific courses. In this study, undergraduate research methodology was used with junior level students majoring in Interior Design as participants.

The study took place at CIDA accredited interior design department, at American University in Dubai in the United Arabs Emirates. CIDA is Council for Interior Design Accreditation, an independent, non-profit accrediting organization for interior design education programs at colleges and universities in the United States and internationally. From CIDA Mission: “The Council for Interior Design Accreditation advances the interior design profession as the definitive source for quality standards and accreditation in higher education” (Council for Interior Design Accreditation, 2022).

The two studio sections involved twenty-two undergraduate Interior Design junior level students. They voluntarily participated in the study led by two course Professors, Prof. Annamaria Lambri and Prof. Natalia Albul. Students received detailed information about the study and acknowledged their participation. The purpose of this two-fold qualitative study was to analyze the typical learning environment, engaging students in undergraduate research and defining innovative creative learning environment characteristics, developed then on an adaptable spatial model/prototype.

The first step was to introduce the project and its relevance, and to provide background knowledge. Then, the work on the studio project had begun. First, the lectures were provided by faculty and special seminars were presented by Herman Miller Research Center. Herman Miller is a leading worldwide office furniture Company with a research-based approach implemented by his highly informative and active Herman Miller Research Center. Many resources were available to students to gather data and academic research strategies were reviewed. Students began the process of literature review about the innovative classroom design.

Another form of data was assigned to gather for students – their own perception and evaluation on their individual experience at their high schools in terms of space configuration

and benefits. It was a successful assignment that culminated in a great studio discussion. Students also researched and reviewed existing literature on innovative classroom design and existing successful studio classroom layouts. Each student had an option to focus on specific aspects of studio design. Next step was to create a survey and administer that to students, staff, and faculty on the aspect of studio design. The final data step was for students to elaborate an analysis paper where they combined their personal experience, literature review and conducting surveys, narrowed down to their understanding the characteristics of an ideal creative studio environment.

Students presented creative learning environment characteristics. The culmination of the project was a spatial solution that students designed based on the analysis. Students produced design of creative studio learning space with modules 10x10 meters combined as suitable for their concept. Modularity was used as relevant for the project to identify the areas and make it interchangeable for the definition of the prototype.

After students completed their work, faculty engaged in their research part, after the course was completed. The faculty evaluated students' analysis reports, reviewed, and supplemented literature reviews, and evaluated successful spatial examples. Following all evaluations and analysis, Faculty produced a final set of creative learning environment characteristics and an adaptable prototype.

During the complex process with undergraduate research components, faculty researchers have formulated creative learning environment characteristics and an adaptable prototype. Students were exposed to an advanced level of research study that has provided preparation for a senior thesis project, while fulfilling program learning objectives.

Foundation Research

To understand how university learning spaces were formed and developed, it is important to understand the model of the educational learning spaces that was present at the school settings for the children. At least some elementary form of education was compulsory in Europe and after 1600s in the United States.

Most of the layouts of the schoolhouses were rectangular or square one room buildings that contained rows of tables and chairs for scholars of varied ages. Boys and girls were separated within the one room learning space and often had separate doors to use to access the schoolhouse (Cummings & Miller,1868). The conveniences were present outside and were simple outhouses. Even though the model of rectangular schoolhouses was dominant with the teacher in the head of the classroom, a few other forms were present such as octagonal shapes or rounds shapes (Randall,1868). The octagonal and round shapes layouts positioned teacher in the center with his or her pupils around, it promoted more active learning environment, but was not a common form (Da Silva, 2018).

This typology was transferred to the university classroom in the early American post-secondary institutions and in Europe. When Harvard College was founded in 1636, the first campus building that was devoted to instruction had a typical classroom layout as in one room schoolhouses. This type of space warranted passive instruction, where the teacher was located at the front of the room and students remained seated for lecture (Folkins, et. al., 2015). Due to the space minimal interactions had occurred between teacher and students or between students themselves. Casual interactions absent in the classroom typically occurred

in secondary spaces such as corridors or hallways or other areas of common encounters (Da Silva, 2018).

This traditional form of the learning spaces is still highly dominant in the higher education institutions and while it works for certain types of educational instructions, it is not appropriate for the student centered or active learning.

There is a variety of learning spaces present on a typical university campus such as standard classroom environment with rows of chairs and tables and instructors' station at the head of the room, as just mentioned; classroom environments with loose furniture that allows for collaboration and suitable for active learning; lecture halls; auditoriums; seminars; and computer or technology classrooms (Arizona State University, 2011; University of Connecticut, 2016).

In this study the focus is on the second type of learning space mentioned - classroom environments with loose furniture that allows for collaboration and suitable for active learning or as studio spaces where practicum learning instructions take place such as studio space for creative majors. However, this type of space could be used for any major that requires an active style of learning.

Learning takes place in other spaces rather than just the classroom itself. To have student centered spaces, there is a need to provide components for the spaces to exist. As a creative learning environment needs to accommodate a variety of learners and adapt to different learning topologies (Hoy, 2013), three major characteristics were identified: flexibility; comfort and wellbeing; and technology.

Classroom flexibility is especially important for learners. An ability to change furniture to accommodate for a variety of the classroom activities can create an engaging environment that will support different student learning personalities and styles (Gurzynski-Weiss, et. al, 2015). Moreover, an ability to rearrange furniture based on the activity promotes learning and gives more power to students (Sinem, et. al, 2016).

Comfort and wellbeing depend on ergonomic furniture that can be adjusted to individual user's needs (Hoy, 2013). Building systems are critical for providing a healthy learning environment. Appropriate HVAC systems that support comfortable temperature and humidity levels, and functional lighting systems that create suitable lighting levels are important for overall health standards. It is imperative to incorporate technology into a classroom environment to create inclusiveness and to provide seamless interactions for in-person and distance learning.

According to Herman Miller study related to the impact of design on student learning outcomes and overall learning experience in higher education, the quality of the general student's experience is becoming increasingly important to strategically incorporate goals of higher education institutions. The questions of "What matters?" identifies the key relevant elements impacting the relationship spaces and learning experience: basic needs, sense of belonging, learning outcomes, workplace readiness, and sense of ownership (Herman Miller UK Research Center, 2019).

Basic needs include security and autonomy that allows students to have freedom of actions and decisions. Status as recognitions for contributions and achievement as strive for

excellence and purpose for the spaces are all basic factors required for the space to be functional.

A sense of belonging provides connections with space and with other students and professors. Educational environments should enhance academic performance, learning and collaboration. Learning space should be the place that students find enjoyable and would want to stay there. Learning outcomes are linked to the spaces as the learning environment is the physical aspect of the process of achieving students' and institutional goals. Workplace readiness is the learning environment space that focuses on ease of use. Finally, a sense of ownership is the ability to personalize and provide flexibility.

Development of a Modular Prototype

Based on data, research and study faculty were able to define the Modular Prototype and its characteristics. The adaptable prototype is a vibrant place that supports knowledge and innovation based on creative learning environment characteristics. It is shaped as a regular modular form facilitating further module addition as the learning identity and its needs grow, envisioning constant expansion in contents, and learning spaces. It is a hybrid model inspired by principles of Distributed Collective mode (focusing on participation and collaboration) and Distributed Individual mode from the Modes of Learning Framework by Prof. Richard Elmore, Research Professor at the Graduate School of Education, Harvard University (Elmore, 2018).

The model is based on a “hub” concept where learning experiences happen in various forms and learners have choices; it is developed in both physical and digital means.

The model has a strong identity. It supports knowledge and innovation based on constructive collaboration and contributions linking learners, academia, community, industry, and society at large, benefiting all the parties involved and the overall development of the main domain. It is a recognized space where learning opportunities and experimentation of new and alternative forms of learning are fostered and in constant development.

The aim is to create a physical and virtual space perceived as familiar and comfortable for learners, where learning is easy and natural. It promotes a sense of community, collective and individual learning based on the field of interest with multidisciplinary inputs. The Learning experience is enhanced by exchanges, links, connections, collaboration and networking, empowering members as active participants and contributors. Learning opportunities are many, reinforced and supported by the model itself: teamwork and/or individual work, guided learning and/or learning self-reliance, physical and/or remote. Activities are both structured, coordinated, and spontaneous.

The model welcomes and encourages members’ inputs in a spirit of collaboration and advancement. The Learning space, both physical and digital, provides various and dynamic forms of learning through flexibility, personalization of experience and adaptability, nurturing learners' well-being and fostering a lifelong learning mindset. It responds to learning and needs with transformation and modification. Exploration of new and innovative learning opportunities is supported, helping to grow the overall learning experience.

Prototype

The adaptable prototype includes innovative creative learning environment characteristics. As previously mentioned, it develops through modules facilitating further modules addition as the learning identity and its needs grow. The prototype is based on a few main conceptual Zones, identified by key words: Learn, Explore and Think Zone; Design and Produce Zone; Co-Working Zone; Meet and Relax Zone; and Garden Zone. The zones are all equipped and part of the general concept, boundaries are limitless and often merge.

- Learn, Explore and Think Zone focuses on individual and collective research and study.
- Design and Produce Zone focuses on creative activities, innovation, designs providing specific labs.
- Meet and Relax Zone focuses on meeting, entertainment, gathering and networking, socialization, it may contain food and beverage outlet/area. It also includes lounge areas and, occasionally, recreational activities.
- The Garden Zone is where activities are developed in a green environment with trees and grass. The internal layout can be adapted to fit more specific needs. It focuses on exchange forums, exhibitions, displays, local initiatives, design initiatives involving the community and industry, and seminars. These activities may also be in other zones.
- Outdoor Zone focuses on various-use external zones, fostering social interactions and potential collaborative initiatives. Internal and external areas often merge.
- Co-working Zone focuses on professional work, interaction, collaboration, and networking.

The overall space is developed in consideration of human factors. Physical human factors: the physical location allows easy and comfortable multi-use with effortless adaptability and flexibility. It considers internal see-through partitions, movable or foldable panels enabling different space configurations when needed. Enclosed areas are for services such as toilets. Learners are encouraged to shape the space by moving the furniture for the creation of different zones diversifying the learning options, different typologies of ergonomic furniture are provided. In addition, modular and movable individual acoustic pods are available for individual or team use.

Elements of biophilic design and sustainability are also introduced. The relationship with nature contributes to physical, emotional, and general human well-being and stimulates motivation. Natural light is present, artificial light will be sustainable and chosen based on similarities to natural light. Focused attention is on acoustic solutions for noise control and temperature control, to allow a pleasant experience. Smart design strategies and technologies are implemented as well. The link with the territory is achieved through design references. As an example, being in Dubai UAE, a reference to the culture may be accomplished by adopting typical *mashrabiya* see-through panels and patterns, as reminders of the local context. The general colors are soft and natural. The members, integral actors in the space definition, are encouraged to personalize and “color” the space through work display (both digital and physical), in a continuous evolution and modification. Space is alive, the learners “live” the learning experience, they are proud to be part of it and to contribute to its development. This strengthens the sense of community and belonging.

Cognitive human factors: learners are actively involved in problem-solving; they exchange and challenge their knowledge through positive interactions, links, and connections. The space (physical and digital) supports these factors and stimulates motivation along with engagement, creativity, reactiveness, and constructive critical thinking, shaping powerful comprehensive learning experiences where knowledge is gained naturally.

Social human factors: social interactions are sustained and promoted at various levels and with different modalities. Both the physical and digital model foster an exchange culture based on constructive connections and collaborations.

Cultural human factors: mutual interests and goals contribute to shaping the norms, the habits, and values of space. The member contributes to values development.

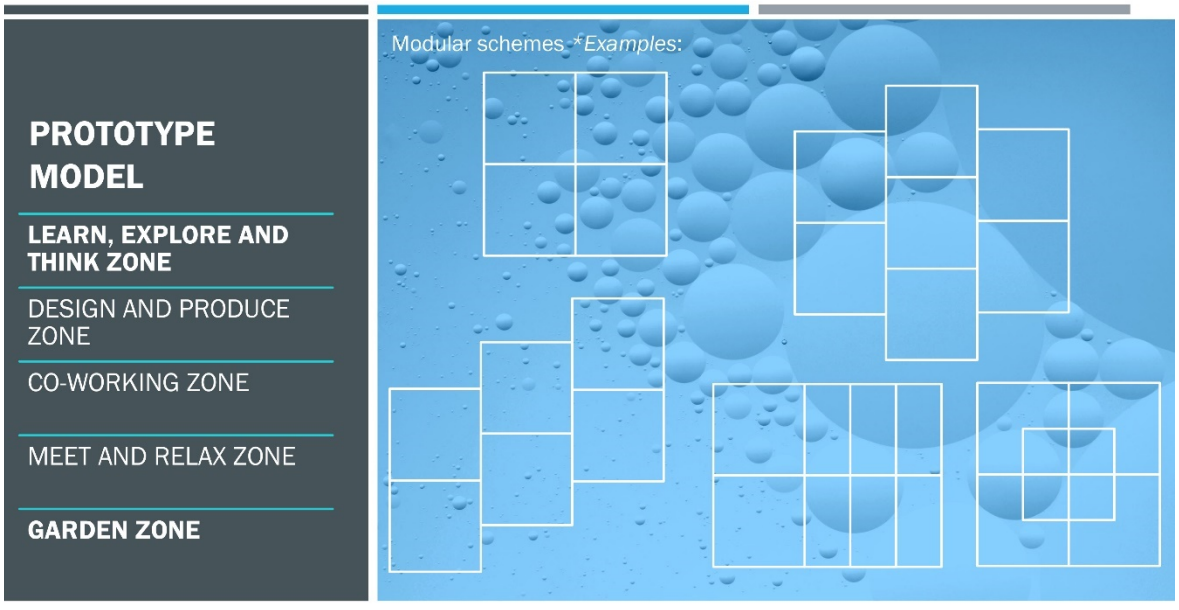
Emotional human factors: the learning model develops a sense of belonging and positive attachment. They feel free to express themselves, they are guided to achieve their full potential. The community is important to create constructive experience and raise confidence.

Space allows face-to-face interactions or other hybrid solutions. Digital space is the translation of physical area in remote modality through interactive digital platform. This is an opportunity to expand the concept internationally for unlimited knowledge exchange. Physical and digital spaces are linked together and supported by the digital platform.

Students' Case Studies of Modularity Schemes

The following are a few examples of students' development based on modular units, including Research and Project phases.

Figure 1. *CLE Prototype Model with Examples of Modular Schemes*



The case study one model focuses on inclusion, effective technology and biophilic design. There is relevance to wellbeing, physical and mental wellness. Areas of the overall space include pavilion, collaborative area or open classroom, individual areas, patio, vertical seating, library, horizontal library.

Figure 2. *Research Phase of Case Study 1*

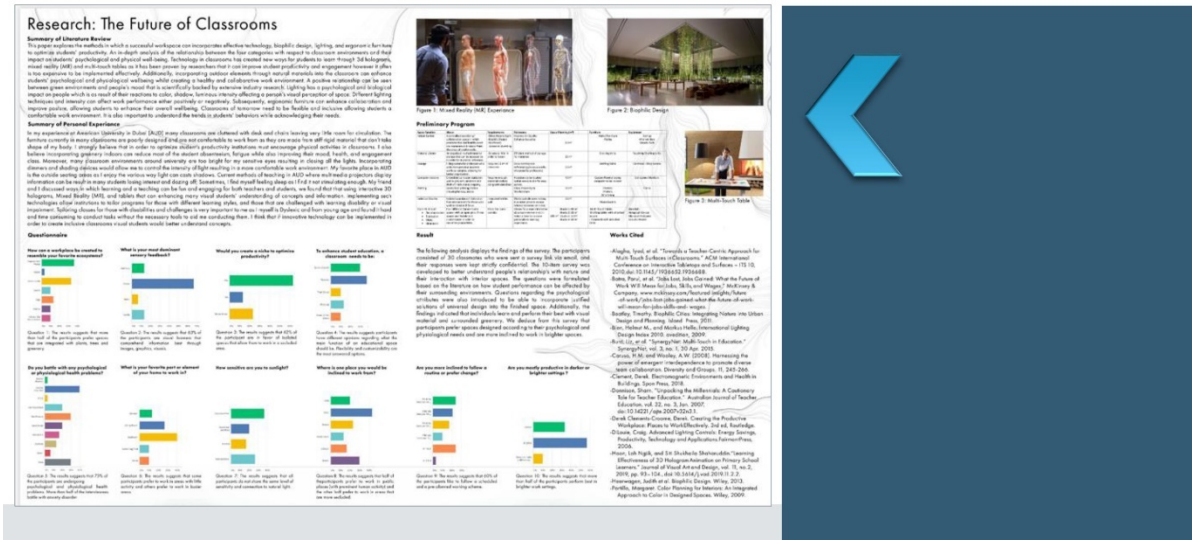
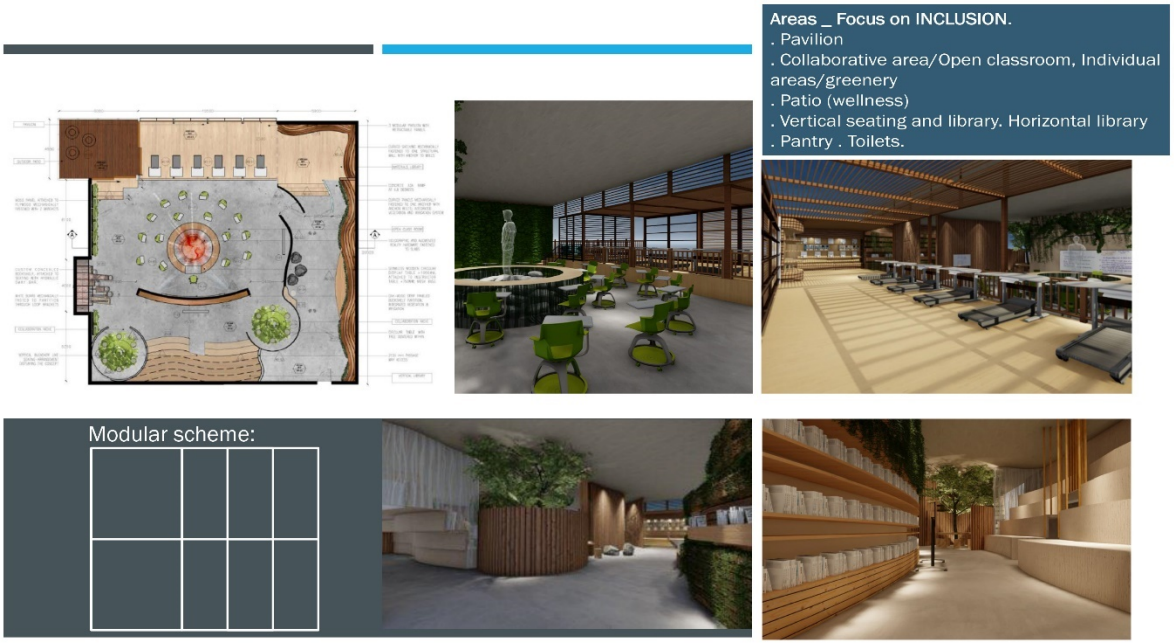


Figure 3. *Project Phase of Case Study 1*



The case study two focused on flexibility as the main trait. The areas that were included were open shared central working area, ground and mezzanine floors with vertical circulation, personalized working pods and individual areas, students lounge, workshop design area and co-working area.

Figure 4. *Research Phase of Case Study 2*

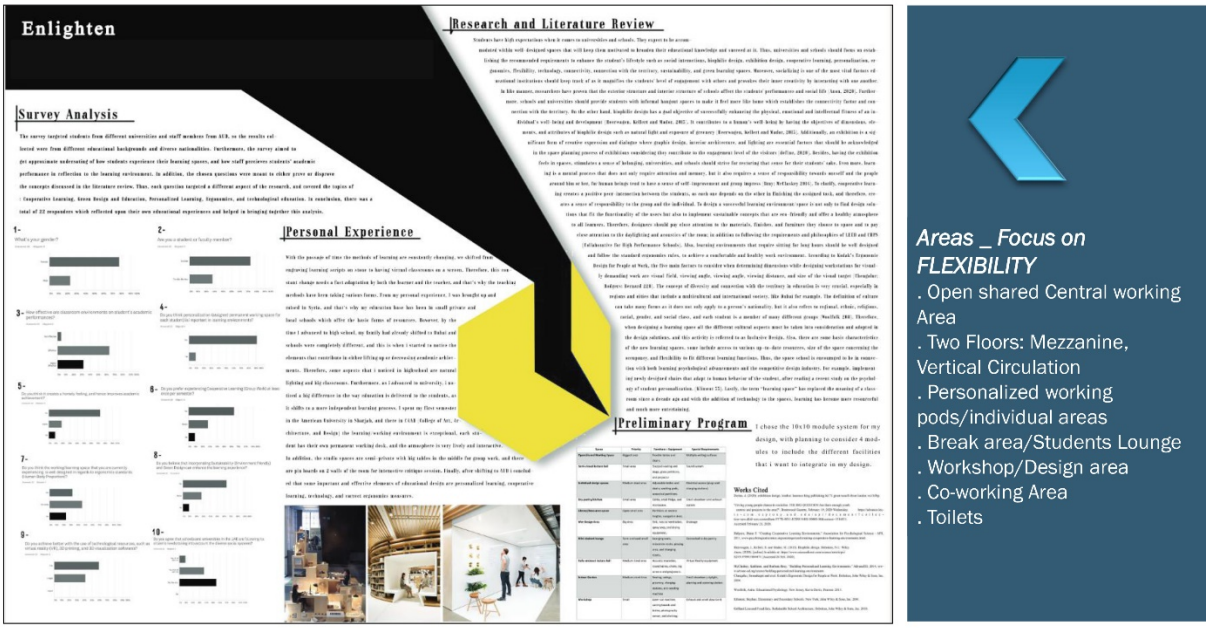
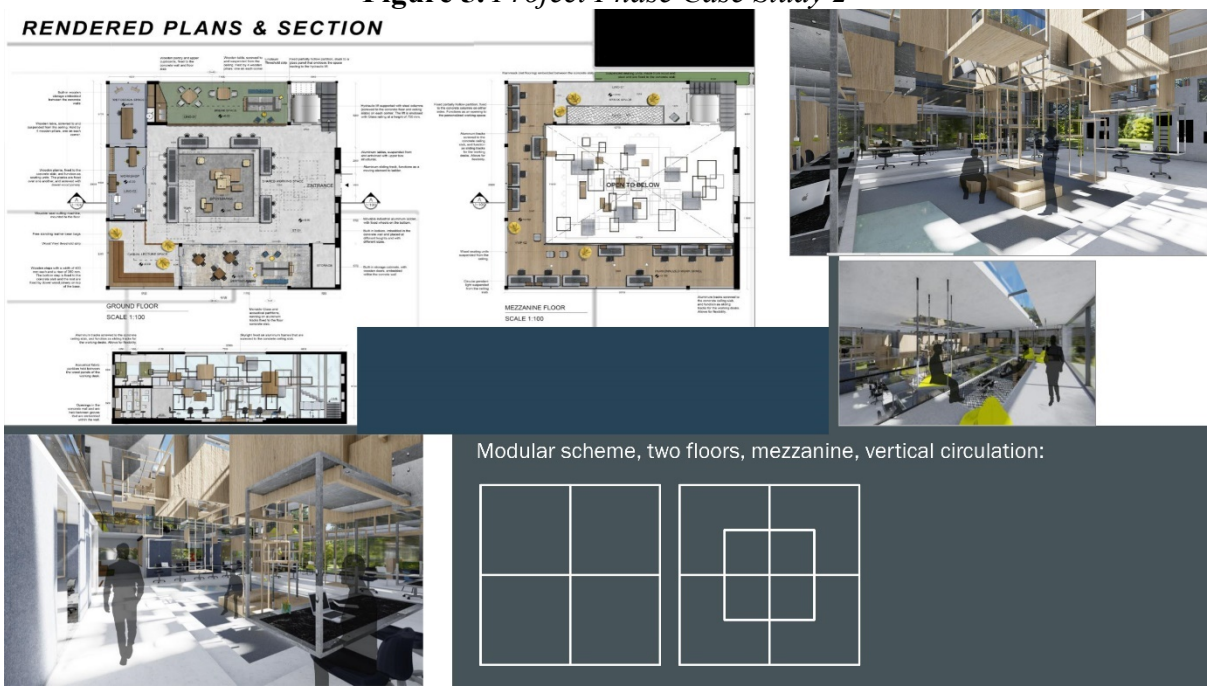


Figure 5. *Project Phase Case Study 2*



The case study three, model with focus on modularity has included the areas of open shared central exhibit area, open space, personalized working pod and individual areas, break area and student's lounges, outdoor area, and co-working area.

Figure 6. *Research Phase Case Study 3*

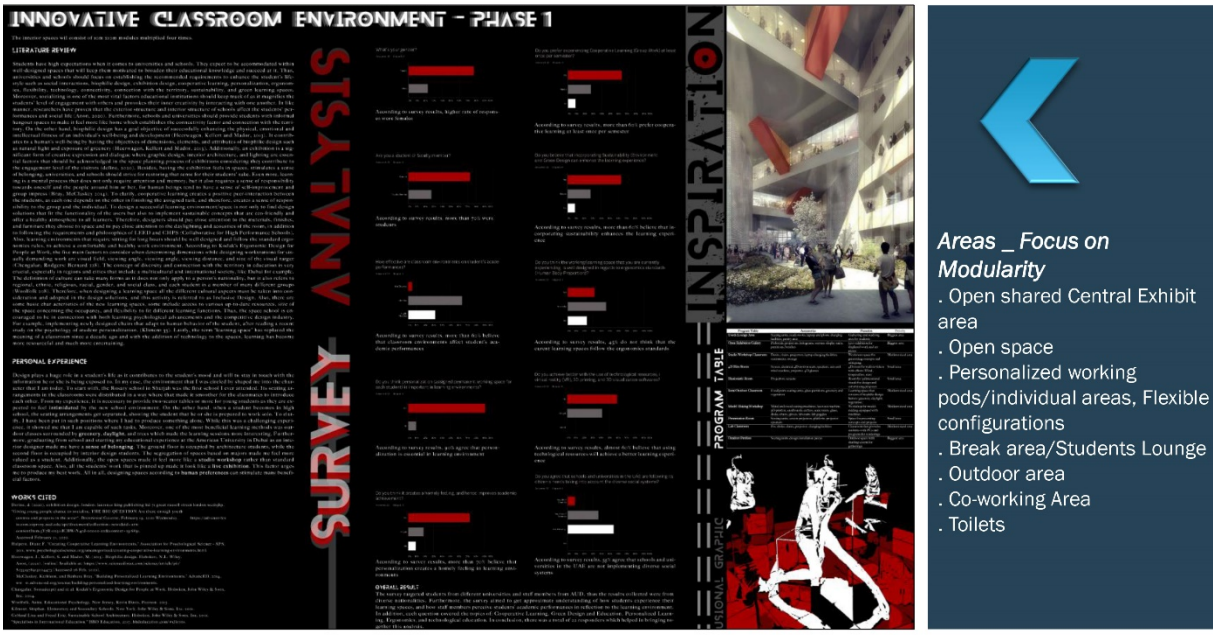
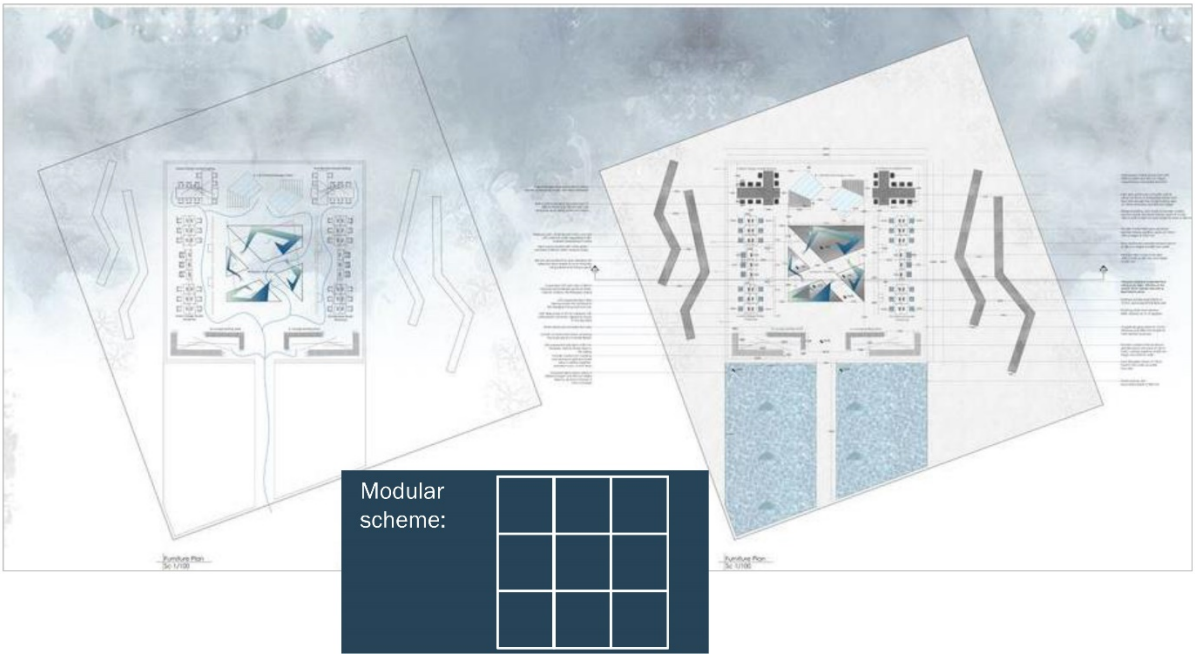


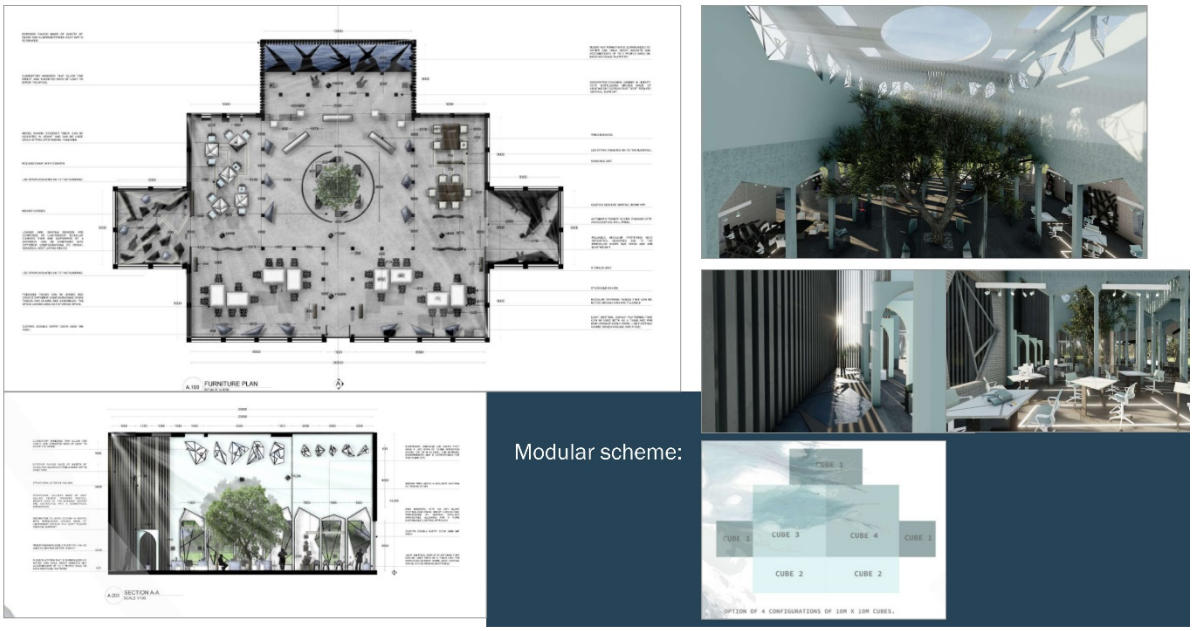
Figure 7. *Project Phase Case Study 3*



The case study four. model with focus on meditation and senses, introduced elements of meditation and worship spaces. Other areas were the garden, exhibit area, open space, sensorial area, collective studio area, individual areas, break area and student's lounge.

Figure 8. *Research Phase Case Study 4*

Figure 9. *Project Phase Case Study 4*



The concept may be developed based on different geometries as well, still following the modular structure. The following are a few examples. The case study five is a model with a focus on circular centralized space organization, which allows flexible use, technology incorporation, with natural lighting and circular space organization. The focal point of the space is on the central element dividing the area in functional spaces through rays. The areas included are studio, workshop, library, graphic and photography space, meditation and spiritual area, individual areas, students lounge.

Figure 10. *Research Phase Case Study 5*

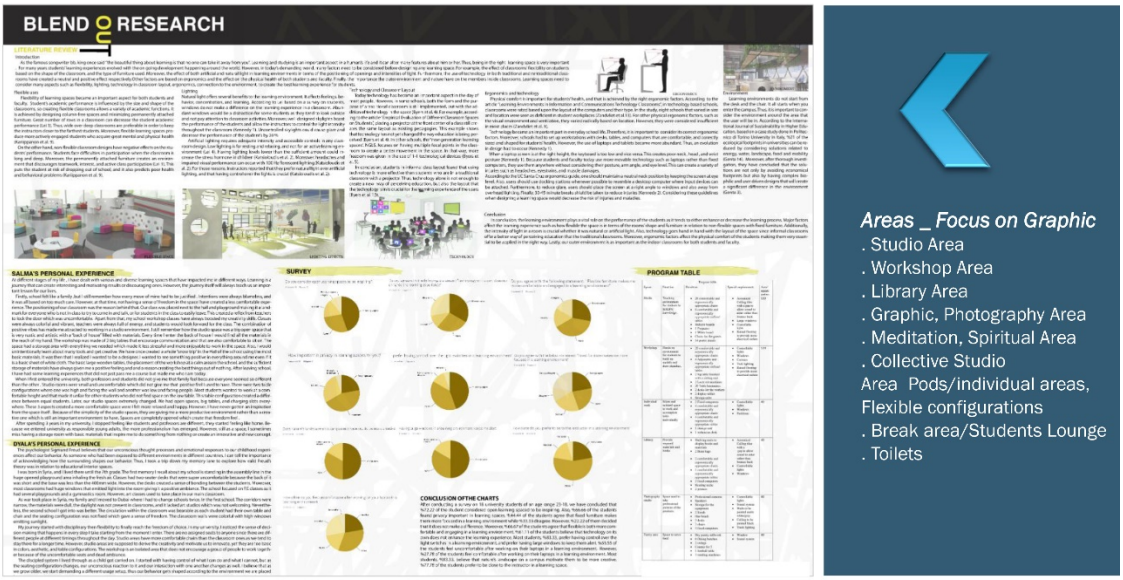
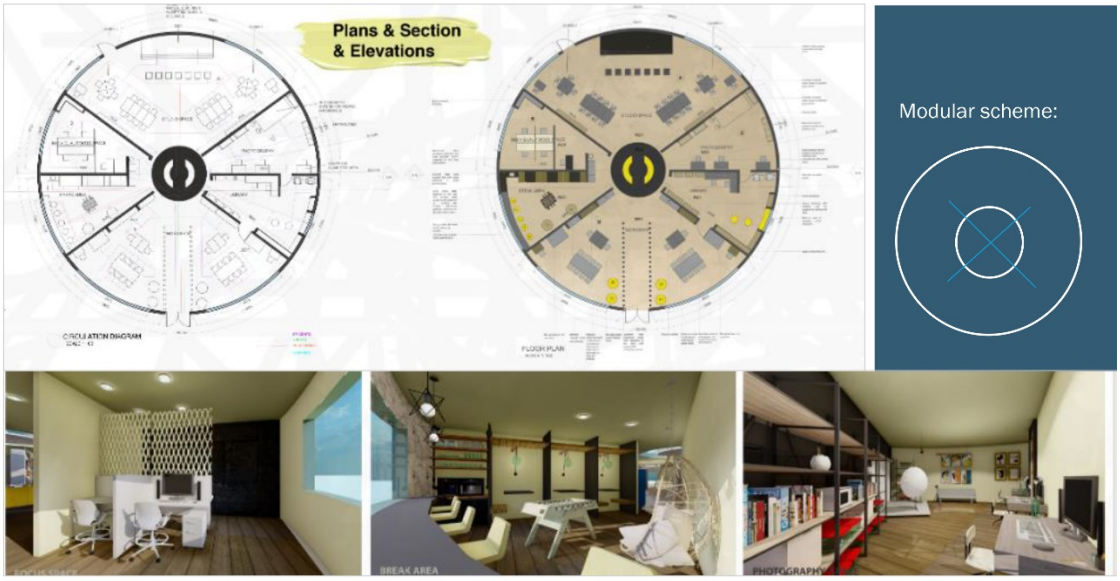


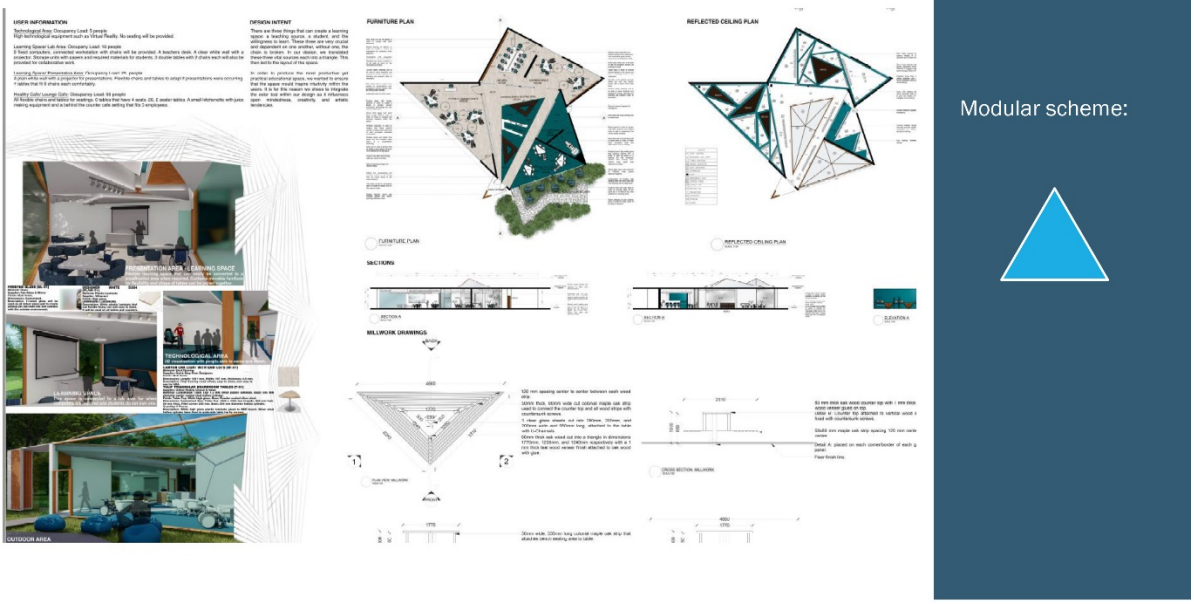
Figure 11. *Project Phase Case Study 5*



The case study six, model with focus on triangular shape that is combining inside and outside. It allows flexible use, with technological incorporation, and with focus on outdoor elements. Areas: studio learning space, exhibit area, technology area, outdoor area, food consumption area.

Figure 12. *Research Phase Case Study 6*

Figure 13. *Project Phase Case Study 6*



Conclusion

Higher education learning spaces have been developing for many years. They started as basic traditional one room schoolhouse spaces and evolved into innovative spaces that can accommodate a variety of users and their needs with the use of technology and flexible furniture. The rigidity of the traditional classroom with the rows of table and chairs still exists and is still needed but gives way to the new shape and layouts that respond to the requirements of the curriculum, faculty, and students. The trends of technology incorporation and inclusiveness, student centered collaboration spaces all work together to create a successful learning environment. Modularity of the spaces can accommodate all those needs.

The learning environment plays a vital role in the experience of the students as it tends to either enhance or decrease the learning process. Major factors affect the learning experience such as how flexible the space is in terms of the rooms' shape and furniture in relation to non-flexible spaces with fixed furniture. Additionally, the lighting levels, temperature and humidity directly influence the comfort of the users of the spaces. Ergonomic factors affect also the physical comfort of the students. Technology goes hand in hand with the layout of the space since informal classrooms offer a better way of processing information than the traditional classrooms. Lastly, exterior environment is as important as the indoor classrooms for both students and faculty. The creative learning environment prototype seeks to accommodate these requirements and provide excellent experience for faculty and learners. It is also suitable for distance learning: digital space allows this form of learning while the physical place is easily adaptable to safety and social distance norms.

In conclusion, learning modes and spaces, virtual and physical, are changing. The recent COVID19 pandemic has accelerated the shift to digital learning opportunities in parallel to physical learning experience. The demand for alternative learning opportunities is growing, redefining the learning spaces.

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Facilitating Students' Transition to Higher Education: Interlinking Engagement Analytics and Digital Mediation

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Official Conference Proceedings

Abstract
Higher Education Institutions' approach to monitoring, managing and maintaining student engagement is evolving, accelerated by the Covid-19 pandemic and aligned prevalence of blended learning models. "Digital mediation", i.e. the use of digital and analytic tools by higher education staff in managing, monitoring and maintaining students' engagement, offers new opportunities in how interpersonal communication is facilitated and student data is collected. However, optimising its utility and effectiveness necessitates continually calibrating how digital and in-person engagement can be reciprocally and seamlessly integrated into student experiences. Here, University College Dublin's 'Live Engagement & Attendance Project' (UCD LEAP) has developed an online engagement monitoring resource providing Student Advisors with real-time programme-level engagement data. This resource supports them in providing students with timely and tailored interventions following potential disengagement. The purpose of UCD LEAP is twofold: achieving a more comprehensive picture of the student experience than would be available within module-specific engagement metrics, and helping staff create additional pathways for digitally-mediated student support. This paper explores ongoing learning from UCD LEAP, alongside the growth, evolution, and institutional embedding of digitally-mediated support interventions in higher education.

Keywords: Digital Mediation, Engagement, Attendance, Data Analytics, Student Support, Student Advisor

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1.0 Introduction

While navigating their journey through higher education (HE), students encounter a variety of issues, tasks and obstacles as they strive to become self-directed learners with the competencies for societal engagement and employability (ESRC, 2014; Knight & Yorke, 2003).[1] How students respond to these challenges can affect their subsequent ability and willingness to participate effectively in their chosen programme (Glynn, Aultman, & Owens, 2005) and their aligned susceptibility to retention issues (Burnett, 2007). Here, students' healthy engagement with their higher education institution (HEI) underpins their psychosocial and academic development (Balwant, 2018; Kahu & Nelson, 2018; Kahu, Stephens, Leach, & Zepke, 2015; Macey & Schneider, 2008), and is crucial in fostering the characteristics and competencies to address these challenges. Consequently, during their transition into HE, students often require proactive social support (Maymon, Hall, & Harley, 2019) to meet the demands of programme integration, such as 'independent learning, living and navigating new social environments' (Thompson, Pawson, & Evans, 2021).[2]

Against this background, ongoing digital and analytic resource innovations continue to shape the design and delivery of student support and services (Karkouti & Bekele, 2019; Underwood & Anderson, 2018) across areas such as information, referral and resource provision (Cutrona & Suhr, 1992). There are a number of factors contributing to the proliferation of digital-centric engagement, including pedagogical necessity in the wake of COVID-19 (Godber & Atkins, 2021; Salah-Eddine, 2020), advances in technology (Karkouti & Bekele, 2019; Srinivas, 2018), and institutional/organisational mandates (European Commission, 2021; University College Dublin, 2020). Thus, in addition to on-campus opportunities for educational and social exchanges already offered within HEIs, staff-student interfaces are occurring remotely. Digital mediation, which we define as the use of digital tools and analytics by HEI staff in managing, monitoring and maintaining students' engagement, has been instrumental to this process. Alongside its practical applications in reshaping staff-student interactions across academic, advisory, and administrative domains, digital mediation is vital in rethinking interpersonal engagement as comprising in-person and digitally-centric forms of interaction.

In this paper, we present ongoing insights from University College Dublin's 'Live Engagement and Attendance Project' (UCD LEAP) from the academic years 2019-2022. This project explores the feasibility of a blended student support model that integrates real-time insights from monitoring virtual learning environment (VLE) engagement with the provision of student support services. We explore digital mediation's status within the ambit of student services and support by reevaluating the binary between digital and in-person engagement and reframing these communication methods as existing on an interpersonal continuum. Here, we assess the potential contributions this support initiative can make to enhancing Student Advisors' (SAs') capacity to identify and intervene when disengagement occurs and provide recommendations on how digital mediation strategies can be integrated into HEIs' organisational practice.[3]

[1] In UCD (2015), it is noted that 'Entering university…brings very significant challenges for first-year students who need to become used to an educational environment where they are expected to function as independent and self-motivated learners'.

[2] Albrecht and Adelman (1987) define social support as communication that reduces forms of uncertainty, functioning to augment perceived personal control. Lakey and Cohen (2000) also note that social support can contribute to people's health by protecting them from the adverse effects of stressful experiences.

[3] Student Advisors (SAs) are UCD staff who provide advisory and support services to students.

2.0 UCD LEAP Overview

University College Dublin's "Live Engagement & Attendance Project" (UCD LEAP) is hosted by the School of Veterinary Medicine at UCD. It comprises ~300 students across four class cohorts in 1st-year and one class cohort in 2nd-year. As of the 2021/22 academic year, it has expanded to the School of Science at UCD, encompassing ~1000 additional 1st-year students. UCD LEAP assesses the contribution digital and analytic tools can make to enhancing student support provision and fostering engagement, particularly during students' transition into HE. Specifically, we seek to interlink digital engagement resources and analytics with student advisory supports, aiding in timely and targeted disengagement interventions. Alongside assessing the feasibility of this resource, we examine the principle and practice of student engagement against recent technological developments in HE services and supports.

To achieve this objective, we have developed a VLE engagement reporting tool that collects and disseminates weekly programme-level data on components of students' engagement activity. Data is derived from UCD's VLE Brightspace, which offers the functionality to capture descriptive data, including the volume, time, and length of students' topic/content access per module.[4] From these metrics, student "at-risk" flags are generated to identify potentially disengaged students from two key factors: VLE long-in and module access frequency.

As UCD LEAP is undertaken as a UCD Student Advisory Services initiative, this data is provided to the designated SA, who has discretion over how they action student insights based on considerations such as extenuating circumstances and recent engagement records. The SA, a designated "Trusted Person" for students, can then arrange personalised, one-to-one follow-up sessions and refer to specific supports on an as-needed basis.[5] Alongside facilitating direct SA interventions, the project also addresses pedagogically-orientated questions on the functionality of VLEs, including whether high VLE usage correlates to high GPA attainment and the converse. Macro-level insights on whether early and consistent student access to VLE material is more beneficial from an assessment perspective than late and variable access is also examined. Similarly, this data may also offer an understanding of whether the volume or type of topics Module Coordinators (MCs) provide in their dedicated VLE module space relates to assessment outcomes.

3.0 Student Engagement in Higher Education

HEIs are tasked with preparing students for professional practice and societal engagement by delivering dynamic and formative educational experiences (Bowden, Tickle, & Naumann, 2019; Kahu, 2013; Kahu & Nelson, 2018; Kahu et al., 2015). Engagement is at the heart of this mission and a crucial characteristic of high-quality teaching & learning (T&L) (Ashwin & McVitty, 2015). It enables students to integrate into their education community, meet the psychosocial demands of their programme, and work with their HEI to become self-directed learners. Kuh (2001) states that student engagement consists of 'Participating in educational practices strongly associated with high levels of learning and personal development'.

[4] While the volume and frequency of access indicated student engagement levels, the time-in-topic metric was considered less significant given difficulties in accurately verifying whether this time was spent consciously internalising the learning material.

[5] The Trusted Person Project is undertaken by UCD Agile, to contribute to UCD's student support ecosystem.

Engagement occurs in numerous areas across students' 'educational interface' (Kahu & Nelson, 2018); within curricular and non-curricular contexts (Krause, 2011). While it offers students a range of academic and psychological growth opportunities, it requires participating in demanding situations, tasks, and interactions. For example, there can be external obstacles relating to logistical, organisational, and cultural aspects of the educational environment, e.g. navigating timetables, adhering to learning/assessment benchmarks, and integrating into social groups (Chipchase, Davidson, Blackstock, & Bye, 2017; Denny, 2015; Kahu & Nelson, 2018). Additionally, internal obstacles may be related to developing the skills and personal characteristics needed to practice self-directed learning.

Student engagement is multidimensional and comprises interconnected capacities that come together to produce a holistic psychosocial experience. Drawing on the literature, we present provisional descriptions of five such components of engagement (Blumenfeld et al., 2005; Bowden et al., 2019; Christenson, Reschly, & Wylie, 2012; Eldegwy, Elsharnouby, & Kortam, 2018; Fredricks, Blumenfeld, & Paris, 2004; Fried & Konza, 2013; Kahu et al., 2015; Khademi Ashkzari, Piryaei, & Kamelifar, 2018; Klem & Connell, 2004; K. L. Krause & Coates, 2008; G. Kuh, 2006; Lay-Hwa Bowden, 2013; Mahatmya, Lohman, Matjasko, & Farb, 2012; NCESS, 1992; Nguyen, Cannata, & Miller, 2016; Reeve, 2012, 2013; Reeve & Shin, 2020; Reeve & Tseng, 2011; Reschly & Christenson, 2012; Schaufeli, Salanova, González-romá, & Bakker, 2002; Vivek, Beatty, Dalela, & Morgan, 2014; Wentzel, 2012; Yazzie-Mintz & McCormick, 2012):

i. Cognitive Engagement: The student intellectually invests in their learning process. This engagement is practiced through self-regulating one's learning and mentally challenging oneself during the process of acquiring, internalising and applying the knowledge and skills needed to advance learning.
ii. Behavioural Engagement: The student participates in learning and development activities. This engagement is exhibited through being a productive and involved member of one's HEI across educational and extracurricular domains, alongside demonstrating academic achievement.
iii. Affective Engagement: The student feels personally connected and emotionally invested in their HE experience. This engagement is expressed by valuing and cultivating one's HEI experience, including being enthusiastic and optimistic about it contributing to one's personal and professional development.
iv. Social Engagement: The student identifies with, and healthily interacts with, significant others within their HE environment. This engagement is reflected in becoming embedded within and developing a sense of belonging toward one's HE social context.
v. Agentic Engagement: The student constructively attempts to contribute to their learning and development experience. This engagement is manifested in proactively and collaboratively making decisions on the nature and content of one's HE experience.

Engaged students discover, deploy, and develop their personal and environmental resources to foster constructive relationships with their educational community (Ecclestone, Biesta, & Hughes, 2009; Fredricks et al., 2004; Kahu, 2013; Phan, 2014; Yazzie-Mintz & McCormick, 2012) and undertake psychosocial and academic development. Numerous departments and domains within HEIs are responsible for ensuring students' needs are adequately met, including academic services and resources, information and communications technology infrastructure, administrative facilities, and student support. UCD's Student Advisory Services, in particular, provide resources enabling students to healthily and productively participate in their HEI community; in particular, they collaborate with students to identify personal engagement barriers and enhancers, and tailor supports accordingly.

Different strategies can help foster HE transition, such as supporting students to develop the internal mechanisms to engage and create an *external* environment conducive to holistic participation. To enable such supports, SAs' role spans academic, administrative, and pastoral spheres embedded within an institutional, professional network, including careers, counselling, disability, health services, and academic support. Inter-departmental embeddedness is a central component of SA services, particularly in enabling the social and academic resources which strengthen transition and retention (Fergy, Marks-Maran, Ooms, Shapcott, & Burke, 2011; Tinto, 1987). An example of an approach to harnessing students' internal capabilities is providing them with the relevant guidance and resources to help foster self-directed learning. Self-directed learning comprises actively gaining greater control over one's learning by taking responsibility for planning, initiating, maintaining, and evaluating learning activities (Merriam & Baumgartner, 2020; Wilcox, 1996). Specifically, it can encompass shaping one's education objectives and academic resources, materials, and methods (Knowles, 1975; Olivier & Wentworth, 2021), either collaboratively or independently. Regarding creating an engagement-conducive environment, SAs are instrumental in assisting students in establishing and maintaining meaningful relationships with peers and faculty (Fergy et al., 2011) through numerous social initiatives, e.g. group events, peer mentoring programs and academic liaising.

4.0 Digital Mediation

We define "digital mediation" as the use of digital and analytic tools by HEI staff in managing, monitoring and maintaining students' interactions and engagement. In addition, these resources are incorporated into their HEI's digital architecture and are integrated into stakeholder communications. Digital mediation now supplements and substitutes for in-person activities across pedagogical and pastoral domains. VLEs are a prominent engagement resource utilising digital mediation, providing remote access to educational content, resources, communications, and assessments (Alves, L, & Morais, 2017).[6] VLEs play a vital role in facilitating and supporting blended learning – reducing potential barriers to learning through accessibility and adaptability, and enabling students to engage autonomously with different education platforms.

Given that technological innovation provides HEIs with additional support avenues and capabilities (Morra & Reynolds, 2010), a question arises, from the perspective of SAs, as to whether a similar integration of digital and in-person communication approaches may enhance their ability to anticipate, identify, and respond to students' needs. Here, beyond pedagogical applications, digital tools are broadening how HEIs capture and analyse student engagement data across a range of domains, e.g. module access, assessment results, class attendance, library usage and fee payment (Hlosta, Zdráhal, & Zendulka, 2017). Defined by Long and Siemens (2011) as 'The measurement, collection, analysis and reporting of data about learners and their contexts', learning analytics help mitigate potential disengagement issues and enhance retention (Cooper, Ferguson, & Wolff, 2016; Nik Nurul Hafzan,

[6] Here, among the UCD LEAP student cohort, the increasingly pivotal role of VLEs is apparent, with usage rates remaining comparatively higher than prior to the shift to blended learning in the 2020/2021 academic year.

Safaai,Asiah, Mohd Saberi, & Siti Syuhaida, 2019).[7] Here, Nutt (2017) provides four examples of how digital insights can enhance engagement across Descriptive, Diagnostic, Predictive and Prescriptive domains:

i. Descriptive insights address the question: 'What has happened?' Important information can be drawn from independent data sources (the student's "digital footprint") based on established parameters, e.g. VLE engagement rates, academic performance, extenuating circumstances and fee compliance.
ii. Diagnostic insights address the question: 'Why did this happen?' Combining and comparing pertinent information can create a thorough understanding of student engagement patterns, e.g. non-compliance with fees and personal financial pressures, and lack of VLE access with a heavy personal workload.
iii. Predictive insights address the question: 'What may happen?' Forecasting can be undertaken based on collected data to ascertain the potential consequences of particular T&L strategies and resources, e.g. aggregated feedback from VLE usage can help MCs decide how to curate their VLE and what learning/assessment materials to offer.
iv. Prescriptive insights address the question: 'How can we make it occur?' By using data that highlights students' trends and needs, SAs may be able to formulate and justify specific student support strategies, e.g. financial aids or healthcare referrals.

Bonnin and Boyer (2017) have identified a range of positive outcomes underpinned by learning analytics, including student retention, informed decision-making, curriculum development, and personalised interventions. Nevertheless, greater use of digital mediation practices has also presented some challenges. For example, more virtual content delivery can result in fewer opportunities for face-to-face contact. More frequent digital-centric engagement strategies and VLE-centrism (Recio & Colella, 2020) may also raise questions about whether blended models offer a holistic student experience. Likewise, when analytics infrastructure is tailored at a module level, this can lead to "module siloing", evident in significant discrepancies in the quantity and quality of learning materials and resources students are provided across different modules. A plurality of such virtual teaching tools can also result in engagement data aggregation challenges. While digital mediation already features within advisory service provision (White, 2020), e.g. email, video meetings, online resources and repositories, and social media, the potential limitations of VLE-centrism raise questions about MCs' and SAs' capacity to identify disengagement and intervene accordingly when such data is used as a primary/sole source for engagement insights.

5.0 UCD LEAP: Interlinking Engagement Analytics & Digital Mediation

Although the full scope of engagement is not confined to teaching and learning, VLE activity is nevertheless a key marker of engagement. As such, the analytic framework employed in UCD LEAP is underpinned by the perspective that students with higher VLE activity levels are more likely to represent students with higher engagement levels than their peers (Fuller, Wilson, & Tobin, 2011; Macfadyen & Dawson, 2010). Therefore, the assumption that students with less programme engagement are less likely to be self-motivated to engage, and would have lower VLE usage and indicative of low levels of engagement in students, underpins the UCD LEAP student targets. The two benchmarks used to flag students with SAs are:

[7] Against this backdrop, UCD (2020) aims to "Integrate student services to ensure a consistent level of high-quality student support…These supports will be bolstered by advanced systems using student data to target and personalise timely interventions".

i. The student had not logged into the majority of their VLE modules in seven days.
ii. The student's module topic access was <30% of their class peer average.

These metrics allow us to relay insights to the SA, which fulfil the aims of Nutt's (2017) framework by capturing two key engagement markers. The login data allows SAs to identify if any students who previously have been highly engaged have had a sudden drop-off in their engagement level, which would not be apparent from topic access levels alone. This approach also aligns with existing literature indicating that the best predictor of student engagement is changes in the student's own VLE engagement compared to previous activity (Wolff, Zdrahal, Nikolov, & Pantucek, 2013). Additionally, the peer average content access allows SAs to attain a sense of the quality of student interaction with learning material while accessing the VLE, differentiating those who log in and access very little material from those who have a broader depth of virtual engagement with their programme. This metric being a relational benchmark helps mitigate the module-by-module variance in total learning material available, effectively controlling for inter-module variance and siloing, and fulfilling the best practice aim of framing engagement within local context (Gašević, Dawson, Rogers, & Gasevic, 2016). It is worth noting here that although time-in-content analytics are available in UCD's VLE, current literature consensus is that this metric is not predictive of engagement (Gardner & Brooks, 2018), and as such, was omitted from UCD LEAP reporting to put greater emphasis on the reporting metrics more likely to capture current student engagement levels representatively.

For the data of flagged students to be effective and actionable, it is necessary for reporting to cover a sufficiently representative time horizon of current engagement, while also being frequent enough to give SAs the capacity to initiate contact as close to apparent disengagement as possible. A weekly reporting run achieves both of these aims, with one week capturing the entirety of regularly scheduled student classes for all modules. Consequently, UCD LEAP reporting is set up to collate student flag data during the weekend, ensuring that the whole prior week of engagement is represented in the data for SAs on Monday, and that interventions can take place within a week of a student's disengagement, at the latest. In addition, the weekly reporting frequency detailed here provides the opportunity to mitigate dropout risk when first-year students are most likely to withdraw (Nistor & Neubauer, 2010).

6.0 Digital Mediation and Virtual Learning Environments

VLEs can enable MCs to monitor, manage, and maintain students' engagement remotely through digital mediation. However, digital mediation should not focus on whether it can replace in-person support and services; instead, it should address how it can help to deepen the efficiency and accessibility of these resources. Digital and in-person resources should thus be mutually reinforcing, which requires leveraging the contribution new technologies can make through an advisory infrastructure that keeps interpersonal engagement at its centre (Kalamkarian, Boynton, & Lopez, 2018). Srinivas (2018) notes: 'Technology is only a tool that makes tasks easier for students. It's the people that actually support the students.' This is borne out, for example, in research by Kalamkarian and Karp (2015) on the implementation of technology-based advisory tools, noting that in the vast majority of cases, students believed that these could not provide them with the levels of personalised feedback and developmental instruction they considered necessary.

As Mattei et al. (2014) argue, new advising technologies 'cannot and should not replace in-person advising'; rather, for them to be most effective, they 'still require strong relationships between advisor and advisee' (Underwood & Anderson, 2018). Mattei et al. (2014) have identified a range of reasons why it is crucial to have a 'human in the loop', including for creativity, critical thinking, and understanding, both interpersonal and organisational. This necessity is apparent in how digital mediation enables MCs to monitor, manage and maintain engagement within VLEs. In each context, a human perspective is needed to maximise the functionality and increase the effectiveness of the online learning space. Thus, while digital mediation continues to enhance MCs' and SAs' role in addressing students' engagement issues, in-person interactions are not there to simply complement digital tools, but to fulfil their capabilities. Here, SAs can play a vital role, ensuring that human insights, interests, and innovations remain at the centre of digital mediation and how it is used to facilitate and foster student engagement. Against this background, we provide some brief recommendations on how both MCs and SAs can help maximise the benefits of using digital mediation with VLEs.

6.1 Monitoring Student Engagement

VLEs are equipped with monitoring tools that track student participation and performance according to specific forms of engagement, including:

i. Cognitive information on how students respond to and absorb module content, e.g. accessing lecture materials/resources and providing critical feedback.
ii. Behavioural information on how students participate in and perform on their module, e.g. adhering to login requirements and submitting assignments.
iii. Social information on how students interact with their class, e.g. contributing to discussion boards and collaborative projects.

One can better understand student involvement with the course by designing one's module to incorporate VLE features that cater to different facets of student engagement. Collecting and collating inter-module data may help reduce monitoring discrepancies in terms of students' program-wide engagement related to silos. It can be challenging to evaluate the relative quality of various learning materials and resources provided through a VLE and decide which engagement resources should be prioritised. In order to control for potential discrepancies in relative access, UCD LEAP establishes a baseline of student engagement at programme-level when monitoring engagement. With this approach, SAs may be able to distinguish between what singular module-level engagement data shows and what program-wise data may indicate.

6.2 Managing Student Engagement

A digitally-centric management approach considers the operational interdependency of modules at the program level, leveraging their shared platforms and infrastructure. The distinct characteristics of each online module should be acknowledged, such as aims, content, learning approach and assessment. Nevertheless, consistency is essential in upholding quality and quantity benchmarks of learning materials and resources, as well as the intuitiveness of interface navigation. It is possible to achieve inter-module coordination and cohesiveness by considering their function, form, and fit and implementing them to facilitate programme-level integration:

i. Module Function is its overriding purpose – understanding what it aims to achieve, why it is educationally and professionally useful, how it will accomplish its objectives, and conveying this information to students.

ii. Module Form is the tangible configuration – providing a cohesive, dynamic, and interactive educational experience. This involves bringing together the constitutive components within a user experience that prizes usability, effectiveness and efficiency.
iii. Module Fit is its embeddedness within the broader programme it exists within – providing a distinct-yet-interconnected contribution to the programme's broader curriculum and the strategies necessary to meet learning outcomes.

6.3 Maintaining Student Engagement

The ability of VLEs to foster engagement has been instrumental in maintaining pedagogical service continuity. In terms of fully understanding the utility of the digital space as a HE participation portal, Self-Determination Theory (SDT) (Deci, Ryan, & Guay, 2013; Niemiec & Ryan, 2009; Ryan & Deci, 2002; Ryan & Deci, 2017) highlights the importance of fostering students' multidimensional need to maintain engagement, notably autonomy, competence and relatedness. Autonomy emerges when students possess control and choice, a sense that they can exercise a degree of ownership over their learning experience. Competency emerges when students are capable of engaging with and completing challenges, a sense that they can achieve mastery of the tasks presented to them. Finally, relatedness emerges when students feel connected with others in their HEI community, a sense that they are integrated into their learning environment and experience.

When discussing why students might not be engaging with their VLE, these three factors serve as a practical framework for developing questions about whether it is fulfilling their engagement needs. For example, regarding autonomy, SAs can ask themselves, 'Does the student have the opportunity to take ownership of their learning experience and participate in a self-directed manner?' Regarding competency, SAs can ask themselves, 'Is the student being given the resources to engage with module requirements and grow their capabilities?' Finally, regarding relatedness, SAs could consider, 'Is the student able to make meaningful connections with their class or lecturer?' Questions such as these can act as a springboard for deciphering if there are ways that their VLE experience can be modified to increase participation.

Additionally, students should ask themselves whether they can make any changes to enhance their participation. The SA can facilitate self-appraisal by implementing various activities, such as decisional balance sheets and setting goals. Decisional balance work encourages students to reflect upon and identify their behaviour(s) that may negatively impact their engagement and consider the consequences of implementing changes. As well as this, goal identification and mobilisation strategies can assist students in recognising and realising specific objectives. For example, based on the student's understanding of their change needs, they can identify an objective they wish to achieve, such as making new personal connections, participating more in class, and approaching study in a more balanced manner. They can then examine how relevant, realistic, and sustainable their goal is and formulate a plan to accomplish it with the support of their SA.

7.0 HEI Recommendations

Building on these insights, we have formulated a set of recommendations that can be adopted by HEIs seeking to deliver balanced and effective digital mediation strategies:

Student Supports

i. Support students in a manner that facilitates multiple aspects of their engagement, e.g. education support workshops, study skills workshops, social and group events, healthcare referrals, and student representation.
ii. Offer students blended services and support to meet their evolving preferences for digital communication with staff, such as video calls and emails, alongside in-person interactions. Here, as HEIs continue to utilise digital resources, it is crucial that SAs are attentive to students' off-site needs, such as technology access, and can address these needs should they arise.
iii. Maintain consistency between modules within their VLE by addressing "module silos" – ensuring greater standardisation in the quality and quantity of T&L materials that students are provided. In addition, these measures will help SAs when comparing students' engagement rates between different modules.

Student Advisor Supports

i. Determine the scope for blended support provision and the necessary resources to achieve this. To accomplish this task, education should also be provided on evolving technological tools, such as workshops, seminars, and best practice sharing.
ii. Test and scale VLE monitoring capabilities cross-campus.

Institutional Initiatives

i. Ensure ongoing consultation with the VLE service provider to continue optimising its functionality. For example, creating an engagement monitoring dashboard can facilitate more accessible access to information and a seamless monitoring process.
ii. Re-evaluate and specify criteria for identifying students at risk from disengagement, integrating a variety of data from VLE digital engagement.
iii. Focus on peer-relative engagement, not absolute thresholds. Although cross-module consistency may simplify some monitoring aspects, this may not always be achievable. Different subject areas can lend themselves to substantial differences in content and assessment. Ensuring that baselines for flagging engagement issues are driven by peer-relative engagement helps control for variability across different modules.

8.0 Conclusion

The binary distinction between in-person and online engagement is becoming less apparent. Notwithstanding their qualitative distinctiveness, the concept of "interpersonal" support is evolving to encompass both resources, and they are increasingly experienced as existing on a continuum of student-staff HEI interactions. Nevertheless, while digital mediation is vital, the primacy of in-person engagement remains apparent pedagogically and pastorally, particularly in courses designed for this to be their primary T&L medium. Consequently, for digital mediation to be most fruitful, it must optimise VLEs as a pathway to student insights and interventions.

The extent to which the provision of HE resources and support through digital mediation represents a paradigm shift in staff-student engagement practices is unknown. Given that student engagement is multidimensional and encompasses a range of interactions, its

relational underpinnings may be best served through in-person and digitally-mediated supports. Therefore, rather than completely displace in-person supports and services, digital mediation can enhance the availability and adaptability of student-staff communications, and provide staff with information on which they can base their support decisions.

Digital mediation is being enhanced by numerous HEI initiatives and resources, such as information workshops, pre-existing digital architecture and resources, and SAs' adaptability. Since the meaning of engagement, and the means through which it is achieved, is evolving in tandem with the proliferation of digital and analytic resources, SAs should remain attentive to these shifts if they are to be responsive to students' needs and preferences. To make the most of their resources and meaningfully contribute to students' success, HEIs should embrace a comprehensive range of opportunities for digital mediation, whether through online participation strategies or learning analytics. Here, UCD LEAP will continue to research VLE engagement data to assess the potential contributions this resource can provide in helping to paint a holistic and dynamic picture of students' experiences – bolstering pathways for SAs to achieve student insights and interventions.

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Revealing Test Answer Behavior Patterns Through Quartile Analysis

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Abstract
Characterizing a dataset by the mean value homogenizes the data to lose the integrity of the highs and lows, however, a quartile analysis quantifies the tendencies of both high- and low-performing participants for comparison. This study analyzed the grammar assessment responses of 8th grade students to determine patterns of response between the lowest and highest quartile. Using Peng's Learning Portrait Model, each assessment cell was coded to show the accuracy of prior and subsequent answers. Analysis of these codes revealed that learners in the lowest quartile were significantly likely to respond inconsistently (variable accuracy, such as correct-incorrect-correct) and that learners in the highest quartile were significantly likely to respond consistently, whether correct or incorrect. Further, the baseline score increased over the course of seven months by 25% on unrelated content, suggesting that familiarity with the application software can account for that much of a student's assessment score. Future explorations on the dynamics of online assessment and the persistence of students in resolving inaccuracies on digital assessments are encouraged.

Keywords: Assessment, Quartile Analysis, Accuracy, Middle School, Grammar Assessment, Application Effects, Digital Assessment, Consistency, Inconsistence, Response Patterns

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Introduction

Analysis of cohort data can be beneficial for generalizing responses of the overall group, however, unique features of subgroups are homogenized in the process. Adjusting the analysis to group the cohort by quartiles can reveal variations between the highest and lowest quartile, which would be entirely lost by averaging. In short, the midpoint between success and failure is moderate success, but the midpoint provides little valuable within-group information. Quartile analysis, however, establishes a profile for success at the top quartile and for poor performance at the lowest quartile. To educators who strive to guide learners on the path of success, an analysis of the variations between the higher and lower performances can help to identify key patterns which are common to low-performing students who differ from those of more successful students. Interruption of these problematic behavior patterns in responses can lead students toward growth. Training in methods which emulate the behavior patterns of success equip struggling learners to perform better.

In classes which engage in routine assessment in a certain style, the effect of quartile-based analysis and guidance can yield marked results. For learners at the lowest level, facing the greatest challenge, mapping a pathway to success is nothing short of shedding light to escape from a dark tunnel or providing a ladder to someone stranded at the bottom of a deep hole. Until teachers know what is unique to the situation of these learners in comparison to those at the top of the class, there can be no map, no light, and no ladder.

Literature Review

Importance of prompt, direct, high-quality feedback

Immediate, explicit, and well-grounded feedback is necessary for academic advancement. Study after study echoes the imperative that students need prompt, direct, high-quality feedback on their work to optimize improvement (Butler & Nisan, 1986; Kluger & DeNisi, 1996; Hattie & Timperley, 2007; Kulik & Kulik, 1988; Yang et al., 2014). These qualities are present in automated feedback provided by intelligent tutoring systems in a smart learning environment (VanLehn, 2011; Spector, 2016; Paassen, Mokhel, & Hammer, 2016; Slof et al., 2013; Koedinger et al., 2013). These responses to the answers that learners provide in online assessments are informative for students, but it is the overview and analysis of these assessments which inform teachers. Key questions following an assessment on which teachers need detailed feedback to meet the needs of the students and guide them effectively include: Who fell below the mean? Who scored well? Did students improve over the previous assessment? However, for a teacher to get answers to these questions, calculations are needed. Few teachers have or choose to expend the available time tabulating comparative data. A score can provide some information, but behavioral patterns, especially when studied longitudinally, can provide insight to their causes and other influential factors.

Value of AI in providing prompt response

The obstacle to timely feedback lies in ever-present barriers to classroom teaching. Though over 50 years old, a study by Claye (1968) defines these barriers in rank order: overcrowded classrooms, too much clerical work, pressure from supervisors and administrators, lack of instructional materials and supplies, too many interruptions, rigid curriculum, lack of freedom, rigid time schedule, and too many non-teaching duties. The same factors are shared in more recent studies as well (Gallo et al., 2006; Bresciani, 2011). Faced with these

impediments, teachers are not able to provide immediate, accurate, and effective feedback to all students for all assignments. However, advances in technology and accessibility for students to computer-based or online resources opened new opportunities through the use of artificial intelligence (AI) and intelligent tutoring systems.

Computer-aided instruction (CAI) and virtual reality (VR) enhance the impacts of classroom teaching through new opportunities. Traditional methods pose limits, while VR bridges the gap and makes learning personal and interactive, offering skill training and authentic environments (Xie, 2018, p. 76). Extensions of CAI produced adaptive learning systems which offered personalization of experience based on the unique responses of each learner. Programming branching scenarios and levels of response allowed programs to meet the learner at any stage of development and work toward advances (Peng et al., 2019). This adaptive technology provided the opportunity to respond to the individual based on accumulated data, but also provides a wealth of data about comprehension and logical pathways supporting the *learning portrait model* (Peng et al., 2019).

Learning Portrait Model

The *Learning Portrait Model* described a sequence of learning cells which depict learning processes (Peng et al., 2019). Each cell includes a learning act and represents a duration necessary to experience that act (Peng et al., 2019). A sequence of cells represents a learning pattern (Peng et al., 2019). As the duration of the cell increases, the level of engagement also increases (Peng et al., 2019). An analysis of the cells which comprise an assignment, the duration of each, and the relative duration of each cell in a sequence can provide insight on the task itself. Further, a comparison of the duration of a cell (learning act) for different students can lead to valuable analysis in the differential factors at work, as well as which patterns characterize which profile of student, if there are commonalities. Each cell consists of a micro-learning situation including content, activities, and effects (Peng et al., 2019). The occurrences or *effects* in a cell can present different experiences of learners in the same learning setting, with the same content and assignment. Granular data is necessary to explore the variations within and among cells in a learning sequence. Such granular data includes each attempt within an assignment and a characterization of the learning activity for each experience. At this level, patterns of learning cell sequences may be recognizable and even predictive of learner behaviors.

Data-Informed, Personalized Formative Assessment

Within the architecture of a learning environment, several factors are necessary, whether they are traditional or the product of technology: context awareness, adaptive support, adaptive interface, adaptive content, personalized support, tracking and updating learner progress, and an inference or recommendation engine (Hwang, 2014). While these are well within the capabilities of educators, they are time-consuming and labor intensive on a one-to-one scale, but a virtual impossibility on a large scale, so some elements are sacrificed. With the automated options available, these sacrifices are no longer necessary. Technology resources are capable of providing many answers, but some are better suited to teacher expertise and relationship-building with learners. Partnership between technology and the educator can be valuable (Spector et al., 2016). In fact, “lack of teacher support has been cited as one reason that very promising technologies have failed to scale up and achieve sustained success” (Spector & Anderson, 2000, cited in Spector et al., 2016). Professional development and

adequate resourcing of teachers enable them to respond to students with guidance as feedback creates the optimal learning experience (Spector, 2015).

Apart from the efficiency and practicality offered by intelligent tutoring systems, human teaching/tutoring involves confounding dynamics of relationship, credibility, mood, and perception. Learning results are not purely based on the experience of the process and a cognitive change in the subject. They are mitigated by past history with the instructor, the level of credibility that this individual has with the subject, the prevailing moods of both the teacher and the subject at the time of the assessment, and factors such as perceived judgment, skepticism, and support (Snow, 1986). In preparing an analysis of the effectiveness of human tutoring, VanLehn (2011) hypothesized that human tutors offer detailed diagnostic assessments, create individualized tasks, involve sophisticated strategies, allow learners to control the dialogue, have broad domain knowledge, inspire motivation, provide feedback, scaffold information, and follow an ICAP framework, which suggests the prioritization of interactive over constructive, constructive over active, and active over passive (p. 198-202). The *interaction granularity hypothesis* indicated that the key element differentiating human from computer tutoring is the level of granularity of attention (VanLehn, 2011). Critically important to the observation is the focus on step-based tutoring vs. answer-based tutoring. With the application of steps and the additional level of sub-steps, computer tutoring can approach the granularity of a human tutor and produce similar results (VanLehn, 2011). Results indicated that computer tutors in both the step-based and sub-step-based conditions yielded results equivalent to or better than human tutors, the researchers included a qualification of the results relating to the level of expertise of the human tutor (VanLehn, 2011).

Value of Quartile Analysis in providing targeted response

Student progress requires feedback on their performance. According to John Hattie:

> One of the ironies is that students who are above the average are less likely to ask for the 'what now?' feedback because they can usually work it out on their own. The kids who are below average really want the dialogue, want the information—and they're the least likely to get it. They get 'correct, incorrect, you could improve here'—checks and crosses that give them no information. (Sparks, 2018)

The needs of highly successful students and the needs of low-achieving students regarding feedback vary because struggling learners are not well-equipped to navigate the lessons, the assessments, and the decisions for themselves. Serving the middle or the median is a disservice to this subgroup. Determining a mean score holds little value for learners at either end of the achievement spectrum. While cluster analysis has shown some value in test-taking behavior implications, correlation coefficients reveal limited significance (Davis et al., 2008, p. 953). Quartile analysis, common in medical studies, appears less frequently in educational and behavioral analysis, where the mean, as a single descriptor of the whole, is the standard. It is in the more expansive and diverse analysis that variations, patterns, and behaviors come to the forefront.

With the *interaction granularity hypothesis* (VanLehn, 2011) and the *learning portrait model* (Peng et al, 2019), a method for unpacking the inner workings of the process of assessment and the decision-making characteristics of learners is possible, particularly when it utilizes

computer-based systems which can be programmed to process and analyze the data, including quartile analysis and individual trends instantly.

Value of equipping educators for results analysis

According to the Atkinson theory of achievement motivation, learners possess a need for achievement and a need to avoid failure (Atkinson, 1978, cited by Snow, 1986). This intuitive explanation fuels the exploration of individual responses among students on an intelligent tutoring system or online assessment. The task cannot be viewed as a single performance, but is a series of individual performance events with independent potential and consequence. However, the study of learner performance in these environments has been characterized by a summary score of the final accuracy of the entire undertaking. Studies indicating mixed results can be the byproduct of ineffective targeting of the variables which should be measured. Each time a student attempts a response to a prompt, there is potential to achieve or to fail, accompanied by the need to achieve and the avoidance of failure (Atkinson, 1978, cited by Snow, 1986). The impact of the anxieties of the previous instance compound, amplifying the potential for a perpetuation of the direction, either toward correctness or toward error. The urgent need exists to explore these trends at the 'cellular' level, as recommended by the learning portrait model (Peng et al., 2019). Examination of students' responses for each cell, which includes a task and response, as well as the relationship of cell sequences, could be the key to unlocking the mystery of mixed results about feedback elements and understanding student performance.

Value of equipping students to overcome their negative test-taking patterns

Formative feedback is designed to "increase student knowledge, skills, and understanding of some content area or general skill...and there are multiple types of feedback that may be employed to this end" (Shute, 2008). It is directive feedback which targets items to revise, whereas facilitative feedback guides through suggestion (Shute, 2008). Results of the meta-analysis demonstrated that goal-directed feedback, which is specific, but not overly complex, and timely is most effective. If elaborative, delayed feedback can have stronger effects.

Research Questions

The following research questions will be explored in this analysis:

1. What patterns exist in accuracy and consistency between quartiles in test answer selection among eighth grade students?
    a. How do unsuccessful question attempts impact success on subsequent questions?
    b. How do successful question attempts impact success on subsequent questions?
2. Which quartile demonstrates the most consistent responses?

Method

Participants

This study was conducted at a midwest private, Catholic school in an urban setting. Eighth-grade students (n=61) accessed the application from September 2019 to May 2020 as a regular practice of their English coursework. The cohort of 27 males and 34 females ranged

from 13- to 14-years old. Only assessment data during the year was used for calculating results. Participants were not contacted directly. Use of archived data constituted an exempt status for participant consent, although permission was given by both the classroom teacher and the school principal.

Assessments and Measures

All assessments were taken using a software application available at NoRedInk.com. The school licensed the software for improving grammar practice and assessment using diagnostics, practice lessons, and assessments. Students were asked to answer twenty questions with multiple answer choices available, of which one was correct. Assessment 1 (Commas) was given in October. Assessment 2 (Verbals) was given in December. Assessment 3, given in April, addressed active and passive voice. Most participants had experience with the software application prior to their first assessment, because of coursework during their seventh-grade year.

Answer coding.

Coding the responses for each NoRedInk quiz involved a series of strategies to map the behavior patterns. First, each answer was coded for accuracy to the question itself and the accuracy of the preceding and subsequent questions. For example, in a series of answers such as CNNCC, which reflects that the first question was answered correctly, the second and third answers were not correct, and that the fourth and fifth answers were correct, the code would begin with xCN (whereas "x" depicts no prior response), CNN, NNC, and NCC. The final code set ended in x to designate a null subsequent answer. In total, sixteen code variants were established -- XCC, XCN, XNC, XNN, CCC, CCN, CNN, CNC, NCC, NCN, NNC, NNN, CCX, CNX, NCX, and NNX. All codes were tallied for frequency by participant ID. Cross-references were tallied for each two-response pattern.

Quartiles.

Participants were grouped for each assessment based upon their final score. Groups were divided by quartile and labeled *Low*, *LowtoMid*, *MidtoHigh*, and *High*. Quartile determinations were based on an IBM SPSS analysis of the data for each assessment. Participants scoring in the identified range were labeled as indicated. In this case, quartile represents those participants whose scores are in the lowest quartile, not the lowest 25% (15.25 participants) because individuals in the bordering ranges with identical scores were placed in the same "quartile" for accuracy of numerical analysis.

Consistency/Inconsistency Groups.

The next step in coding analysis was to establish which patterns reflected consistent initial responses (CCC, CCN, CCX, NNN, NNC, NNX) and which indicated inconsistent initial responses (CNN, CNC, NCC, NCN, CNX, NCX). In the former instance, the accuracy or inaccuracy of the first response is duplicated on the second response. In the latter instance, the first response and second response are opposite of one another. The total number of codes demonstrating a consistent pattern was recorded for each participant, as was the total number of codes demonstrating an inconsistent pattern. The mean of the number of consistent patterns and the inconsistent patterns was calculated for each quartile and was reflected in the following tables with descriptive data (Tables 1-3).

Accuracy vs. Consistency.

While it may seem counterintuitive to analyze results by pattern of consistency instead of accuracy, this method promotes a less-biased representation of the data. Participants in the lowest quartile are predisposed to present incorrect answers more frequently than participants in the highest quartile. The opposite is true regarding correct answers. Therefore, identifying consistency instead of accuracy allows a comparison of each group in their area of strength. The correct and consistent (CC) condition and the incorrect consistent (NN) condition were aggregated in the Total Consistent calculation. The correct inconsistent (CN) and the incorrect inconsistent (NC) condition were aggregated in the Total Inconsistent calculation.

Results

Results are presented first as comparative means in chronological order of the test and then visually as stacked bar graphs of mean of initial response patterns by quartile for assessment. An analysis of variations over time will follow. Scores on Assessment 1 ranged from 30 to 100 percent, with 61 participants (*m*=74.59%; *sd*=15.229*)*. Scores on Assessment 2 ranged from 40 to 100 percent, with 60 participants (*m*=77.25%; *sd*=16.708). Scores on Assessment 3 ranged from 55 to 100 percent, with 59 participants (*m*=89.66%; *sc*=10.621). All assessments were conducted with the same participants, but the varying number of total participants reflected that some respondents opened the assessment, but did not answer any questions or answered only one question before ending the assessment. The data for these individuals was removed from the dataset when it seemed clear that analyzing their "incorrect" responses was not reflective of their knowledge, abilities, and choices, but of a different agenda in opening an assessment required by their teacher, but choosing not to engage in it.

Analysis of comparative mean data

When analyzing the results of the Assessment 1 data, a clear relationship was demonstrated between the level of consistency of answers and the quartile of the respondent (Table 1). The total of consistent responses increased gradually from the *Low* quartile to the *High* quartile. Tables 2 and 3 demonstrate rising performance scores with the same trend. Additionally, all tables demonstrated an inverse trend with the total of inconsistent responses.

Table 1. *Comparative mean data by quartile on Assessment 1(Commas Quiz).*

N=61		**Low**	**LowtoMid**	**MidtoHigh**	**High**
Total Consistent (CC & NN)	**Mean** **St. Dev.**	8.71 2.016	10.11 1.616	12.00 1.713	14.86 1.612
Total Inconsistent (CN & NC)	**Mean** **St. Dev.**	10.29 2.016	8.89 1.616	7.00 1.713	4.14 1.612
Correct Consistent (CC)	**Mean** **St. Dev.**	4.93 2.401	8.89 .928	11.13 1.204	14.77 1.602
Incorrect Consistent (NN)	**Mean** **St. Dev.**	3.79 2.424	1.22 .833	.88 .957	.09 .294

Correct Inconsistent (CN)	**Mean** **St. Dev.**	5.21 1.188	4.56 1.014	3.62 .957	2.14 .834
Incorrect Inconsistent (NC)	**Mean** **St. Dev.**	5.07 .997	4.33 .866	3.38 .885	2.00 .816

Table 2. *Comparative mean data by quartile on Assessment 2(Use of Verbals).*

N=61		**Low**	**LowtoMid**	**MidtoHigh**	**High**
Total Consistent (CC & NN)	**Mean** **St. Dev.**	11.21 3.068	12.14 1.460	14.00 1.683	16.89 1.560
Total Inconsistent (CN & NC)	**Mean** **St. Dev.**	7.79 3.068	6.86 1.460	5.00 1.683	2.11 1.560
Correct Consistent (CC)	**Mean** **St. Dev.**	5.93 2.814	10.43 1.089	13.23 1.301	16.89 1.560
Incorrect Consistent (NN)	**Mean** **St. Dev.**	5.29 2.091	1.71 .825	.77 .725	.00 .000
Correct Inconsistent (CN)	**Mean** **St. Dev.**	3.93 1.592	3.64 .842	2.54 .877	1.05 .780
Incorrect Inconsistent (NC)	**Mean** **St. Dev.**	3.86 1.512	3.21 .699	2.46 .877	1.05 .780

Table 3. *Comparative mean data by quartile on Assessment 3(Active and Passive Voice).*

N=61		**Low**	**LowtoMid**	**MidtoHigh**	**High**
Total Consistent (CC & NN)	**Mean** **St. Dev.**	14.45 2.162	15.47 1.179	17.00 .000	19.00 .000
Total Inconsistent (CN & NC)	**Mean** **St. Dev.**	4.55 2.162	3.53 1.179	2.00 .000	.00 .000
Correct Consistent (CC)	**Mean** **St. Dev.**	11.09 1.814	14.88 .857	17.00 .000	19.00 .000
Incorrect Consistent (NN)	**Mean** **St. Dev.**	3.36 2.248	.59 .712	.00 .000	.00 .000
Correct Inconsistent (CN)	**Mean** **St. Dev.**	2.27 1.104	1.82 .636	1.00 .000	.00 .000
Incorrect Inconsistent (NC)	**Mean** **St. Dev.**	2.27 1.104	1.71 .588	1.00 .000	.00 .000

Analysis of Increase Over Time in Mean of Initial Response Patterns

Figure 1 revealed a gradual increase in overall consistency from the *Low* to the *High* quartile in the height of the blue and red bands combined. A reduction of inconsistency from the *Low* to the *High* quartile was also indicated by the combined height of the green and orange bands. Consistent incorrect responses dropped between the *Low* and *LowtoMid* quartiles by 68%. The mean of the *MidtoHigh* quartile reflected a 77% reduction. The *High* quartile was 2% of the *Low* quartile mean. While the total of inconsistent responses diminished from the *Low* to the *High* quartile, they remained proportionate across both conditions (CN and NC). A similar pattern was demonstrated with Assessments 2 and 3.

Figure 1. *Stacked bar graph of mean of initial response patterns by quartile for Assessment1 1.*

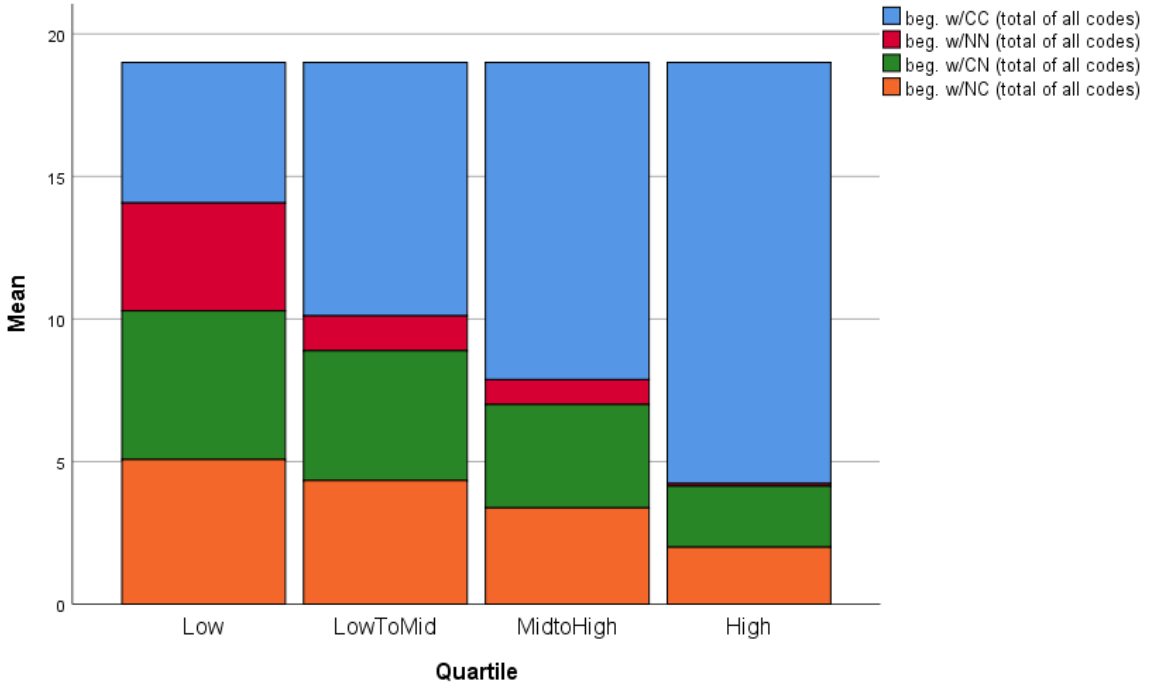


Figure 2. *Stacked bar graph of mean of initial response patterns by quartile for Assessment 2.*

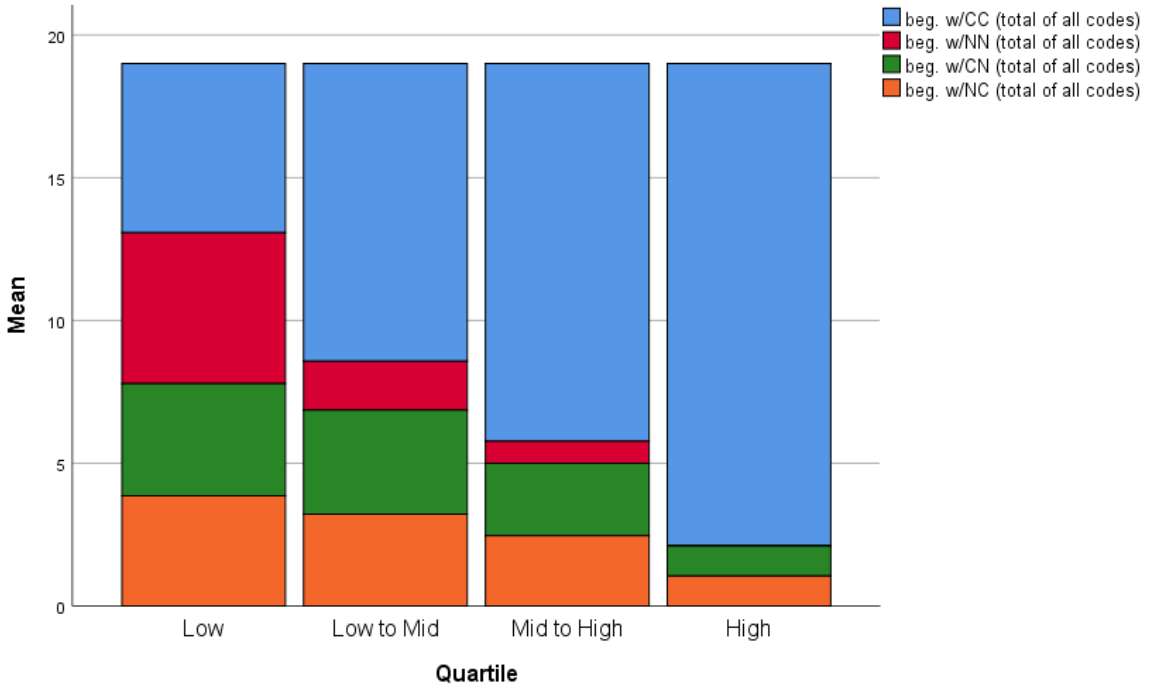
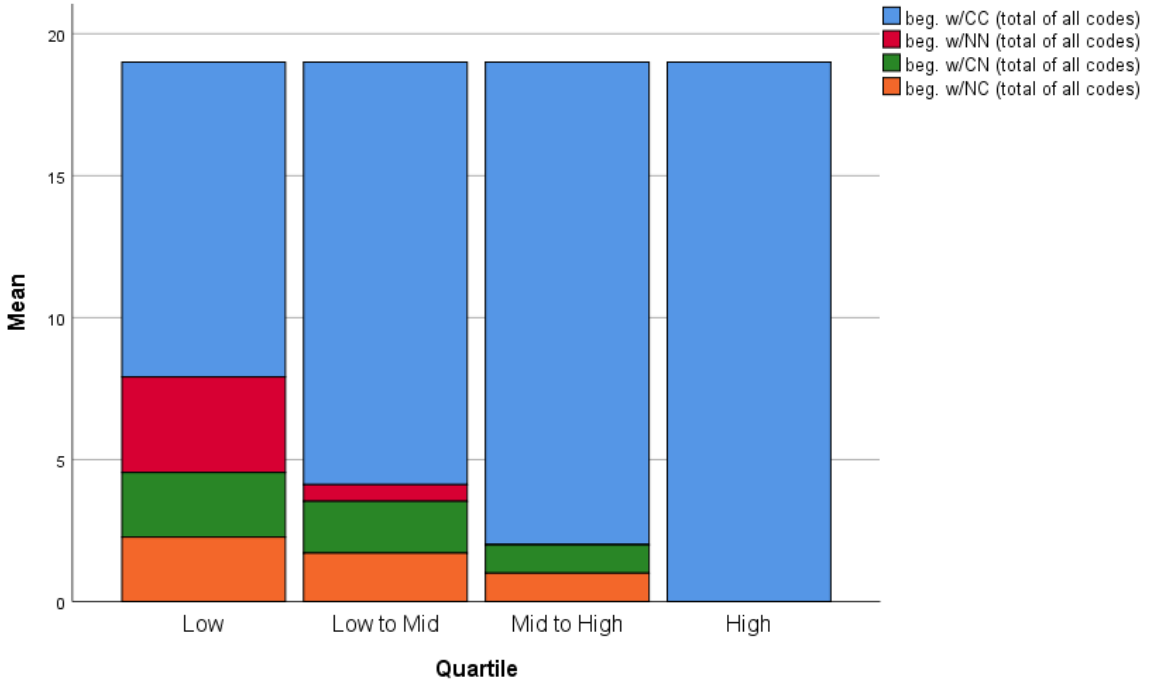


Figure 3. *Stacked bar graph of mean of initial response patterns by quartile for Assessment 3*



In order to investigate the patterns of consistency or inconsistency in greater detail, calculations were completed to assess the correlation between the Quartile variable and the Total Consistent/Total Inconsistent variables using the Pearson correlation method, Table 4 represents the correlations for Assessment 1, Table 5 for Assessment 2 and Table 6 represents Assessment 3.

Table 4. *Correlation of consistency level and accuracy with quartile for Assessment 1.*

N=61		Quartile	Total Consistent	Total Inconsistent	Correct Consistent	Correct Inconsistent	Incorrect Consistent
Total Consistent	**Pearson Sig (2-tailed)**	.814** .000					
Total Inconsistent	**Pearson Sig (2-tailed)**	-.814** .000	-1.000** .000				
Correct Consistent	**Pearson Sig (2-tailed)**	.917** .000	.904** .000	-.904** .000			
Correct Inconsistent	**Pearson Sig (2-tailed)**	-.810** .000	-.975** .000	.975** .000	-.898** .000		
Incorrect Consistent	**Pearson Sig (2-tailed)**	-.706** .000	-.388** .002	.388** .002	-.744** .000	.414** .001	
Incorrect Inconsistent	**Pearson Sig (2-tailed)**	-.779** .000	-.977** .000	.977** .000	-.867** .000	.905** .000	.345** .007
** Correlation is significant at the 0.01 level (2-tailed).							

Table 5. *Correlation of consistency level and accuracy with quartile for assessment 2*

N=60		Quartile	Total Consistent	Total Inconsistent	Correct Consistent	Correct Inconsistent	Incorrect Consistent
Total Consistent	**Pearson Sig (2-tailed)**	.744** .000					
Total Inconsistent	**Pearson Sig (2-tailed)**	-.744** .000	-1.000** .000				
Correct Consistent	**Pearson Sig (2-tailed)**	.918** .000	.885** .000	-.885** .000			
Correct Inconsistent	**Pearson Sig (2-tailed)**	-.739** .000	-.990** .000	.990** .000	-.887** .000		

Incorrect Consistent	**Pearson Sig (2-tailed)**	-.818** .000	-.419** .001	.419** .001	-.794** .000	.436** .001	
Incorrect Inconsistent	**Pearson Sig (2-tailed)**	-.736** .000	-.991** .000	.991** .000	-.867** .000	.993** .000	.396** .002
** Correlation is significant at the 0.01 level (2-tailed).							

Table 6. *Correlation of consistency level and accuracy with quartile for Assessment 3*

N=59		**Quartile**	**Total Consistent**	**Total Inconsistent**	**Correct Consistent**	**Correct Inconsistent**	**Incorrect Consistent**
Total Consistent	**Pearson Sig (2-tailed)**	.818** .000					
Total Inconsistent	**Pearson Sig (2-tailed)**	-.818** .000	-1.000** .000				
Correct Consistent	**Pearson Sig (2-tailed)**	.935** .000	.832** .000	-.832** .000			
Correct Inconsistent	**Pearson Sig (2-tailed)**	-.812** .000	-.991** .000	.991** .000	-.844** .000		
Incorrect Consistent	**Pearson Sig (2-tailed)**	-.650** .000	-.251 .055	.251 .055	-.746** .000	.283* .030	
Incorrect Inconsistent	**Pearson Sig (2-tailed)**	-.809** .000	-.991** .000	.991** .000	-.806** .000	.965** .000	.215 .101
**** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).**							

Discussion

While a performance total of 14/20 can be added to a gradebook, collected for a semester and reflect part of the final grade on a report card, an analysis resulting from Peng's Learning Portrait Model (2019) shares a far more illustrative portrayal of student answer patterns on a short online assessment. While a forthcoming study of students' persistence in correcting errors on this assessment addresses the need for feedback in greater detail, the assessment feedback offered to the teacher by this analysis provided valuable material for planning

effectively, much like the outcomes of the Butler & Nisan study which indicated that grades yielded similar results to giving no feedback at all, but task-related feedback brought improvement (1986). The Learning Portrait Model (Peng et al., 2019) was feasible because of the structure of the NoRedInk app, through data-informed, digital formative assessment (Hwang, 2014; Spector et al., 2016). Armed with assessment results and the following analyses, educators can be better equipped to guide the needs of the learners in their charge.

Correlation of Quartile as a Measure

Participants in the lowest quartile demonstrated inverse response patterns from respondents in the highest quartile regarding the consistency of answer selections. Answers among respondents from the *Low* quartile were less consistent than participants in the *High* quartile. Pearson correlational analyses of between Quartile and Consistency for each assessment demonstrated a highly positive correlation at a highly significant level (p = .000). Assessment 1 yielded r = .814; Assessment 2 resulted in r = .744; and Assessment 3 revealed r = .818. The correlation between Quartiles and most measures of consistency and accuracy are strongly significant at each assessment timeframe, adding a high level of confidence to the validity of the results. The weakest correlations, though still evident, were demonstrated between incorrect consistent responses (NN) and both inconsistent conditions (CN and NC), suggesting that other factors, such as motivation, may contribute to patterns resulting in inaccurate responses.

Answering Research Questions: Impact of Success Level

The results of the mean analysis grouped by quartile (Figures 1, 2, and 3) paint the picture comprehensively. Accuracy increased in direct correlation to performance level. To be clear, students with low scores are predisposed to offer more incorrect answers than their peers with high scores, but the trend is not so simple. The decreasing trend by performance level, combined with assessment platform familiarity (detailed in 5.3) yielded an elimination of inaccuracy in Assessment 2 for the *High* quartile and for both the *MidtoHigh* and *High* quartiles in Assessment 3. Dramatic reductions in consistent but incorrect responses occurred between the *Low* and *LowtoMid* quartiles (68% on Assessments 1 & 2 and 82% on Assessment 3). However, the salient factors identified by the coded pattern analysis identified two other informative criteria: consistency/inconsistency and assessment platform familiarity.

Consistency

The analysis of consistency in the study addressed patterns of both correct and incorrect answers. Even the total of consistent correct responses combined with the total of consistent incorrect responses among learners in the *Low* quartile did not equal or exceed the same total for students in the *High* quartile. Students identified as unsuccessful based on the total test score (*Low* quartile), by definition, respond incorrectly more often than their successful peers in the *High* quartile.

Inconsistency

Participants in the *Low* quartile were more likely to respond with inconsistent patterns than those in the *High* quartile, at the highest level of statistical significance (p = .000). In short, students who score poorly are far more likely to demonstrate fluctuations in accuracy of

response. Thus, it is the inconsistency itself, not the accuracy level, which reveals a trend. The benefit of this analysis provided clarity on the role of inconsistency as a trend among low-performing students, which can become a target for teacher strategy to guide them toward improvements.

Across all three assessments, data revealed that consistency was more important than accuracy. In Table 1, the correlation values were decisively high for students with correct and consistent responses, showing an inverse correlation to each other category. Interestingly, the strongest correlation among all four conditions was always between correct/inconsistent (CN) responses and incorrect/inconsistent (NC) responses. In assessment 1, r=.905; in assessment 2, r=.993; and in assessment 3, r=.965. This was illustrated by the green (CN) and orange (NC) bands on Figures 1, 2, and 3, which are proportionate and decline in magnitude at a slower rate regarding performance level. Therefore, while inaccuracy diminished and is eliminated in multiple conditions, inconsistency is present on all assessments at all performance levels except the Assessment 3 for the *High* quartile which was entirely correct. Not only is it present, but it is evident in the direct correlation at all performance levels, which underscores that the factor of inconsistency is more salient than the factor of accuracy.

Further, the lowest level of correlation across all assessments appeared between incorrect/inconsistent responses and incorrect/consistent responses. In Assessment 1, r=.345; in Assessment 2, r=.396; and in assessment 3, r=.215. It should be noted that the value for Assessment 3 did not rise to the 95% confidence level (p=.101), but also acknowledged that the accuracy rate for Assessment 3 was far higher than each of the other assessments. The low values for the correlation between types of incorrect responses reveals that it is not the strength of inaccuracy which drives the pattern, but the inconsistency of the responses which is most significant.

Platform Experience as an Assessment Barrier

Response pattern trends in inconsistency and inaccuracy diminished over the course of the assessment period from October 2019 to April 2020. The range of scores on Assessment 1 was 30 to100%, whereas Assessment 2 rose to 40 to100%, and Assessment 3 revealed 55 to100%, which shows the baseline increasing by 10% from Assessment 1 to Assessment 2 and increasing by 15% more between Assessments 2 and 3, with an overall baseline increase of 25% from the beginning to the end of the school year. Not only was the last assessment the best assessment for all groups, the comparative means between the first and second assessment demonstrated a trend of improvement in scores as well. The mean on Assessment 1 (m=74.59%) increased a slight 2% in two months by the time of Assessment 2, but increased a total of 15% (m=89.66%) by April. Even the standard deviation slimmed from 15.229 in October to 10.621 in April, underscoring the narrowing of the range and the focus of skills. Further, this evidence adds urgency to the importance of appropriate assessment and educational technology platform experience for learners. If familiarity with the platform is a barrier to successful responses for all students at early stages of experience, then providing adequate experience before students are subjected to a weighted assessment is a necessity.

Conclusion

While there are many factors which impact students when completing an online assessment of content knowledge, including anxieties, wakefulness, nutrition, visual processing, and dexterity, this study has revealed that a habit of consistency is also a strong influencer of successful outcomes.

Implications

Although few educators would be surprised by the statement that learners in the *Low* quartile are more likely to respond inconsistently on digital assessments or that students improve their performance over time as a function of experience in a digital environment, the evidence can be affirming. Armed with this data, teachers can provide guidance to all students in the introduction of the software application to the class. Proper introduction is likely to mitigate some of the issues which allow students to improve over time with hands-on experience through such explicit instructions as: 1) the goal of the task; 2) a vicarious, functional example; 3) a personal, live, and interactive experience with the application; and 4) an opportunity to see the results of the strategies employed so that the user can identify poor or strong practices, which can be discussed and used for later improvement. With this level of familiarity with the software application, students are more likely to be unencumbered by a lack of understanding or concerns that some of their actions may involve negative consequences.

As part of the effort to familiarize students with the software application, this study can assist teachers in helping to identify learners who may struggle with erratic decision-making during the time of testing. Learners who have not been explicitly taught to narrow a list of options, to reread the instructions for clarity, and to take additional care before making a final decision are more likely to perpetuate the model of inconsistent responses which are largely inaccurate. In the end, it is not about students making the right responses as much as it is about them answering authentically to the base of knowledge that they possess because it reveals a more accurate assessment of student knowledge than results which are flawed by behavioral anomalies and navigation-oriented mistakes.

Limitations

While this study provided a deep dive into the process of online assessment and the patterns of respondents in different quartiles, it was limited by its small population and application within subject matter. With only 61 participants, while it was an entire grade level for the school, the small group size limits generalizability to all eighth-grade students, all middle school students, and all grammar learners with the software used. Repeating the study over time with multiple cohorts of this grade level population in the school would lend itself toward rigor over time. Making a step toward a larger school system or toward an analysis of the archived data from the software application provider could offer some robust opportunities for assessing the validity of the trends in evidence from the current analysis. Additionally, similar data could be collected using other applications in other subject areas. Most applications which involve dashboards of student results to the teacher offer some levels of “drill down” reports which reveal an item-by-item analysis that could be retrieved and assessed for similar response patterns and trends.

Recommendations for Future Research

In addition to the explorations mentioned by means of overcoming limitations present in this study, the following data collection and analysis could be meaningful.

Gender effects. While the data set was not available for the current study, an analysis of the possible effects of gender as a contributing factor might yield intriguing results. Other studies have shown increased tendency for impulsivity in male participants (Fields, et al., 2009; Pham, 2016; Wise, et al., 2015), which could present similarly to the trend toward inconsistent answer patterns for the *Low* quartile of respondents in the present study. In fact, a combined follow-up of exploring additional grade levels along with gender effects could identify patterns related to age and gender at the same time.

Overall Performance Level. The use of a final accuracy score in the present assessment provides useful information regarding the level of the participant, but including data to show the respondent's final, comprehensive course grade as a grouping factor by quartiles might also lead to some effective comparisons. Situations in which the overall performance grade for the course differed markedly from the individual grammar assessment should shed light on the validity of scores. While the overall course score is likely to include a wider variety of components, such as composition skills, the integral nature of grammar in the subject area would seem to suggest a baseline of performance.

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Assessment of Self-Directed Learning Readiness Among Undergraduates of Teacher Education in Vietnam

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Abstract
This study aimed to evaluate levels of self-directed learning readiness (SDLR) among pre-service teacher education undergraduates in Vietnam. The study employed quantitative method by using a SDLR survey questionnaire. The questionnaires were administered to 249 undergraduate students at a university in the north of Vietnam. The data was analyzed by SPSS 26.0 with descriptive statistics and MANOVA to find out the level of SDLR. The research results showed that teacher education students reported achieving a moderate level in a dimension of SDLR of confidence and independence in learning while they had high levels in other dimensions. The findings also revealed that different years of education possessed different degrees of SDLR (attitude to learning, control in learning, confidence and independence in learning and self-concept in learning). The research would provide a springboard for future research to evaluate self-directed learning preparedness across majors, region, nation, income, etc. Furthermore, it could be a valuable reference to students, educators and curriculum designers in curriculum development, teaching and learning in the context of Vietnam.

Keywords: Self-Directed Learning, Self-Directed Learning Readiness, Teacher Education

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Introduction

The self-directed learning plays a vital role in today's world especially at higher educational institutions. Students now have opportunities to access to massive data and information. This presents challenges for the educational institutions to prepare the workforce for society's demands. These demands include skill-based competencies such as problem-solving, curiosity and reflection, creativity, collaboration, applying knowledge to real-life problems (Toit-Brits, 2019).

As stated by Cohen (2012) that self-directed learning is viewed as an effective mode of learning that encourages students to be active in their own learning and able to conduct such learning at any time and any place. Specifically, pre-service teachers who will likely become teachers, need to possess the quality of self-directed learning since knowledge in the field is constantly changing (Prabjanee et al., 2013). To promote the students' SDL, it is important to assess the readiness of students (Klunklin et al., 2010). This is because SDL is not for all students, and can cause anxiety and dissatisfaction in some students, as indicated by Yuan et al. (2012).

While self-directed learning is considered one of the most worthwhile approaches to higher education in the context of increasingly diversified knowledge, SDL is still a new concept in Vietnam (Tri et al., 2017). There has been no study to investigate self-directed learning readiness among Vietnamese university students in general and pre-service teachers in particular. Meanwhile, previous studies in other countries and disciplines may not be applicable in the Vietnamese context due to differences in learner characteristics. Therefore, we conducted this study with the aim to explore levels of self-directed learning readiness and compare the readiness across years of education among undergraduate students at a specific university in a mountainous area in Vietnam where training pre-service teachers to serve at the locality. The results of this study could provide empirical evidence n students' attitudes, abilities, and personality characteristics required for self-directed learning. In addition, the findings of this study could contribute to the knowledge base available to university educators to the orientation of student self-directed learning preparedness in the instruction plan.

Self-directed learning readiness

As defined by Wiley (1983), self-directed learning readiness (SDLR) is the degree to which an individual possesses attitudes, abilities, and personality characteristics necessary for SDL According to Guglielmino (1977), SDLR consisted of eight dimensions, including: 1) openness to learning, 2) self-concept as an effective learner, 3) initiative and independence in learning, 4) informed acceptance of responsibility, 5) love of learning, 6) creativity, 7) positive orientation to the future, and 8) the ability to use basic study and problem-solving skills. These dimensions have been widely used as a theoretical framework to examine SDLR. This scale then was studied and developed by Fisher et al. (2001) in a study on development of self-directed learning readiness scale for nursing education (SDLRS). Fisher et al. (2001) stated that most students had these abilities. In their instruments, three sub-factors were utilized for assessment including: 1) Desire for learning, 2) self-management, and 3) self-control.

Motivation: The attitude and responsibility towards learning include: 1) Attitude: desire to participate, interest, learning responsibility. In addition, a growth mindset demonstrates

curiosity, openness, perseverance in learning or confidence in learning; 2) Responsibility: willingness to take responsibility for one's own actions, respect for values; 3) External motivation: such as meeting goals, demands of educational needs (school, teachers, social context)

Self-management: Self-management manifests itself through learning and problem-solving skills, including: diagnosing of learning needs; setting learning goals; selecting suitable resources and strategies; monitoring learning progress; adjusting; acquisition and evaluation; generating knowledge. In addition, it is also expressed in implementing strategies/measures to manage emotions and maintain self-control, patience perseverance, ambition and autonomy in learning.

Self-control: Showing personal characteristics in the learning process, including: 1) awareness such as remembering to-do, controlling for shortcomings and limitations, cognitive flexibility, metacognition. In addition, students also value their own effectiveness, control emotions and ensure the stability. It is also presented in the resilience, ambition, self-control; 2) Independence in implementing and managing the end-to-end learning process; consideration in making decisions. Besides, it also shows the students' creativity.

Relation of self-directed learning development and readiness

According to Guglielmino (2008), self-direction can occur in a variety of situations, be it in a teacher-oriented classroom, or in a learning context where students plan and learn to meet their own learning needs or employers' requirements. Learning can be conducted independently or collaboratively. Guglielmino & Guglielmino (2016) believed that, in the viewpoint of active learning (activation), the students' personal attributes (including individual values, abilities and attitudes) that affect SDL. Besides, Guglielmino also pointed out that SDL exists naturally, continuously and it is available in each person at different levels. Therefore, he emphasized that students with a good level of SDLR can help them prepare for their future jobs (Nordin et al., 2016). The Figure 2 below demonstrates the staged self-directed learning model.

Individuals has different levels of SDLR and the Staged Self-directed Learning Model clearly demonstrates the difference in the individual's SDL level (Grow, 1991; Tennant, 1992). Accordingly, students who have low level of SDLR when performing SDL activities often show a high level of anxiety. Similarly, those with a high level of readiness for SDL but with an increasing level of teacher's instruction also showed a high level of anxiety (Grow, 1991; Wiley, 1983).

The SDLR is considered highly personalized. Students with a low level of SDLR when doing the SDL tasks/assignments may reveal a high level of anxiety. Moreover, the students who achieved high level of SDLR but studying in a structured and obligatory instruction may also express their high level of anxiety (Fisher et al., 2001; Wiley, 1983). Previous researches have shown that when teaching is suitable for the SDLR, it can create opportunities for effective learning. Furthermore, it is appropriate when building a foundation for SDLR it can improve the student's readiness for self-directed learning. At the same time, individual readiness can be demonstrated through personal attributes such as attitudes, values, and abilities (Guglielmino, 2013).

Measurement instruments of self-directed learning readiness

To measure the information system, a number of instruments have been developed and used such as Oddi Continuing Learning Inventory (OCLI) of Oddi (1986), Self-Directed Learning Readiness Scale (SDLRS) by Guglielmino (1977), Self-Directed Learning Readiness Scale (SDLRS) in nursing training by Fisher et al. (2001); Self-Directed Learning Perception Scale (SDLPS) by Pilling-Cormick (1996); Self-directed Learning Skills Scale (SDLSS) by Askin (2015).

According to Merriam & Baumgartner (2020), self-directed learning readiness scale (SDLRS) by Guglielmino is most often used in educational research to measure SDLR. This is a tool of high value and reliability (Nordin et al., 2016). The author identified eight factors including adult students' attitudes, values and abilities associated with readiness for self-directed learning. These factors are the elements of the SDLR scale. This scale was later developed by Fisher et al. (2001) to undergraduate students in nursing and other sectors of education.

Candy (1991) believed that assessing the students' self- directed learning readiness implies to assess students' ability of "can do" and "will do". Therefore, the SDLRS must show the measurement aspects of the SDLR, including factors related to skills and personal attributes needed for self-directed learning. In this study, the SDLRS by Guglielmino (1977) and the other SDLRS by Fisher et al. (2001) were referenced to develop and standardize an instrument to measure the SDLR applied for Vietnamese students in general.

Studies of self-directed learning readiness assessment

Assessment of SDLR level is an essential activity to consider the students' ability in SDL (Klunklin et al., 2010). Because, measuring the level of SDLR allows discovering the degree of self-direction of an individual or the relationships between self-direction and the variables related to the SDL such as creativity, intelligence and satisfaction (Brockett & Hiemstra, 2018). Therefore, many studies focused their interests in SDLRS such as Guglielmino (1977), Oddi (1984), Fisher et al. (2001). In addition, other studies concentrated on the factors affecting SDL and assessed SDLR at higher education in various nations and sectors.

According to Lounsbury (2009), psychological variables such as interest, personality, emotional stability, independence, super-ego strength, sensitivity and conscientiousness would have a direct effect on students' SDL, while demographic and social variables would have an indirect impact on SDL (Oliveira & Simões, 2006). The studies of Ponton et al. (2005) showed that the personality characteristics explained the content of self-directed learning. By contrast, Roberson & Merriam (2005) confirmed that factors affecting SDL are all related to personality characteristics. The studies also showed that there was a relationship between SDL and demographic variables such as gender, age, race, region, education level, marital status and learning outcomes (Fontaine, 1996; Shulman, 1994). However, the results of these studies are not consistent. Shulman (1994) found that there was a significant relationship between sex and the level SDLR through OCLI checklist. Fontaine (1996) stated that marital status was a factor to predict frequency of adult's participation in SDL.

Some studies also found a relation between self-directed learning and learning outcomes (Cazan & Schiopca, 2014; Chou & Chen, 2008; Lounsbury et al., 2009). They claimed that a positive correlation between self-directed learning and grade point average (GPA) as well as

course score was recorded. (Hsu & Shiue, 2005) pointed out that self-directed learning also played as a factor to forecast students' learning outcomes in traditional learning environments or non-web-based distance learning. Slaughter (2009) carried out a study on pharmacy students, and the results showed that the students with higher SDLR average scores learned better than those with lower scores. Students with high SDLR scores were said to be able to graduate on time and have lower exclusion rates. However, in a study by Francis & Flanigan (2012) found that no significant relationship between SDLR and learning performance was recorded. Similarly, Nordin et al. (2016) did not see the correlation between SDLR and academic achievement, but based on descriptive data revealed that the students with higher achievement were more likely to be ready for SDL than the students who had the lower learning achievement. This research result was consistent with the study by Abraham et al. (2011). Their findings showed that high-academic achieving students were seen to catch high score at all SDLR aspects. However, Abraham et al. (2011) suggested that although students desired to learn and had the ability for learning autonomy, they should be supported in skills of learning management.

Many studies related to the SDL skills and SDLR to undergraduate students have been conducted to a variety of majors such as medicine, nursing, technology, or pedagogy, natural and social sciences. Those showed that the importance of Assessment of SDLR level among students at higher education institutions. Because, defining the SDLR level can help students, educational institutions and educators understand the students 'capacity which would be the reliable scientific evidence to apply the relevant solutions in consistent with adult learning characteristics to maximize students' learning opportunities and create an educational environment, promote students' learning (Klunklin et al., 2010). However, a range of researches on SDLR focused primarily on nursing students and engineering students (Klunklin et al., 2010; Prabjanee et al., 2013; Yuan et al., 2012), among those there was a study by Prabjanee et al. (2013) investigated on the level of SDLR among students in colleges of education in Thailand. These studies assessed the SDLR to undergraduate students focusing on nursing meanwhile SDL is significant skill for pre-service teachers. Those attempted to investigate levels of self-directed learning readiness and compare this readiness across years of education and gender. These studies yielded consistent results that self-directed learning readiness differed significantly across years of education, but no significant difference was found across genders.

In Vietnam, SDL is a new concept (Tri et al., 2017), there are few researches on SDL and no studies on SDLR to undergraduate students in general and teacher education in particular. Meanwhile, studies on SDLR in other countries may not be applicable in the Vietnamese context due to differences in students' characteristics and learning context. This is the gap that the study will supplement and provide the scientific foundation for research on measurement and evaluation SDLR in Vietnam.

Methods

The quantitative was employed in this study. Besides, the desk study method to review the SDL theories was also applied during the research.

Sample

The population is a group of undergraduate students in the teacher education program at a university in the north of Vietnam. Participants were selected by clustered sampling and

purposive techniques. Those are students from the faculty of the pre-service teacher education. Questionnaires were administered to the students at their class by providing the link of online survey. Therefore, the response rate achieved 100%. There is 16,2% male student and 83,8% female student. Those classified as: first year (42,9%), second year (33,7%), third year (8,3%), fourth year (15,2%).

Instrument

The tool was developed based on the self-directed learning readiness scale (SDLRS) developed basing on the results of interviews and discussions with five Vietnamese professional experts in education measurement and assessment at higher education. Furthermore, discussions with 30 university undergraduates were conducted to decide the most relevant items to students. In addition, some valuable adaptation items from the SDLRS by Fisher et al (2001) were selected by both experts and students for the sub-scales. The scale by Guglielmino (1977) was only referenced during the scale development. The SDLRS applied a Likert-type scale, designed to examine self-directed learning readiness. The questionnaire was made through several steps. At first, referencing the items in the SDLRS by Fisher et al (version 2001 and an adaption in 2010), a draft of questionnaire with 42 items was sent to a group of 5 experts to review 2 times before sending to a group of 33 pre-service teachers at a university of education to pre-test and comment on the questionnaire. After revision, the second edited version was sent to the 5 experts to provide their feedback again. The last version was tested for validity and reliability of the scales. The Cronbach's alphas of 5 sub-scales were all over 0.80. Seven subscales with 41 items were formed after EFA analysis including 1) attitude to learning (8 items); 2) management in learning (9 items); 3) application and creativity (5 items); 4) control in learning (9 items); 5) confidence and independence in learning (4 items); 6) self-concept in learning (4 items); 7) acceptance of responsibility in learning (2 items). The survey was divided into two parts: first section is a part for 2 demographic information including gender, years of education. The second part examined attitudes, skills, and characteristics that comprise an individual's current level of SDLR with 41 items. The questionnaire was then administered to 249 pre-service teachers in a university in the northern mountainous area of Vietnam. The survey was online conducted with 41 statement items using a five-option Likert scale, ranging from 1 (completely not true to me) to 5 (completely true to me).

Data collection

The questionnaire was directly distributed to participants at their class for completion. Prior to completion of the survey, participants read the consent form and received permission to use their responses for research purposes. Confidentiality was preserved as no name was used in the paper. The participants completed the survey in approximately 10 to 15 minutes. Papers were collected and cleaned before analysis.

Data analysis

Quantitative data from the survey was analyzed by using the software of SPSS version 26 to descriptive statistics, t-test, MANOVA. Meanwhile, qualitative data collected was encoded into numbers. Data then was imported and saved in a classified data file for data entry.

The data analysis was conducted by using SPSS 26.0. Prior to conducting data analyses, survey psychometrics (internal-consistency reliability, construct validity, and content

validity) as well as the assumptions of one-way MANOVA were examined.

Descriptive statistics (frequencies, means, standard deviations) were performed to assess the assumption of normality. To examine the levels of SDLR, means and standard deviation were performed. Klunklin et al. (2010) provided criteria to interpret this readiness as follows: 4.50-5.00 (highest level), 3.50-4.49 (high level), 2.50-3.49 (moderate level), 1.50-2.49 (low level), and 1.00-1.49 (lowest level). Additionally, to compare the level of SDL across years of education, one-way MANOVA was performed. Linear discriminant function analysis was conducted to see which subscales contribute to the difference.

Results and discussion

Results

Three assumptions of a one-way MANOVA were tested prior to data analysis. The first normality expectation was fulfilled, as histograms showed that all ten dimensions of SDLR were regular. Skewness and kurtosis were also acceptable in all subscales, ranging from +1 to -1. The second assumption of homogeneity of variances was met since the test of equal variances was not significant. The assumption of independence of observation was difficult to assess since the participants may have taken the survey at the same time. The results of level of SDLR and comparisons of this readiness across years of education, majors are presented below. The results of level of SDLR and comparisons of this readiness across years of education and majors are presented below.

Table 1: Means and standard deviation of five dimensions of self-directed learning readiness

Dimensions of SDLR	M	SD	Level
Attitude to learning	3.86	0.59	High
Management in learning	3.61	0.50	High
Application and Creative	4.25	0.45	High
Control in learning	3.52	0.51	High
Confidence and independence in learning	3.43	0.59	Moderate
Self-concept in learning	3.71	0.57	High
Acceptance of responsibility in learning	3.76	0.57	High

These descriptive statistics of the ten subscales showed the different degrees in readiness of self-directed learning. Among those, students reported having SDLR at the moderate level in confidence and independence in learning (M=3.43, SD=0.59). The participants reported having the other dimensions at the high level, (M=3.52-4.25, SD=0.45-0.59).

Comparison of self-directed earning readiness across years of education

To compare SDLR across years of education, a one-way MANOVA was conducted. Table 2 below showed the differences across years of education.

Table 2: SDRL differences across years of education

Dimensions of SDLR	F	p-value	η2
Attitude to learning	4.460	0.004**	0.043
Management in learning	1.987	0.116	0.020
Application and Creative	2.106	0.100	0.021
Control in learning	7.442	0.000***	0.069
Confidence and independence in learning	3.087	0.028*	0.030
Self-concept in learning	5.813	0.001***	0.055
Acceptance of responsibility in learning	2.206	0.087	0.022

*p<0.05

The result showed that self-directed learning readiness differs across years of education. The discriminant ratio coefficient suggested that the four variables responsible for distinguishing SDLR between years of education were: attitude to learning (p=0.004, ŋ2=0.043), control in learning (p=0.000, ŋ2=0.069), confidence and independence in learning (p=0.028, ŋ2=0.030), self-concept in learning (p=0.001, ŋ2=0.055). They are statistically significant (p<0.05).

Discussion

It was interesting to learn that students possessed attitudes, abilities, and readiness to take charge of their own learning. The students thought they could be confident and learn independently, be responsible in learning and could application and creative in learning. However, the level of SDLR of the students in solving problems and their love for learning is lower than other dimensions of SDLR. This may be because of the popular situation at Vietnamese families that parents often involve in selecting and deciding the university for their children. The other reason may be that the learning culture at many universities in Vietnam where students often regard their university instructors as a source and authority of knowledge, leads to the dependence on others and their real love for learning. This result is similar to the result of a study by Prabjanee & Inthachot (2013) to university students in Thailand. Their research found that the average levels of creativity and openness to learning and other dimensions (self-assessment as an effective learner, proactive and independent in learning, accepting responsibility clearly, love of learning, positive future orientation, and ability to ability to use basic learning) while their problem-solving skills) has a high degree (Prabjanee & Inthachot, 2013). Their research result also showed that Thai students of different years have different levels of self-directed learning readiness. Furthermore, there was a prominent difference in the level of students' SDLR between students across years and disciplines.

When comparing self-directed learning readiness across years of education, the results showed that different years of education possessed different degrees of self-directed learning readiness. The findings in this study were far different with results of a study in Thailand by Prabjanee et al. (2013) who examined the SDLR of Thai education college students. They pointed out that the students possessed a moderate level of creativity and openness to learning. When identified the source of the resulting differences across years of education as self-control in learning, openness to learning, self-regulation and decision making, positive orientation to the future, self-concept as an effective learner. At this point, the direction of the difference is not clear, yet it is likely that younger students may have less future orientation, responsibility, and openness to learning than older students. Meanwhile, the difference of other factors is not clear. By contrast, Phillips et al. (2015) did not find out the difference in years of education (age) or gender. He saw the level of SDLR among fresh students is lower

than other students. Future research should attempt to investigate the directions of these differences.

Conclusion

In order to present a landscape of current circumstances of Vietnamese students in teacher education, this study attempted to investigate self-directed learning readiness of pre-service teacher education students in Vietnam and compare the SDLR across years of education and majors. The results showed that students of teacher education program reported achieving a moderate level in two dimensions of SDLR including confidence and independence in learning. The other six dimensions were at a high level. The findings also revealed that different years of education possessed different degrees of SDLR (attitude to learning, control in learning, confidence and independence in learning and self-concept in learning).

The study shed light on the current circumstances of students' SDLR among teacher education students in Vietnam. The results of this study could provide empirical evidence on students' attitudes, abilities, and personality characteristics required for self-directed learning. In addition, the findings of this study could contribute to the knowledge base available to university educators to the orientation of student self-directed learning preparedness in the training plans. Furthermore, it could be a valuable reference to students, educators and curriculum designers in learning and teaching or in development of training programs and curriculum.

The limitations of this study include the scope of survey conducted only in a university of education where students are provided supports from the university and the government in tuition fees, scholarships and opportunities.

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Content Value Analysis of Taiwan Social Issues Advertising Design Which Using AR

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Abstract
In the past, most of the methods to publicize social issues were Graphic Poster Design or TV advertisements. However, with the development of global Internet technology, people read newspapers and magazines less than before. Therefore, the value of print ads declined significantly after 2008. On the other hand, in 2016, the proportion of watching videos online surpassed that of watching TV in Taiwan for the first time, and mobile Internet has become the most common media for Taiwanese consumers. To let the new generation pay continuous attention to social issue advertisements, new technologies must be combined to enhance the value content of advertisements. This study is based on the fact that the population of some animals in Taiwan is decreasing, and they are even on the verge of extinction. Therefore, it is necessary to promote ecological conservation. The experiment process includes literature discussion, case studies on the ecological conservation poster works of the World Wide Fund for Nature, and the illustration works of three ukiyo-e-style artists. Finally, combine AR technology to design an AR advertisement for Taiwan's conservation animals. The results of this study show that the advertising environment evolves with the development of MarTech's thinking and model, and advertising is everywhere. AR advertising with interactivity and immersion is gradually gaining consumers popularity. Social issue AR advertising uses text, images, and space to connect with the real world and it creates value to attract consumers willing to participate. It is effective in promoting the importance of ecological conservation and arousing people's awareness of ecological conservation.

Keywords: Ukiyo-e, Environmental Childcare, Illustration, Public Service Advertising

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Introduction

United Nations Secretary-General Antonio Guterres has stated that environmental deterioration caused by the human destruction of the ecosystem has affected the welfare of approximately 3.2 billion people (Tzang, 2021). Taiwan, which is located in the center of the Eastern Asia island arc, has also been affected by this event. Because of its unique island terrain, climate, and geographical environment, Taiwan boasts high biological diversity and a high proportion of endemic species. However, the loss and destruction of habitats, hunting pressure, and the introduction of alien species have drastically reduced the population of wild animals in Taiwan, even resulting in some species becoming endangered. The rapid deterioration of Taiwan's ecosystem necessitates the promotion of the prevention of extinction prevention and ecological conservation programs in a timely manner, and everyone's combined effort is required to restore the global ecosystem. Conventional promotional methods for social issues mainly involve the use of designed printed posters or television commercials. However, with the maturing and flourishing development of internet technology globally and the decreased consumption of paper newspapers and magazines, the value of printed ads has significantly decreased since 2008 (Siltanen et al., 2017). In 2016, the percentage of Taiwan's citizens who mainly watched videos online was higher than the percentage of those who mainly watched television programs. Currently, the mobile internet has become the media format with the highest engagement rate among Taiwanese consumers (Eastern Online, 2018). The influence of traditional ad media has since continued to decrease. Fifth generation mobile networks have wider bandwidths, stronger connection, low latency, and high reliability, thus they are conducive for use in big data, artificial intelligence, and Internet of Things services (e.g., Industry 4.0, smart homes, autonomous cars, smart cities, smart medicine, virtual reality, and augmented reality). Furthermore, advancements in hardware equipment have spurred the development of augmented reality (AR) and virtual reality (VR) technologies, which combine design with technology to bring about an unprecedented and revolutionary technological change (Chang & Chang, 2018). This has created a new presentation method for the design industry to convey their designs.

Posters are a crucial promotional medium in traditional media. They are the most common medium for visual expression, and they can reach various consumers of different ages, cultures, and societies. In posters, distinctive visual signals are used to convey messages. Tsai (2008) reported that among the numerous forms of design media, poster designs are the most effective in presenting visual effects and the rich imagination of a designer. The general purpose of posters is to make announcements, provide information, or promote products. On the basis of their characteristics, posters can be classified into commercial posters, cultural posters, social and education posters, and artistic posters (Yuen, 1993). In particular, the content for social and education posters mainly focuses on promoting public morals and social issues. Relative to commercial posters, which target a specific consumer group, social and education posters are targeted toward society as a whole. A 2020 survey on internet usage among Taiwan citizens reported that 82.9% of Taiwan citizens below the age of 12 years access the internet through their smartphones. This suggests that the use of smart handheld devices has increased consumer expectations for brand communication. This study combined novel AR technology with poster design to promote public welfare issues, provide consumers with a novel experience, and create public awareness for social issues related to environmental conservation.

For design style, young Taiwanese people prefer Japanese culture, including Japanese drama, music, tourism, and art, thereby creating a unique Japanophilia trend (Yang, 2019). Ukiyo-e,

a unique art style in Japanese culture, has widespread influence on contemporary illustrations and comics, and it has attracted the attention of Taiwanese citizens who embrace the Japanophilia trend. Accordingly, this study focused on the social issue of animal conservation and applied the ukiyo-e illustration style in poster design through the use of AR. The posters are expected to increase public awareness of animal conservation in Taiwan among Japanophiles. The objectives of this study are to (1) understand the Japanese ukiyo-e art style and explore innovative design in AR; (2) discuss the design and image presentation techniques used in social and education posters and conduct case analysis; (3) explore the presentation of creative thinking, images, and symbols in illustration and analyze existing illustration and design pieces; and (4) develop AR poster designs that are based on animal conservation by applying the ukiyo-e style in accordance with the analysis results.

Literature Review

Aesthetics of ukiyo-e style

The ukiyo-e style trended between the second half of the 16th century and the 19th century in Japan during the Edo period (1603-1867). After the 19th century, the style became a representation of Japanese folk art. The themes portrayed using the ukiyo-e style include characters, scenes, flowers, insects, birds, animals, and lifestyle customs. Two methods are used to create the ukiyo-e style. The first method is the draw-by-hand method, which is also referred to as the "flesh and pen" method and involves an artist drawing directly on silk or paper. The second method is the engraving method, which is also referred to as the "orthodox ukiyo-e" method; it involves an artist drawing directly on an engraving board, which is then used for printing (Chuang, 2020).

The main characteristic of the ukiyo-e style is how the pictorial space is flattened. This style abandons the conventional fixed-point perspective to present images without a depth of field, thus it is considerably different from the three-dimensional style pursued by renaissance artists. Additionally, the ukiyo-e style first outlines the image of an object before coloring it in, and lighting is not added to the image, such that lines and colors are emphasized.

The aesthetic principles of the ukiyo-e style are to (1) pursue a highly painterly two-dimensional space (the ukiyo-e style recreates three-dimensional images perceived using the eye in a two-dimensional space, and the limitations of engraving techniques result in created images featuring a flat sense of space), (2) abandon the conventional fixed-point perspective (i.e., the perspective adopted in the ukiyo-e style does not consist of a fixed focus; the style employs the scattered-point perspective to create an overall decorative effect by presenting scenery and characters on the same plane and adopts an overlapping perspective to place foreground objects over background objects, and this overlapping effect creates a sense of space), (3) use outlines to emphasize the colors on a plane (the ukiyo-e style first outlines an image before coloring it in, and lighting is not added to the image, such that colors and lines are emphasized), and (4) present lifestyle-based, elegant themes (the themes used in ukiyo-e style are diverse, mainly themed around wind, flowers, snow, the moon, mythical creatures, and daily lifestyles; Hsu, 1998; Huang, 2005).

Pictorial symbols

For a poster to achieve its purpose, its design must attract the target audience and employ pictorial elements and principles of visual culture to accurately and effectively convey its

message (Banu, 2014). Graphic symbols in posters convey key messages for the audience to make decisions on; these messages are disseminated to ensure successful communication with an audience. The coding process of a poster message involves the employment of various visual symbols and textual elements. If an audience attains an improved understanding of the symbols and elements used in a poster, the effects of graphic symbols and message coding is regarded to be more successful (Firouzeh & Hamedi, 2014). Graphic symbols can convey messages to achieve the objective of communication and prompt an audience to connect with other associated ideas, thereby allowing for the complete portrayal of the symbolic meaning of a graphic image. With the evolution of culture and society, an abundance of graphic symbols with diverse meanings and implications have been created (Tsai, 2008).

Wang (2011) proposed the 13 graphic symbol presentation methods as follows: (1) Form isomorphism: This method transcends common sense by combining two different forms of visual elements to create a new creative image. (2) Form deconstruction and reconstruction: This method segments visual elements and intentionally reconstructs the segments in accordance with the intended design. (3) Replacement reconstruction: This method replaces image aspects on the basis of the similarities between forms, thereby altering the forms presented in an image. (4) Paradoxical imagery: this method makes the impossible possible by creating a paradoxical image to represent a reasonable moral. (5) Adaptive and filled-in imagery: This method integrates an image into a simple structure, thereby making the interior aspect of the image diverse and complicated while maintaining the structural simplicity of its exterior. (6) Symbiosis and positive–negative imagery: This method uses the positive and negative spaces of an image to present separate meanings that convey the message of the imagery (e.g., figure–ground illusion). (7) Textual image presentation: This method uses the text in an image as the foundation for developing creative images. (8) Profiling formation: This method creates new visual meanings by combining different elements to create an image that is lively. (9) Hidden formulation: This method prevents an audience from directly interpreting the meaning of an image and requires them to closely observe the image to reveal its hidden meaning, thereby creating a double entendre effect. (10) Visual hallucination and optical illusion: This method causes an image to distort and transform under specific conditions, thereby creating a visual illusion. (11) Visual extension: This method requires an audience to infer the meaning of an image through imagination and extension. (12) Grafting and fusion: This method ignores technological limitations and combines two different objects that are correlated and complementary. (13) Heteromorphic imaging: This method uses the contrasting relationship between images to express a intended meaning.

Augmented reality interaction design

With the rapid increase in the number of smart network device users, AR has become the new human–machine interface for connecting the digital world with the physical world. Expenditure on AR technology was expected to hit US$60 billion in 2020. AR technology affects organizations in every industry, from universities to social enterprises. It influences how we learn, make decisions, and interact with the physical world (Porter & Heppelmann, 2017). Brand and social issue advertisements must convey their messages accurately and increase their influence to flexibly and humanely present themselves to the audience. The use of AI, AR, and VR technology in brand or social-issue advertising can overcome the limitations of traditional design thinking and create a more innovative approach through creative interactions. Through the combination of these technologies with mobile applications, the design of advertisements and promotions can outperform existing monotonous and

unidirectional advertisement methods; the application of technology can increase an audience's perceived freshness of a brand or social issue (BRANDinLABS, 2015).

AR employs the characteristics of digital overlay to overlap virtual objects over the real world (Azuma, 1997). Kounavis et al. (2012) regarded AR as a visual technology for integrating multimedia messages with the real world. Most AR systems overlap virtual messages over physical objects and spaces to enhance the continuity of space and time (Azuma, Billinghurst & Klinker, 2011). Early AR monitors are head-mounted displays that are placed over a user's eyes; this amplifies the user's perception of an image that is projected on a small screen. Currently, AR technology is applied in marker-based operations. Users can use their smartphones to scan cards with AR-code images to view the corresponding AR images on a web browser.

Huang (2018) proposed the use of AR to create 10 types of user experiences, namely visualized experiences, augmented experiences, real-time translation experiences, magical experiences, multisensory experiences, guidance experiences, communication experiences, superhuman experiences, real-time measurement experiences, and highly customized experiences. The operation of AR technology is dependent on the use of smartphones, tablets, computers, or hardware installed with AR software and cameras that track objects in the physical world. These objects include icons, images, objects, sounds, positions, or even people. Input data pertaining to an object is processed by software and compared with the corresponding data in a database. If the input data matches those in the database, the AR experience is initiated, and digital content is overlapped over the physical world. The present study applied AR technology to design posters on social issues that are related to animal conservation in Taiwan; this was achieved by applying the ukiyo-e illustration style to create awareness among the young population.

The AR poster designed in the present study was created a story-based narrative on animal survival and the ecological environment. An anti-structure, anti-perspective, anti-proportion, and anti-order design thinking process was implemented, and the designed poster uses the ukiyo-e illustration style to advocate the crucial role of animal conservation for rare species.

Research method

The research framework is divided into five stages. In the first stage, the poster theme was determined and the design motivation and purpose were clarified. In the second stage, a literature review was conducted to explore the literature on the aesthetics of the ukiyo-e style, graphic symbols, and AR interactive designs. In the third stage, the research method and poster design were planned. A case analysis was conducted to analyze posters on social issues related to animal conservation and ukiyo-e illustrations to obtain an understanding of previously applied design methods and to provide a reference for the poster design of the present study. In the fourth stage, the results of the design creation are discussed; the data collected in stages two and three and the data analysis results are applied to the design and creation of an AR poster that consists of illustrations that promote the conservation of rare species in Taiwan. In the fifth stage, the conclusion and suggestions of the present study are proposed. In the present study, a case analysis was conducted to explore the designs of animal conservation posters and ukiyo-e style illustrations. The analysis content and results are as follows:

Case analysis of animal conservation posters

The present study collected promotional posters of the World Wide Fund For Nature and selected 15 posters on social issues related to animal conservation for case analysis to explore the themes and graphic symbols presented in these posters. The analysis results are as follows. (1) Theme and purpose: Among the 15 cases, seven (46.67%) conveyed the message "disappearance of animals", five (33.33%) conveyed the message "human destruction", and three (20.00%) conveyed the message "self-reflections of humans." Accordingly, the themes explored in the posters on social issues related to animal conservation were mainly focused on promoting the message of disappearance of animals. These posters warn of the threats to endangered species and highlight the urgency of animal conservation. (2) Image presentation and form: The present study referenced the 13 graphic symbol presentation methods proposed by Wang (2011) for content analysis. Among the 15 cases, five used the profiling formulation method (33.33%), three (20.00%) used the visual extension method, two used the paradoxical imagery method (13.33%), two (13.33%) used the grafting and fusion method, one (6.67%) used the adaptive and filled-in imagery method, one (6.67%) used the hidden formulation method, and one (6.67%) used the textual image presentation method (Table 1). Accordingly, among the 15 cases, the profiling formation method was most frequently employed method for presenting graphic symbols. This presentation method emphasizes the visual meaning created by combining various visual elements, which prompts an audience to connect with other associated ideas using the clues provided in an image to understand the purpose of the conveyed message. Additionally, the combination of numerous visual elements in an image can increase an audience's interest in the image. Therefore, the present study applied the profiling formation method to design an AR poster on animal conservation in Taiwan.

Table 1 Case studies of WWF animal protection posters

Item	Types	Quantity	%	Percent total
theme purpose	disappearance of animals	7	46.67%	100%
	human destruction	5	33.33%	
	self-reflections of humans	3	20.00%	
pictorial representation	form isomorphism	0	0.00%	100%
	form deconstruction and reconstruction	0	0.00%	
	replacement reconstruction	0	0.00%	
	paradoxical imagery	2	13.33%	
	adaptive and filled-in imagery	1	6.67%	
	symbiosis and positive-negative imagery	0	0.00%	
	textual image presentation	1	6.67%	
	profiling formation	5	33.33%	
	invisible composition	1	6.67%	
	visual hallucination and optical illusion	0	0.00%	
	visual extension	3	20.00%	
	grafting and fusion	2	13.33%	
	heteromorphic imaging	0	0.00%	

Case analysis on ukiyo-e style illustrations

The present study examined 15 ukiyo-e style illustrations by the Chinese illustrator Rlon Wang, United Kingdom illustrator Daniel Mackie, and Singaporean illustrator William Chua for case analysis. The analysis content included the illustration content, the design thinking approach, and the use of colors and art media. The analysis results revealed the statistics as follows. (1) Illustration content: Among the 15 cases, five (33.33%) depicted a story-based narrative, five (33.33%) depicted the ecological environment, and five (33.33%) depicted the anthropomorphism of animals. Accordingly, the results indicated that the three illustrators used images of animals to convey various messages. In particular, the illustrations all feature enlarged images of animals to visually indicate that animals are the theme of the illustration. (2) Design thinking approach: The present study categorized the design thinking approach of the images on the basis of the creative thinking categories proposed by Song and Liu (2011). Among the illustrations, five(33.33%) adopted anti-structure and anti-perspective design thinking , five (33.33%) adopted anti-proportional and anti-order visual thinking, three (20.00%) adopted anti-structure visual thinking, and two (13.33%) adopted anti-perspective thinking. The results revealed that the illustrations mostly employed anti-proportional visual thinking that contrasted with the context of daily life. By adopting this approach, the illustrators altered the functions or positions of the objects depicted in their illustrations and used multiple vanishing points and multiple horizon lines to transgress the natural and society order, thereby creating attractive images. (3) Use of colors: All 15 illustrations (100.00%) used bright colors to distinguish the foreground and background, allowing an audience to focus on their themes. (4) Art media: Among the illustrations, five(33.33%) were drawn by hand, five (33.33%) were drawn by both hand and computer graphics, and five (33.33%) were drawn using solely computer graphics. The results indicated that different illustrators used different drawing methods to produce illustrations of a similar quality.

Table 2 Case studies of illustrations in Ukiyo-e style

Item	Types	Quantity	%	Percent total
the illustration content	a story-based narrative	5	33.33%	100%
	depicted the ecological environment	5	33.33%	
	depicted the anthropomorphism of animals	5	33.33%	
the design thinking approach	anti-structure and anti-perspective	5	33.33%	100%
	anti-proportional and anti-order	5	33.33%	
	anti-structure	3	20.00%	
	anti-perspective	2	13.33%	
use of colors	bright colors	15	100.00%	100%
	dull colors	0	0.00%	
art media	drawn by hand	5	33.33%	100%
	drawn by both hand and computer graphics	5	33.33%	
	drawn using solely computer graphics	5	33.33%	

Results and discussion pertaining to design creation

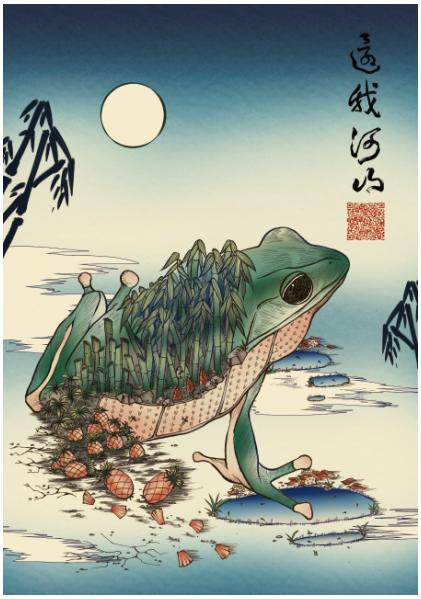
Design sampling

The Chianan Plain is the largest alluvial plain in Taiwan. The region receives abundant rainfall in the summer and is a key habitat for frog species. *Rhacophorus arvalis* is a species that is endemic to Taiwan, and it is mainly found in low-altitude agricultural bamboo forests, secondary-growth forests, and orchards in Yunlin, Chiayi, and Tainan. In recent years, the aforementioned regions have been replanted to grow pineapples and oranges, which has reduced the habitat of the species and led to their dispersion. This threatens the ecological development of *R. arvalis* and results in a declining population, thereby pushing the species closer to extinction (Chen & Liu, 2017). On the basis of the protected species categories in the list of protected wild animals that was established in accordance with the Wildlife Conservation Act by the Council of Agriculture, Executive Yuan, endemic species in Taiwan are classified into endangered species and rare and valuable species. The present study selected the endangered species *R. arvalis* as the subject for poster design. Prior to the start of the design process, the authors conducted a review on literature, and they collected and analyzed data to determine the main characteristics and habits of the species and the reasons why it is endangered. This process facilitated the subsequent design process in which converting graphic symbols were converted into design.

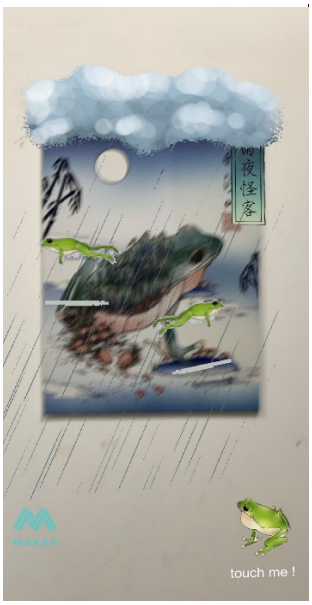
Design process for creating graphic symbols and augmented reality

In this stage, the authors adopted the ukiyo-e style in the illustration design process to present the characteristics of *R. arvalis*, including its living environment, food, and habits. The four principles of reverse thinking (i.e., anti-structure, anti-perspective, anti-proportion, and anti-order design thinking) were integrated and used for the coding of graphic symbols to highlight how the species is influenced by the planting of pineapples and the changes to its original habitat. Accordingly, the illustrations depicted the overturning of the natural order.

For AR design, the present study divided the AR experience into emotional and rational experiences. The emotional experience presents the environmental habitat of the *R. arvalis* before its destruction. The AR design presented a rainy background and highlighted that *R. arvalis* often called after a rainy night. Users may click on the poster to experience the species' habitat and the wonderful melodies that it created by calling. The rational experience consisted of a 15-s auditory introduction of the species. Additionally, users were asked three questions to increase user engagement and deepen their understanding of the species. The AR design provided users with an immersive experience and used multisensory stimulation, including visual, tactile and auditory stimulation, to strengthen users' understanding of the crucial role of animal conservation for endangered species. The designed AR poster is presented in Figure 1.



AR conservation poster, scan QR cord



Click to appear rain scene

Click to listen to the 15-s species introduction

Click to make the species chirping sound, click at will to form a melody.

Click for Q&A

Response

the End

Figure 1 the *R. arvalis* AR poster design
Source: Produced by Chang, W. Y.

Conclusions

Conventional promotional methods for social issues mainly consisted of designed printed posters or advertisements. In the contemporary era, such promotional methods are considered by the young generation to be overly statistical and unengaging, thus they less likely to attract the attention of this generation. Given that the young generation embrace Japanese culture and that the ukiyo-e style is a major Japanese drawing technique, the present study applied the ukiyo-e style to design a poster aimed at promoting the problem of the decreasing population of wild animals in Taiwan. Additionally, AR technology was applied to the design of the poster to raise awareness regarding this social issue among the young generation, thereby promoting the crucial role of ecological environment conservation. The present study analyzed the design and graphic symbols used in ukiyo-e style illustrations and combined the

analysis results with AR technology to design an AR poster that is based on *R. arvalis*, which is an endangered species that is endemic to Taiwan. The research conclusions are as follows: The case analysis of the posters of the World Wide Fund For Nature (which advocate the social issue of animal conservation) revealed that most posters employed the profiling formation method to present graphic symbols. This method combines different visual elements to convey a visual meaning, is easy to understand, and creates an entertaining imagery. Most of the analyzed posters convey the message "the disappearance of animals," which emphasizes the threat of disappearing animal populations.

The case analysis of the collected ukiyo-e style illustrations revealed that most illustrations feature enlarged images of animals to clearly indicate that animals are the main theme. For design thinking, most illustrations applied reverse thinking to transform their subjects into unfamiliar forms, thereby enhancing their attractiveness.

On the basis of the results of the case analyses, the present study adopted reverse thinking to develop the content of the designed image. The profiling formation method was employed for the presentation of graphic symbols. The designed AR poster employs the ukiyo-e style to convey the message of "the disappearance of animals," and it uses a brief auditory introduction and question-and-answer activities to enhance the narrative of the social issue, attract the attention of the young generation, and achieve the design objective of creating an interactive experience.

AR technology was applied to the poster design process not as a complete replacement of the conventional poster but as a means of enhancing the promotional effect of conventional posters through the creation of an immerse experience. This application employs new technology to enhance the liveliness of printed posters by including AR elements. In summary, the present study included AR elements into the design of an animal conservation poster to simulate a multisensory experience (i.e., visual, tactile, and auditory experiences), thereby "immersing" users in the social issue through virtual and real interactions. Consequently, the poster enhanced the value and uniqueness of the reading content and attracts consumers to actively engage with the poster, thereby successfully promoting the social issue.

In the current stage, the present study completed the design of an AR poster that is based on *R. arvalis*, which is an endangered species that is endemic to Taiwan. Future studies can reference the proposed design method to design AR posters that are based on other endangered species; these posters can provide the young generation with a learning experience, raise awareness regarding social issues, improve the environment, and promote ecological conservation. Additionally, the present study designed a questionnaire survey to evaluate the effectiveness of the designed AR poster in communicating with the young generation.

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A Case for the Bicycle: How Cycling Can Promote Equality

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Abstract
The purpose of this paper is to explore how cycling enhances health and quality among minority groups. We see examples from empirical literature of how cycling supports female health and empowerment, how cycling improves quality of life for people with cognitive and physical disabilities, how cycling increases health equality among people of color, and how cycling can combat ageism. Overall, a cycle of health, body autonomy, quality of life, and education work together to support equality in minority groups. . A prime example of this is seen in the history of the bicycle. Not only is this tool for exercise used for promoting positive physical and mental health outcomes, but also in increasing the quality of life. This quality of life does not only refer to the improvement of physiological and psychological outcomes but also changes in the ability of the individual to participate equally in society as their counterparts (i.e., men, people without disabilities). This is seen with the suffragettes riding bicycles to promote the right for women to vote or individuals with Autism Spectrum Disorders utilizing cycling as a life-long leisure skill. This paper argues that through utilizing means of accessible physical activity (i.e., the bicycle) minority populations are able to find more equality within society through transportation, physical and mental health, and education.

Keywords: Human Equality, Exercise Science, Adaptive and Inclusive Training

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The Beginning of the Bike

While it may be common to see a female riding a bicycle today, it was a radical sight in the 1890s. The bike had gained immense popularity, and women and men alike were partaking in the new invention. As strange as it may seem, this form of physical activity gave women not only a means of travel but also fostered a new level of independence.

It is not irrelevant that women began to wear pants (riding in a dress wasn't as efficient) and use the bicycle to symbolize the suffragettes. Alice Hawkins, a suffragette, promoted the women's rights movement by riding her bike around Leicester (in the United Kingdom) in pants. She was one of the first females to wear pants publicly in the city while promoting women's right to vote.

Cycling and Women Today

Increasing Access to Education

Cycling promotes female empowerment through access to education. A program called "Wheels of Change" seeks to supply bicycles to females in 5th to 7th grade. A year after the program distributed the bikes, female absences from school decreased by 28%, increased their punctuality by 66% (due to reducing their travel time). It increased their safety in commuting to school by 22% (measured by cat-calling and teasing from male counterparts during their commutes), and females had more positive self-image and felt more in control of their lives than females who were not in the program.

Individuals with Cognitive Disabilities

It is clear that the bicycle was influential in female empowerment and still is today. But can this independence and freedom be applied to other minority groups? A key group that has already been anecdotally and empirically shown to benefit from cycling is individuals with cognitive disabilities, specifically Autism Spectrum Disorder (ASD) and Down syndrome (DS).

For instance, those with ASD often have deficits in balance due to poor proprioception, connected to elevated anxiety and decreased motor skills (Stins, & Emck, 2018). So not only do populations with ASD struggle with balance, but this deficit also produces other comorbidities that may limit functioning and quality of life. Therefore, interventions that address balance in this population could also benefit other aspects of quality of life.

What if there could be an intervention easily applied at home? Recent research has demonstrated that pedal-less bikes might be the solution (Shim, et al., 2021). This research found that in a 4-week trial, in 20 participants of ages 3-5 years old, balance and overall quality of life could be significantly improved. This is vastly important, as those with ASD and other disabilities may struggle to learn to ride a bike given their deficits in balance. While the research in discussion does not focus specifically on ASD and other disabilities, there is a plethora of research.

HOPE for Autism is a program that provides opportunities for children in the community to learn how to ride a bike, including those children who have been diagnosed with an autism spectrum

disorder (Page, 2019). This is an important aspect to address as youths with ASD are less social compared to their typically developing peers (Garcia, Hahs-Vaughn, 2021; Head, McGillivray, & Stokes, 2014). Significantly, research has demonstrated that males with ASD are more likely than females to be less sociable (Head, McGillivray, & Stokes, 2014). Meaning, cycling may be an especially important intervention for males with ASD to improve not only physical health but also sociability.

Individuals with Physical Disabilities

Another group that benefits from the bicycle is individuals with physical disabilities. This group is often significantly less physically active than those without physical disabilities (Hollander, & Proper, 2018; Jung et al., 2018). Importantly, physical activity is important not only for physical health but also for mental health (Landers, & Arent, 2007; Tyson et al., 2010). Research has shown that the mental health of individuals with physical disabilities is significantly poorer than those without disabilities (Jones, & Loller, 2008; Schreurs, Ridder, & Bensing, 2002). What's more, individuals with physical disabilities are more likely to report lower quality of life (Brown et al., 2014). Importantly, this same research from Brown and colleagues (2014) demonstrated that physical activity increased reported quality of life in individuals with and without physical disabilities. Therefore, bicycling is capable of improving the quality of life for individuals with physical disabilities.

Adaptive Equipment in Cycling

In order for those with physical disabilities to be successful in cycling, there are a variety of adaptive bicycles available. Examples of these bicycles include handcycles, tandem bikes, and recumbent cycles. Descriptions can be found in the appendix (Table 1). Additionally, resources for purchasing these bikes and accessories are available in the appendix.

Programs for Individuals with Disabilities

There are programs available to educate individuals with cognitive and physical disabilities on how to ride a bike, as well as services to make bikes adaptable for different disabilities. Many of these programs are free to participants and function as non-profits. Examples and descriptions of these programs can be found in the appendix (Table 2).

Importantly, research has also demonstrated that education coupled with an active cycling intervention promoted greater sport participation (Vanroy et al., 2017). This study analyzed patients with severe motor deficits. Both groups (test and control) showed significant improvements in physical activity measures regardless of coaching or no coaching (meaning cycling of any duration seems to improve physical performance in this population). With this in mind, it further supports the claim that programs that promote inclusiveness in cycling are vastly crucial for improving the quality of life for these populations. More work is needed to assess what types of intervention strategies are most successful.

Fighting Ageism through Cycling and other Physical Activity

Ageism, stereotyped, prejudiced, discriminatory attitudes based on age, has replaced the practice of honoring old age with a focus on the negative aspects of aging (Ye, Gao, Fu, Chen, Dong, & Gu, 2020). Studies show older adults' perceptions and attitudes toward aging has a significant influence on physical and mental health (Massie & Meisner, 2019; Dionigi, Horton, & Bellamy, 2011; Vertinsky, 1995). According to Levy, Slade, Kunkel, and Kasl (2002) a positive self-perception on aging increased the lifespan of subjects 7.5 years. A variety of factors contributes to this self-perception influencing older adults' behaviors and health, and indirectly to the social and economic costs of a frail older generation. Physical activity continued into older age can provide significant relief to the health and social care services, through the positive impact on quality of life as well as social and mental wellbeing (Black & Street, 2014).

Older Cyclist and Holistic Health

The Cycling without Age group supports the organization of local groups of volunteers who act as 'pilots', biking with a trishaw carriage to give rides to older nursing home residents, an outdoor excursion and social activity (Cycling without Age, 2021; Jørgensen, Petersen, Eghøj,& Toftager, 2021). This leisure-time physical activity has been identified as a positive experience in active aging, but not all older adults are able to experience the health benefits, as they fight the perceptions of ageism (Massie & Meisner, 2019).

Breaking Stereotypes

Older adults who view aging positively can be role models for society. An active older person challenges the traditional stereotypes related to aging. According to Clément-Guillotin, Radel, & Chalabaev (2015) physically active older adults were viewed as an admired group and more socially accepted. The potential for personal empowerment and purpose through physical and sports activity supports women in particular, who lose the ability to socialize and freedom of movement (Dionigi, Horton, & Bellamy, 2011).

Social Aspects of Cycling

When looking at the human experience as a whole, a major component of holistic well-being is the social bonds humans form between one another. The Main Effect Model can be used to support this concept, as seen below in figure 1 (Kawachi and Berkman, 2001). Kawachi and Berkman describe the Main Effect Model as a way of portraying how social interaction can influence mental health. Social influence is defined as how our peers influence our actions (i.e if a child sees their parents working out, they are more likely to work out when they get older). Neuroendocrine responses pertain to how an individual responds to stress (i.e how their CNS reacts to a stressful stimulus with hormones and neurotransmitters). Overall, the researchers found that individuals who were active in their community had an increase in positive psychological states (such as an increased state of purpose and belonging) which could contribute to a higher sense of motivation for self-care, such as exercise or other beneficial habits.

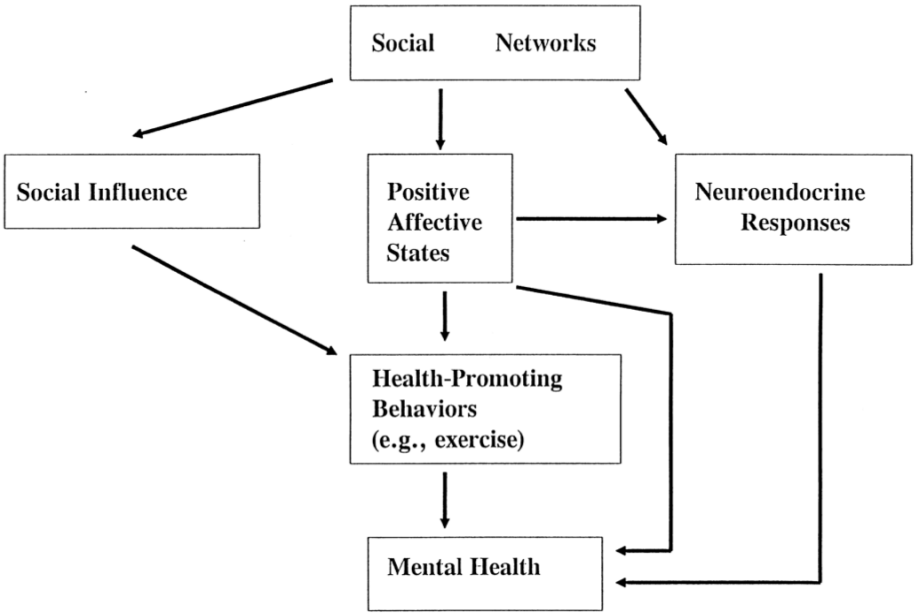

Figure 1: Main Effect Model on social interactions and mental health (Kawachi & Berkman, 2001)

Furthermore, while research shows that social interactions improve mental health through engagement in activities that increase positive psychological states, the inverse is also true. Exercise can be seen to allow individuals to form social interactions. For example, a study performed by Duncan and colleagues (2017) reached out to members of the CrossFit community (i.e. Members of gyms certified as CrossFit affiliates) to evaluate their experience with exercise and the CrossFit environment. The following quote can be seen in the study:

> Moreover, for some participants ([n=]5), the social aspect of CrossFit was just as or even more important than the health and fitness benefits as expressed by participant 16, "I enjoy the workouts, but at the end of the day it is the people who are there and how supportive everybody is for each other.

This study shows how exercise is in itself a way to form social connections.

Older people and Sociability

Similarly, Zander, Passmore, and Rissel (2013) found that cycling in older individuals could increase the quality of life. The researchers argue that cycling is an affordable resource that is easily incorporated into a daily routine and is a habit that provides various beneficial factors. For example, the study concluded that through enhancing social networks and allowing the individuals to build confidence in their abilities, the participants essentially had a higher sense of self-efficacy. Interestingly, the study found differences between the male and female participant outcomes, as seen in the following quote:

> […]the sense of empowerment and pride was felt very strongly by female participants but not even mentioned by men. It is possible that men may be inherently more physically confident and assume that they will be able to ride without problems while for women this is a realisation rather than an assumption.

This quote is an important finding. It shows that women are often the members of society who need exercise the most- not for the physical benefits, but for the positive psychological developments. This evidence supports that exercise is critical for all people, but especially women. Cycling is an accessible form of exercise to achieve this goal.

The Covid Era

Moreover, not only is exercise an essential part of an individual's overall well-being through physiological and psychological factors, but also a healthy outlet for stress. Amongst the diverse stressors many people face in today's society, the Covid-19 pandemic can be found to be a mutual stressor for many. A review by Hu and colleagues (2020) discusses the mental health changes seen during the Covid-19 lockdown in April 2020. The review evaluates how stress during the lockdown altered neurotrophic factors and endocrine pathways in the CNS. That is to say, how the stress and fear of the Covid-19 lockdown stimulated depression and anxiety in individuals. Through this review of studies, the authors state that "Although outdoor physical exercise is unavailable during the outbreak of Covid-19, indoor exercise is recommended in view of the positive effect of exercise on boosting [the] immune system…and alleviating anxiety and depression…" (Hu et al., 2020). Therefore, not only did exercise increase mental health during the Covid-19 lockdown, but also increased overall immune function- an essential factor during a global pandemic.

Furthermore, while the Covid Era further substantiated the importance of exercise on mental health, it also revealed the inequality found between social groups. The Centers for Disease and Control Prevention (CDC) states that "The COVID-19 pandemic has brought social and racial injustice and inequity to the forefront of public health" (Centers for Disease Control and Prevention, 2021). The CDC found that minority groups were more at risk for contracting Covid-19 and becoming ill or dying. According to the CDC, social determinants that contribute to minority groups being more at risk range from their work environment, home environment, learning environment, etc. The CDC goes on to discuss discrimination that minority groups may face once in a healthcare facility as well, such as language barriers and biased care (Centers for Disease Control and Prevention, 2021). However, despite these obstacles minorities already face when it comes to health, Janet Fulton, Chief of the CDC's Physical Activity and Health Branch in the Division of Nutrition, Physical Activity, and Obesity, states that minority groups are physically less active than others in the United States (Fulton, 2020). This is in part due to the communities that minority groups live in. Many of these communities are deprived of resources, and do not provide areas where individuals can safely exercise. Fulton states that "...Hispanics had the highest prevalence of physical inactivity (31.7%), followed by non-Hispanic blacks (30.3%) and non-Hispanic whites (23.4%)." Overall, it can be concluded that limited access to opportunities to exercise within a minority community contributes to the lack of activity level. Likewise, this could be a negative factor when it comes to minority mental health and staying healthy during the Covid era.

Conclusion

Bicycles have played a part in the empowerment of women as well as other underserved groups. It has been shown that cycling is capable of improving the quality of life in minority populations. The general increase of physical activity lends itself to transportation, leisure physical activity for life (as seen from pediatric to geriatric populations), improved mental health, and an increase in education. When we increase the ability for a human to utilize their body with full autonomy, we are able to increase the quality of life in realms that reach outside of physical activity.

Appendix

Adaptive Bicycles

Bike Name	**Description**
Handcycle	Allows cyclists to propel a three-wheeled cycle using their arms.
Tandem Bike	1. two-wheeled bike with a guide in the front. (other set-ups are possible) a. side-by-side tricycle: allows two people to work together synchronously or asynchronously
Recumbent Cycle	1. tadpole-style: one wheel in the back and two in front. 2. Delta-style: two wheels in the back and one in the front 3. Four-wheeled: similar to the Delta-style recumbent, but with two wheels in the front.

Table 1. Examples of adaptive bicycles

Where to Buy Adaptive Bikes

https://www.adaptivemall.com/specneedtric.html

https://www.freedomconcepts.com/product-lines/adaptive-bikes/

https://www.thealinker.com/?gclid=Cj0KCQjwnoqLBhD4ARIsAL5JedLu9BQPijzR6oyqjhR7wD9MTHJ5_vVeMKfXlb8FP2SK4fl1S4Xi03kaAqsrEALw_wcB

Programs for Adapted Cycling

Program Name	**Summary**	**Website**
Move United	This program provides an adaptive cycling recreational manual. This manual covers off-road, tandem, handcycling, and others.	www.moveunitedsport.org
Adaptive Cycling Foundation	This program manufactures and supplies adapted bikes for first responders and service members. These bikes serve to address limitations in mobility and balance, limb loss, and other sustained injuries.	www.adaptivecycling.org
Programs to Educate All Cyclists (PEAC)	This program is based in Ypsilanti, Michigan, PEAC teaches individuals with disabilities how to ride a bike and to maneuver public transit safely.	www.bikeprogram.org
AdaptAbility	This program is based in Brooklyn, New York; this program makes custom adaptive bikes for kids and adults with disabilities. This program also offers applications to receive a free custom bike. AdaptAbility also has subprograms such as 4Ride, which is a program that allows youth with disabilities to rent adapted bikes for free.	www.adaptabilitybike.org
Adaptive Sports Connection	The Adaptive Sports Connection offers four programs: Discover Cycling (ages 24+), Discover Mountain Biking (any ages), Group rides (any ages), and Bikes To Go (ages 23 and under). Therapists are present at programs to aid in the learning and riding of adaptive bikes.	www.adaptivesportsconnection.org
iCan Shine	iCan Shine provides learning through the iCan Bike program. This program teaches individuals with disabilities how to ride bikes (ages 8 and up).	www.icanshine.org

Table 2. Examples of available adaptive programs for cycling

Sources of Older People Being Active

Instagram Handle	**Description**
Squat_University	This instagram account is run by Dr. Aaron Horschig. On this account movement analysis and recommendations can be found, and athletes who are 50+ can be seen lifting weights.
OldLadyGains	This account is run by a Master's women empowHERment company. The account posts apparel to support the company and female empowerment, and female athletes of all ages.
TrainWithJoan	This account is run by public figure, Joan MacDonald. She is 80-years-old and documents her fitness journey. She has over 1.5 million followers and has drastically transformed her life through fitness.

Table 3. Examples of social media accounts where role models can be found for older people wanting to begin lifting weights and exercising.

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Self-Care Plan of College Freshman Students During the Covid-19 Pandemic in the Philippines

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Abstract
The covid-19 pandemic affects not only physical health but also mental health and well-being. Loss of loved ones, fear of being infected by the virus, threats to the financial stability of their family, changes in normal routines, and feelings of isolation can contribute to increased anxiety, sadness, and loneliness which pose a greater danger for psychological impairment. Literature pinpoint that promoting self-care has a favorable effect on individuals' mental health. With the current health crisis worldwide, the majority was inevitably shaken by its life-changing effects. The student population is one of those who were directly affected due to the overwhelming challenges and uncertainties they face. It is in this light, that this research was conducted to encourage freshman students to design their self-care plan embedded in online course-based mental health modules to help them overcome difficulties and promote resilience. This research employed a qualitative approach to describe the self-care plan of freshman students. The eighty-two participants were enrolled in a non-academic online course on mental health literacy at a private university in the Philippines. Thematic analysis was utilized to examine the data gathered using the eight dimensions of self-care by Fisher (2015). Results show that students' self-care plan includes systematic (physical self-care), emotive (expressing emotions), luminescent (spiritual practices), cognitive (having a positive mindset), aptitudinal (finding creative ways to use skills and talents), relational (connecting with others), environmental (supporting local communities), and financial self-care. With these findings, implications of the importance of comprehensive and sustainable mental health programs in schools and universities are discussed.

Keywords: Covid-19 Pandemic, Mental Health; Self-Care; College Students

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Introduction

It was January 2020 when the World Health Organization (WHO) declared the highest level of alarm under international law for the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as a public health emergency of international concern (World Health Organization, 2020). Eventually, WHO began referring to the virus as the covid-19 which rapidly spread worldwide and has greatly affected the lives of the general population. The pandemic has resulted in tons of reported deaths, hospitalizations, risks to health and safety, loss of livelihood, health services breakdown, and economic recession. Different policies to help manage the transmission of the contagious disease had led to a major disruption in the daily life activities of humans of all ages. Many countries resorted to implementing strict health and quarantine protocols that include wearing face masks, frequent washing of hands, physical distancing, minimizing face-to-face interactions, localized community lockdowns, and self-isolation (World Health Organization, 2020 and Haleem, Javaid, & Vaishya, 2020).

It is also evident that the covid-19 pandemic affects not only the physical health but also the mental health and well-being of many (Kontoangelos, Economou, & Papageorgiou, 2020; Fiorillo, & Gorwood, 2020). Loss of loved ones, fear of being infected by the virus, threats to financial stability, sudden changes in normal routines, and the feeling of isolation can all contribute to increased anxiety, sadness, and loneliness which pose a greater danger for impairment in individuals' functionality (Hou, Lai, Ben-Ezra, & Goodwin, 2020) and are also known risk factors for several mental health illnesses such as major depression, anxiety disorders, schizophrenia, post-traumatic disorder, and obsessive-compulsive disorder (Fiorillo & Gorwood, 2020). In the study conducted by the US Consensus Bureau, Household Pulse Survey (2020), the report revealed that 56.2% of young adults ages 18-24 are experiencing symptoms of anxiety and/or depression, 48.9% for adults ages 25-49, 31.9% on adults ages 50-64, while 29.3 for adults 65 and up. More so, aside from anxiety and depression, sleep disturbance, substance abuse, and suicidal ideation have also escalated for many young adults who experience the closure of universities, transition to online school or work, and financial issues brought by the pandemic (Panchal, Kamal, Orgera, Cox, Garfield, Hamel, & Chidambaram, 2020). In the Philippines, a study was conducted during the onset of lockdowns and community quarantine to determine the psychological impact of the covid-19 pandemic on the general population. Results showed that 16.3% of the respondents revealed moderate to severe psychological impact; 16.9% of the respondents experienced moderate to severe depressive symptoms; 28.8% reported moderate to severe anxiety symptoms; and 13.4% experienced moderate to severe stress signals (Tee, Tee, Anlacan, Aligam, Reyes, Kuruchittham, & Ho, 2020). These numbers clearly illustrate that in one way or another this global health crisis had brought physical and psychological problems to the general population.

One of the government's strategies to eradicate and flatten the curve is to minimize the mobility of all. This includes the suspension of face-to-face classes at all levels which caused immense disruption to the educational system all over the world (Hou, Lai, Ben-Ezra, & Goodwin, 2020). In the Philippines, both the Department of Education (DepEd) and the Commission on Higher Education (CHED) were forced to shift gears on teaching modalities and migrate the educational platform to distance learning, modular approach, blended learning, and online learning (Tria, 2020). Indeed, this health outbreak gave an avenue for the educational system to introduce digital learning and maximize the use of the internet (Dhawan, 2020). However, the abrupt changes also create adverse consequences for students, teachers, and parents. There was an interruption in learning, confusion, and stress to all

school stakeholders. Teachers, parents, and students are caught unprepared for distance or homeschooling, higher economic costs, rise in dropout rates, social isolation, increased rates of exposure to violence and exploitation, and challenges in validating and measuring learning (United Nations Educational, Scientific, and Cultural Organization, 2021).

Specifically for the tertiary level, most colleges and universities also encounter issues and concerns related to online learning (Talidong & Toquero, 2020). Reports show that institutions are lacking online teaching infrastructure, limited knowledge, and training of faculty members on conducting online classes, students' unconducive home environment that affects their learning experience, and the quality of education students' acquire through the new educational system (Pokhrel & Chhetri, 2021). With these challenges, it is significantly notable that students have been directly affected by the "new normal" setup. In the recent study by Baloran (2020) which includes 530 college and senior high school students, results showed that during the entire period of lockdown in the Philippines, the majority of the students displayed anxiety symptoms. Another research on the mental health of college students during the pandemic was conducted in the United States and found that among the 2031 respondents, 48.14% experienced moderate to severe level of depression, 38.48% displayed a mild to severe level of anxiety, 18.04% had suicidal ideation, and 71.26% of the respondents expressed that their level of stress and/or anxiety had increased due to the pandemic. Furthermore, the reasons for the escalated stress level of the respondents are due to academic concerns (e.g., increase in academic difficulties, adjustment to online classes, concerns over grades, delayed graduation), uncertainty regarding the pandemic, health concerns (e.g., both physical and mental of family, friends, and self), financial problems (e.g., unemployment or uncertainty for future employment), living/working environment (e.g., studying/working from home, cabin fever, returning from home, confinement with others), disrupted social life and feeling of isolation due to quarantine protocols (Wang, Hegde, Son, Keller, Smith, & Sasangohar, 2020). Evidence already revealed that mental health should also be one of the priorities during this time of the pandemic, especially for the student population due to the prolonged school closure, quarantine, and social distancing protocols that led to isolation, academic pressure, difficulties adjusting to online learning, delays in significant academic requirements (e.g., graduation, internship programs, thesis writing), and unhealthy home situation (Lee, 2020).

In this regard, it is very essential that students also exert conscious effort to take care of themselves despite the challenges caused by the covid-19 pandemic to promote positive mental health. Self-care is defined as "the ability to care for oneself and the performance of activities necessary to achieve, maintain or promote optimal health" (Richard & Shea, 2011, p. 256) while self-care practices are self-initiated activities to manage stress and promote physical and emotional health (Myers, Sweeney, Popick, Wesley, Bordfeld, & Fingerhut, 2012). Although there have been numerous studies conducted about self-care however, up until now they are few that focus on the college population, and studies are conducted before the pandemic. One of these is the study that investigated the role of self-care in supporting college students' psychological well-being. The recent findings pointed out that mindful acceptance, social support-seeking, healthy eating, and sleeping hygiene are the four self-care practices that directly affect students' well-being (Moses, Bradley, & O'Callaghan, 2016). This result was supported by the study by Jenkins, Slemon, O'Flynn-Magee, & Mahy (2019) on enhancing undergraduate nursing students' well-being based on self-care assignments. Findings showed that self-care practices have a positive impact on students' overall wellness. Lastly, a similar study was conducted by Tan-Masukhani (2020) in the Philippines that describe self-care practices of college students in the context of course-based mental health

training, findings revealed that self-care practices do not just help students to manage stress but also boost psychological resources and well-being.

Literature pinpoint that promoting self-care has a favorable effect on individuals' mental health. With the current worldwide crisis brought by the covid-19 pandemic, the majority has inevitably been shaken by its life-changing effects. The student population is one of those who were directly in distress due to the overwhelming challenges and uncertainties that they need to face. It is in this light, that this research was conducted to encourage freshman college students to design their self-care plan embedded in online course-based mental health modules that will help them aid to overcome difficulties during the time of pandemic and promote mental health and well-being.

The purpose of this study is to describe the self-care plan of freshman College of Science (COS) students in the context of a course-based mental health module that aims to help them to attain a sense of balance in their lives as they face a new milestone in their educational level and to cope effectively with the challenges brought by the pandemic.

Methodology

This research employed a qualitative approach to describe the self-care plan of freshman COS students. The participants were enrolled in a non-academic course on mental health awareness and career development at a private university in the Philippines. Out of 184 students who consented to participate in the study only 82 (53 females and 29 males) were included based on the screening criteria set by the researcher (e.g., complete self-care plan output with labels). No additional course credit was given to the participants. Thematic analysis was utilized to examine the data gathered in the online course-based mental health modules using the eight dimensions of the self-care framework by Fisher (2015) which includes systematic, emotive, luminescent, financial, cognitive, aptitudinal, relational, and environmental self-care based on their self-care plan output. Thematic analysis is an appropriate method for analyzing qualitative data to identify, analyze, and report repeated patterns (Kiger & Varpio, 2020).

In the online course-based mental health modules, participants were introduced to different topics such as coping with stress, understanding mental health, and mental illnesses, caring for mental health, and managing online learning during the time of the pandemic. Applying what they have learned from the different modules, students were asked to come up with a collage illustrating their self-care plan that they can incorporate into their daily schedule as college students which aims to help them to attain a sense of balance in their lives and to cope effectively with life's challenges, especially during the time of the pandemic. Only students with accomplished informed consent forms and labeled (with description) collage were included in this study and responses were analyzed and categorized to identify the common themes in the self-care plan of freshman students.

Results

The findings of this study on the self-care plan of freshman COS students are presented below as themes using the eight dimensions of self-care by Fisher (2015). Among the eight dimensions of self-care, systematic self-care was the most common practice that the participants intend to incorporate into their self-care plan. According to Fisher, systematic self-care is centered on physical health including how you eat, move, and rest which

primarily aids in nourishing your body. Participants' common responses to their systematic self-care plan include exercise, getting enough sleep, skincare routines, eating healthy, drinking water or hydrating, playing sports, and simply resting. One participant emphasized taking care of her physical wellness by stating "I try to incorporate exercise into my daily routine at least 30 minutes to an hour a day". Also, another participant stated "I create a healthy sleeping schedule to follow", and "practice good hygiene and skincare routine". Participants also highlighted the importance of proper diet in their self-care plan by committing to "eat nutritious food and maintaining a healthy diet plan". Most participants also aim to stay physically active despite quarantine limitations by playing sports such as swimming, basketball, golf, badminton, taekwondo, and biking.

Another common theme in the self-care plan of the freshman COS students is relational self-care. This dimension focuses on how you connect with others. Relational self-care helps an individual develop social support system through healthy relationships with friends, families, intimate partners, and professional relationships. All these actions may contribute to social wellness and meaningful relationships. Participants during this time of pandemic target to incorporate their relational self-care by keeping in touch with friends online, playing online games with friends, spending time with family members during quarantine, and reaching out to relatives and friends via video calls. Commonly stated responses among participants are "having a regular video call with loved ones and friends", "being with my support system", and "eating, watching movies, and creating more memories with family" are some of the priority plans of the participants to prioritize relational self-care. Another participant stated "talking to my mom about my busy day/week" helps her spend more quality time with her mother. On the other hand, a participant mentioned that "keeping up with my boyfriend" and "regular social media detox" also contribute to her relational self-care. There are also participants who intend to spend more quality time with family and friends by attending local trips where there are fewer health protocol restrictions.

The next theme that emerges in the data gathered is luminescent self-care. According to Fisher (2015), this kind of self-care involves any action that supports an individual's spiritual level. Self-care practices under this dimension help in identifying values, beliefs, strengths, life's meaning, and purpose. Common responses of the participants in this dimension are praying, reading the bible, journaling, yoga, taking time for meditation, and positive self-affirmation. A participant highlighted his spiritual self-care by stating "I communicate with God by allotting time for prayer and meditation". Also, another participant expressed self-care plans by "creating a journal on my progress daily and listing down positive things that happened". In addition, participants also shared similar goals on committing to self-love, positive affirmation to oneself, self-validation, and rewarding self for small and big victories. All these actions can help increase spiritual wellness, rediscover strengths and abilities, understand own personality traits, and establish a personal brand.

The fourth dimension that was revealed in the participant's responses is emotive self-care. This refers to how an individual expresses himself/herself in a healthy manner. Thus, actions in this dimension help an individual effectively express and regulate his/her emotions and manage daily life challenges. Common responses of the participants that reflect their emotive self-care plans are deep breathing, being humorous, listening to music, singing, dancing, doing hobbies such as arts and crafts, painting, sketching, doodling, knitting, watching movies, and youtube when they are stress. Other frequent responses from the participants also include journaling, creative writing, making a diary, reflective writing, and mood tracker which they plan to do in caring for their emotional wellbeing. Also, a participant stated "I

take some time alone, stop, and introspect" as one of her practice under emotional self-care. Likewise, other participants added "I destress by doing recreational activities like gaming, chilling, watching my favorite shows on weekends", "Taking time to unwind and relax, "I engage in a creative release like playing a musical instrument", and "Communicating my feelings or problems to others". Indeed all these practices may help an individual channel their negative emotions into positive calming strategies and cope with difficult situations successfully.

The fifth theme that was noted in the participants' self-care plan was the cognitive dimension of self-care. This dimension incorporates strategies for setting a positive mindset, focusing attention on strengths, and using creativity to solve problems. Common responses are reading books such as magazines, manga, novels, solving puzzles, watching podcasts, being organized, managing time effectively, setting goals, taking notes, writing a to-do list, and having a timeout from social media and gadgets. Along with these, a participant pinpoints his plan for cognitive self-care by "organizing schedules and deadlines by making a weekly plan" and "taking five to ten minutes time off between classes to stay focused". Another participant emphasized that "setting attainable goals and prioritizing tasks" could help her improve their mental wellness.

The next theme that emerged in the participants' responses is the environmental dimension of self-care. This dimension's focal point is environmental health which refers to how an individual interacts with the world around him. Actions towards this type of self-care help an individual reconnect with his natural environment, create a safe space to rest and recharge, and establish linkage with the community. Common responses from the participants are "taking care of plants or gardening", "appreciating nature", "going to the beach", "watching sunsets", "taking pictures of pretty sunsets", "reconnecting with nature", "road trips", and "getting some sunlight while working". Others also shared, "decluttering and organizing my room" and "helping the community through organization and volunteer work". These strategies may contribute to the improvement of his environment or community which directly impact an individual's wellbeing.

Following this theme is the aptitudinal dimension of self-care. It focuses on how an individual creates meaningful interaction with the world using his unique strengths. Actions in this dimension help build happiness by doing your passion and continuously improving your abilities. Common responses of the participants are "learning to cook and bake", "doing digital art", "honing skills in playing musical instruments", "taking pictures or photography", "crocheting", "pottery making", "learning a new language", and "making youtube content". Lastly, the financial dimension of self-care. In general, this dimension shows how an individual allocates financial resources which includes healthy spending habits, saving and sharing with others, and preparing for a financially-secured future. However, participant's response only showed their financial self-care plan by how they will spend their resources. Some participants said "online shopping and window shopping" makes them feel better when they are down or stressed out.

The gathered data above affirms that freshman college students know how to create a balanced self-care plan and prioritize their well-being through different practices that are not only limited to physical activities but also target their emotional wellness, spirituality, cognitive functioning, aptitudinal skills, social relationship, and connection to their environment. This result was also supported in the study of Tan-Mansukhani (2020) wherein she conclude that college students have the capability to create, implement, and evaluate their

self-care plans resulting in positive outcomes. Furthermore, she emphasized that a holistic approach to self-care helps the students manage stress and enhances their psychological resilience in facing the different challenges in their daily life demands.

In the study of Yang, Tu, and Dai (2020) on the effect of the 2019 novel coronavirus pandemic on college students in Wuhan wherein they have concluded that positive thinking, being hopeful, and resilience can help reduce the negative effects of the Covid-19 pandemic on the mental health among college students. This also aids them to still be functional even in the face of adversity. These activities can be found in the luminescent self-care of the participants wherein they practice being optimistic by listing down positive things that happened the everyday. More so, the study of Wang, Hedge, Son, Keller, Smith, and Sasangohar (2020) on the mental health of US college students during the Covid-19 pandemic emphasized that students find more time to boost their mental health during the pandemic through meditation, doing physical activities like exercise, pursuing their hobbies, and interest. All these practices are forms of self-care that also can be found in the participants' self-care plan on systematic or physical self-care, luminescent or spiritual self-care, and aptitudinal self-care. These findings are also similar to the study of Moses, Bradley, and O'Callaghan (2016) on the self-care practices and well-being of college students wherein mindful acceptance, social support-seeking, healthy eating, and sleeping hygiene are the four practices which were identified to have beneficial effects on students mental health.

Conclusion

Adjusting to college is one of the most exciting yet challenging stages in a student's life. However, due to the current health crisis, this so-called "new adventure" was given a different scenario and the focus was shifted to transitioning from face-to-face to an online learning environment while prioritizing health and safety. Many students experienced difficulties in adjusting to the current educational setup, were overwhelmed with academic requirements, the unconducive work environment at home, experienced low motivation, troubled to stay focused, hassled on building connections with classmates and professors, managing personal and academic time, challenging relationships in household, feeling of isolation, and limited recreational activities due to restrictions in mobility. All of these may contribute to the declining mental health and well-being of college students during the covid-19 pandemic. However, amplifying self-care practices through a holistic plan can help students to lessen the negative impact of the pandemic and help boost psychological wellness despite the challenges students face brought by this crisis. School plays a vital role in promoting students' mental health, especially in these trying times when students' health is at great risk. A proactive mental health program should be in place as a core component of the curriculum and services should always be readily available for all. Creating a culture of self-care in the university may have long-term effects not only on students' mental health but may also lead to psychological resilience that will aid them in managing difficult situations inside and outside the school.

The findings of this study also recommend for future research to explore the self-care of students in terms of the actual practice and include other variables such as self-regulation and different student population since this study is only limited to the creation of self-care plans for freshman COS students.

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Understanding Help-Seeking Behavior Among Filipino University Students

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Abstract
There is an increase of mental health concerns among university students, compared to previous generations, as relationships and academic demands become more complex. The researchers explored students' perceptions and the experiences they go through in seeking help, specifically problem awareness, decision to seek help and support system. 14 respondents from different colleges and universities in Metro Manila participated in this qualitative study. Thematic analysis was used to process data gathered from the interviews. Key results were help-seeking can come from both informal (family and friends) and professional help (counselors, psychologists), one's outlook towards help-seeking can be connected to the individual's decision to seek help and quality of support system is evident in the process of help-seeking, from problem recognition to decision to seek help. Hence, help-seeking behavior is an important psychological process to understand to effectively deliver counseling services and advocate progressive mental health programs in our universities and counseling centers. The findings highlight the crucial role of practitioners and policy makers to explore the relevance of its guidance programs in relation to the needs of the stakeholders, university students.

Keywords: Help-Seeking Behavior, University Students, Mental Health

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Introduction

There is an increase of mental health concerns among university students, compared to previous generations, as relationships and academic demands become more complex. Dramatic increase in mental health concerns among university guidance centers (Zivin, 2008) Psychological conditions such as anxiety (41%), depression (36%), relationship issues (35%) and suicidal thoughts (16%) are prevalent among university students and appear to be increasing in number and severity (Hunt, 2010). In a study conducted by Vogel, Wade, Wester, Larson & Hackler (2007), less than 40% of individuals seek professional help within a year of the onset of a psychological disorder. Goh and Ang (2007) posit that adolescents tend to underutilize mental health services provided by the schools and over utilize informal sources of support. Mental health services in the country are inaccessible and monetarily prohibitive, and beliefs about the etiology and nature of mental illness are inconsistent with the medical model (Tuliao, 2014). Other cultural variables such as shame, stigma, and collectivist beliefs such as social outlook, also discourage Filipinos from seeking help from mental health professionals. The researchers explored students' perceptions and thee experiences they go through in seeking help, specifically problem awareness, decision to seek help and support system.

Help-seeking behavior (HSB) is defined as "any action or activity carried out by an adolescent who perceives herself/himself as needing personal, psychological, affective assistance or health or social services with purpose of realizing this need in a positive way" (Barker, 2007). Help-seeking behavior is also known to be an important subset of coping, which includes requests for assistance and advice from friends, relatives, neighbors and as well as professional agents (Bolero, 1995). Understanding the kind of adolescents who live in today's generation is an important recipe for society to be able to recognize their needs and address their concerns (Patel & Fisher, 2007). The scope of help-seeking behaviors covers the use of health and other psychological services both counseling and clinical in nature. Help-seeking behavior also includes cases of serious or severe mental health issues, substance abuse, depression and suicide (Barker, 2007).

In a study conducted by Liang, Goodman, Tummala-Narra & Weintraub (2005), they articulated the three phases of help-seeking behavior among survivors of intimate partner violence. These are awareness of the problem, decision to seek help and support selection. These stages are nonlinear, and that the process can be influenced by interpersonal and sociocultural factors. Having an understanding about links between behavior and health, specifically help-seeking, is an essential factor in an informed choice concerning a healthy lifestyle. These factors include perceptions of psychological health risk, potential efficacy of behaviors in reducing this risk, perceived social pressures to perform the behavior, and control over performance of the behavior (Connor & Norman, 2015). The Filipino youth nowadays also tend to be comfortable at constructing themselves as individuals with unique characteristics, personal wishes and goals and as individuals who value others' expectations and wishes (Puyat, 2003; Miralao, 2003). The literature indirectly tells us that people's help-seeking behavior differs from one person to another. Age, self-worth and environment of a person affect an individual's vulnerability in facing and handling pressure. It is noted that young people who feel good about themselves tend to be less vulnerable to pressures from various sources to engage in high-risk behaviors. Achievement in school elevates this general sense of self-worth, underscoring the importance of schooling itself and a school environment that is conducive to the experience of success (Fernandez, 2012). Saunders (1993) and Liang, Goodman, Tummala-Narra & Weintraub (2005) believe that support selection is the stage

that sustains the whole help-seeking process. In a study conducted by Bolero (1997) on adolescent help-seeking behaviour most of the adolescents ask help from family and friends. This is in contrast to seeking professional help that they visit infrequently. This reinforces Understanding Help-Seeking Behaviour among Filipino University Students 8 the conclusion that adolescents rarely ask professionals for help even when they are distressed. When ranked, consulting peers came in first (51%), followed by parents (42%), professional help (41%) and teachers (37%). Social support among Filipino adolescents is conceptualized mainly as hands-on support (Fernandez, 2012). Advice, personal assistance, and being challenged are conceptualized as expressions of care and concern, rather than as intrusive acts. Less than 40% of individuals seek professional help within a year of the onset of a psychological disorder (Vogel, Wade, Wester, Larson & Hackler, 2007).

Conceptual Framework

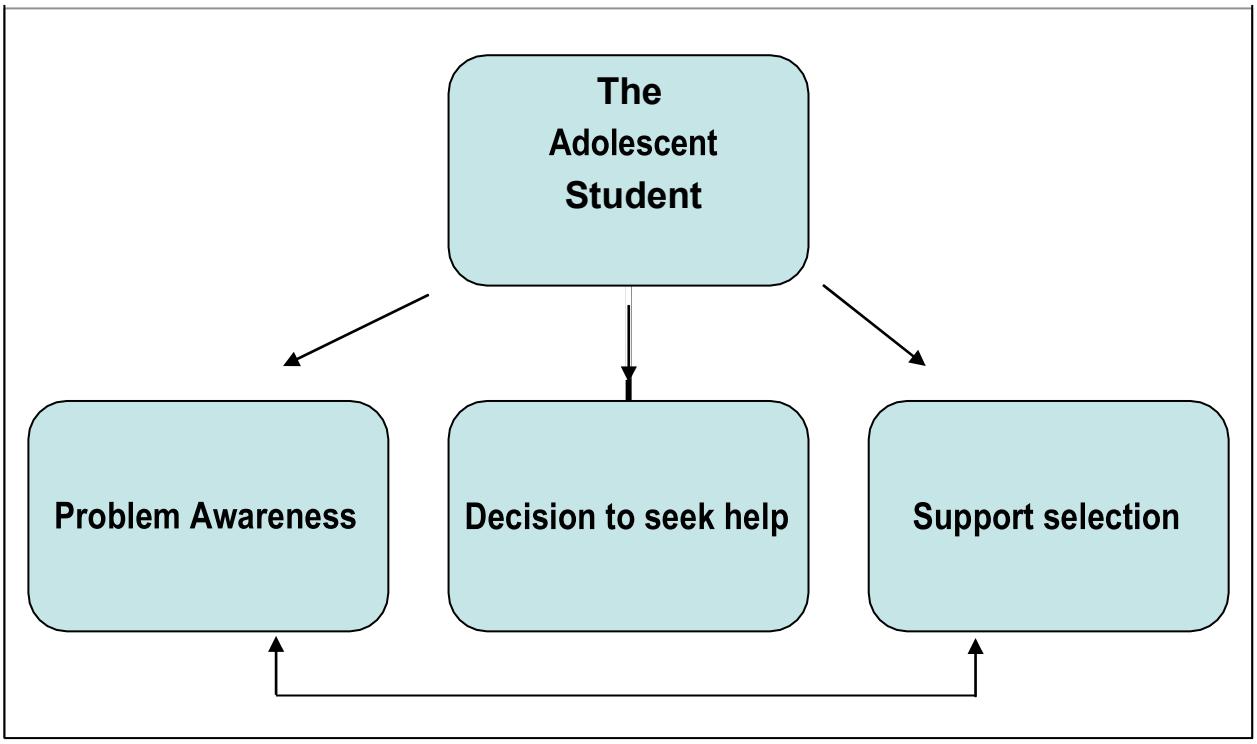


Figure 1: Model on Help-Seeking

This study adapted the model on help-seeking and change developed by Liang, Goodman, Narra and Weintraub (2005). There are four concepts that were identified as areas of discussion in this study: (1) a background of the college student, his/her understanding of what help-seeking behavior. and the process of help-seeking which includes three stages; (2) problem awareness; (3) decision to seek help; and (4) support selection. This process is non-linear since there may be stories that would start with the decision to seek help, choose their help giver then the realization of the problem to follow suit. However, these concepts are interrelated with one another as problem awareness and support system are crucial stages for the help-seeker to formulate the decision to seek help. In this study, help-seeking behavior (HSB) is operationally defined as “any action or activity carried out by an adolescent who perceives herself/himself as needing personal, psychological, affective assistance or health or social services with purpose of realizing this need in a positive way” (Barker, 2007).

This research aims to explore the experience of university adolescent students in the help-seeking process, specifically in the areas of problem awareness, decision to seek help and support selection.

Furthermore, it forwards the following research questions:
1. What is the perception of a university adolescent student on help-seeking behavior?
2. When does a university adolescent student recognize that he/she is need of help?
3. What are the factors that lead a university adolescent student to seek help?
4. How does the university adolescent student define support system?

Methodology

Because the primary aim of this study is to understand the process that transpires before the actual help-seeking occurs, qualitative study using thematic analysis was conducted. Help-seeking is a complex behavior that needs a systemic approach in order to understand the process that goes with it. Webster (2008) affirmed that qualitative research done in this area of help-seeking behavior is comparatively rare. There has also been a growing interest in pursuing qualitative research in understanding experiences of service users and mental health problems, which includes their perceptions and interactions with healthcare services. Thematic analysis gives this research the opportunity to also understand the social context of the participant and how it can play and important role in the cognitive process without imposing pre-conceived expectations. The nature of this research is to capture the process of help-seeking through the personal accounts of the participants.

This study involved 14 university students, both male and female, ages between 18-20 years old. All were able to articulate in Filipino and/or English, have accomplished needed consent forms and agreed to have the interviews tape-recorded. At the time of the interviews, all were enrolled in private or state universities across Metro Manila. Prior to the interview, all participants have experienced seeking assistance either from their guidance counselor (professional) or peers and family (personal). Out of the 14 participants, 7 of them sought professional help through their university/college counselor, 7 sought the assistance of their family and friends. From the 7 participants who went through professional help, 5 were able to finish therapy, 2 were ongoing. These participants were asked of their personal background (beliefs, values, social relations), how they perceived themselves and current concerns that they experience in relation to help-seeking behavior. These participants came from diverse family backgrounds, upbringing and social status which presents a wide array of personalities.

Results and Discussion

An individual's background on how one formed his/her beliefs and behavior came from his/her experiences. The participants came from different backgrounds and upbringing. During interviews, they have disclosed their respective roles in the family, their interpersonal roles in the home and school setting, past and current experiences that led them to seek help. Majority of the participants were open in sharing their own experiences, with professional and personal help. 7 participants who sought the help of their peers, teachers and family members are also opened to receive professional help once the need arises. Self-presentation, how the participants described themselves and their situation also connectedwith their narratives regarding the whole help-seeking process. According to Hess and Tracey (2012), the belief that they can solve their mental health concerns can be a strong predictor of their

decision to seek treatment. Family dynamics and peer relations also play an important role in one's perception and behavior on help-seeking. Some participants disclosed that they did not want to burden their parents, which is the reason why they prefer going to their friends. There were also participants who would prefer an expert, over family and friends in listening to their problems.

Attitudes and beliefs play an important role in solving problems (Wilson 2002). Perception gives a mental impression of how one understands a concept. Outlook directs us to general point of view, attitude towards life. Thus, one's perception and outlook of help-seeking, has a connection in recognizing their problems and decision to seek help.

Most of the responses from the participants defined help-seeking behavior as people they can approach in times of difficulty. Two participants identified counselors and psychologists as helping professionals and are considered experts in the field. Most participants are more open to seek help from family and friends before going to a helping professional. If the problem is not solved, then that is the only time when they would see their school counselor. Based on the responses given by the participants, professional help means "seeing a person who knows what he's talking about", and expert in the concerned topic, who knows the background of the problem and how it can be treated. This may both mean mental health professionals and at the same time, their family and friends. As Goh and Ang (2007) posit, adolescents tend to underutilize mental health services provided by the schools and overutilize informal sources of support (helper) in help-seeking behavior. Most of the participants claim to have a positive outlook towards help-seeking, that this would help them in dealing with their everyday problems. The difference would always be the people they would approach for psychological help, both professional and informal sources. There were also a few participants hesitant in disclosing their problems regardless of social support available. With this, two main themes surfaced: positive and negative outlook towards help-seeking. Examples of positive outlook towards help-seeking are: heightened level of self-awareness, no harm in asking help, clarity and enlightenment, and maximizing guidance services. For negative outlook on help-seeking, the following subthemes surfaced: ongoing stigmatization and issues of trust.

Some participants carry the belief that there is no harm in asking for help. According to Owen et.al (2013), individuals may internalize or form beliefs about the value of seeking mental health services through the labels and perceptions of others and adopt them as their own. Parental models can also play an important part in forming help-seeking attitudes and beliefs (Connor and Norman, 2015) There were also respondents who wanted clarity and enlightenment with the current challenges they are going through, which led them to seek the help of a counselor. There were participants who believe that counselors are there to listen to their concerns.

From the participants' responses, the definition of help-seeking can relate to how they perceive when and who they go to for psychological assistance. The participants who saw benefit in asking for help, had more motivation to either go to therapy or disclose their concern with their family and friends. Moreso, several participants saw the difference of seeking professional help compared to approaching informal sources of help. Connor and Norman (2015) posit how individual makes sense of their personal situation can be best understood in how they make sense of others (person perception) and oneself (self-regulation). Their outlook towards help-seeking (positive and negative themes) connects to their responses in deciding to seek help (motivations and prevention). Furthermore, one's intention to act can be a proximal determinant of behavior (Hardeman, 2012)

Awareness of the problem is seen to be a crucial step in the whole help-seeking process. Two main themes were established, how participants realized that they are in need of help: changes in thoughts and changes in one's behavior. Changes in one's thoughts had two subthemes, knowing oneself and not wanting to burden family members. On the other hand, subthemes under changes in behavior were, lethargy and depression, bouts of anxiety and low academic grades.

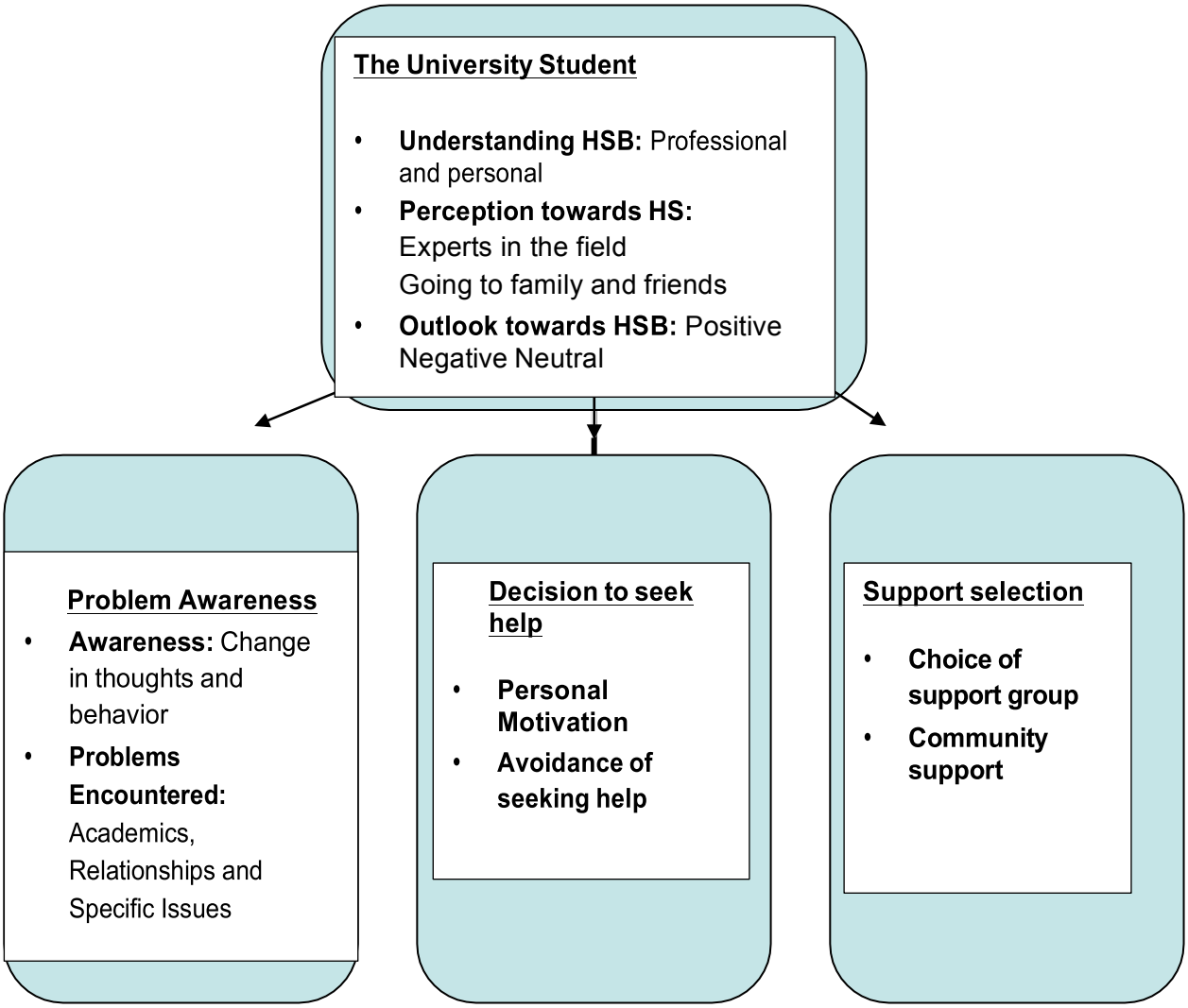
Knowing oneself, strengths and limitations is seen to be helpful in realizing that one needs help already One participant is very conscious of monitoring his thoughts knowing that he has a tendency to have recurring thoughts "sometimes, because I have this tendency to wake up one day overthink and these thoughts can drown you. It's good to have someone listen. I don't want to, realizing that I am suicidal already (due to overthinking)." Two participants mentioned that acknowledging one's limitations played an important role in their decision to ask for other people's participation. One mentioned, "if my self-confidence is already affected and you get this feeling of being overwhelmed, then you know you need help." Another was self-aware that he "was in a mess, when everything felt caving in. Right then, I know I needed to see someone." When asked what "in a mess" meant, the participant described this as "not functioning well, having difficulty sleeping and couldn't focus on academics. "Another recurring response from several participants is that they don't want to burden their family members with their problems, that is why they seek professional help. One participant mentioned that "it is best to seek professional help, then burdening family members with my problems. A mature person (other than family and friends) made me decide to see a counselor." On the other hand, the following are some observed behaviors from the participants that prompted them to seek professional help. A participant said that when he/she keeps on repeating the same behavior, then this person may need to seek "professional help". She believes that one needs help if something cannot be out of your mind to the point that it affects one's daily life. One participant said that the feeling of lethargy and depression, difficulty in sleeping can be an indicator that a person is in need of professional help. There was another participant who disclosed that she had non-suicidal self-injurious behavior. In relation to this, most of the participants try to manage their anger outbursts. Another participant shared that when students have these long lapses of silence, glassy stares and is unusually quiet can be indicators that a person may need professional help.

The problems encountered by adolescents which led them to seek professional help are academics and relationship issues. From the individual's decision to seek help. two main themes demerged: their personal motivation and their avoidance in seeking help. Under personal motivation, there are five subthemes identified: self-realization, solid support system, and characteristics of the counselor, positive outlook in asking for help and routine interviews and referrals. On the other hand, there were four subthemes gathered under avoidance in seeking help: thoughts on not being able to handle problems, being "broken or mental", and feelings of mistrust, fear and shame and obligatory function of counselor to help. Another thing that motivates students from seeking help is sharing their stories which makes them feel lighter inside. The fear of being stuck with a problem is also something that pushes them to share with other people.

Another source of motivation is a solid support system that an individual can trust. This is defined as friends, family other than professional help Characteristics of the counselor is defined as the counselor being warm, friendly, and trustworthy and open to situations. Some

participants see these traits, helpful in their decision to seek help. Majority would still consult peers, because they can empathize and understand the situation better.

Theoretical/Conceptual Implications



Conclusion

Based on the interviews conducted among selected college students, understanding help-seeking behavior can be a complex endeavor for the help-seeker. The decision to seek psychological help often begin from problem awareness and support system. Though the definition of psychological help-seeking is more general, describing the help-giver from informal sources (eg. friends and family) to going to professional help (eg. counselors, psychologists), there is an observed level of sensitivity from the participants in distinguishing psychological issues that may warrant the need for professional help. While it is true that help-seeking behavior is not a linear process, it is also essential to investigate further possible entry and end points for HSB. A quantitative study on the relationship between support system-decision making and problem awareness – decision making can be explored. This is seen important for future program/service evaluation for university guidance centers. Knowing one's perception and outlook towards help-seeking can give the counselor a preview of the client's beliefs. How one evaluates his/her problem (self-assessment) is

crucial. The researchers suggest that a possible topic that can be discussed during sessions is client's perceptions on help-seeking, which can be facilitative in identifying the prognosis of case. Do college students have the skills needed to be able to effectively self-assess their own psychological state? Do they have the skills needed to be able to conduct psychological first aid to themselves and other people? Answers to these questions can deem beneficial in understanding one's intentions that may eventually lead to actual help-seeking behavior.

Self-awareness was seen to be an effective skill that can help students help themselves then eventually help other people. This is how we can create a culture of normative help-seeking behavior in our schools and eventually in our society. Family background and social dynamics play a pertinent role in the formation of one's perception towards help-seeking. This can be explored in succeeding research. Both informal and formal means of help are important in the whole help-seeking process. It is the awareness and acceptance of the help-seeker that there are concerns which might warrant professional help. Both literature and results would direct us that informal sources is still the first line of help that individuals go to. Depending on the problem, these support systems are instrumental in connecting them to appropriate professional help. Since this study is exploratory in nature, there were varied responses of the participants that made the results and discussion more challenging to analyze. Future researchers can further probe on each construct of the help-seeking behavior such as problem recognition, decision to seek help and support system. Quantitative measures can also be investigated to gather a bigger sample of the participants. It is interesting to note university students who are not open to seeking help, both professional and personal. It is the role of the university to also look after these types of students, who are wary of receiving any kind of help from other people.

Knowing the growing number of psychological needs of our students poses an even bigger challenge to our helping professionals in the university. How well do we know our students? Help-seeking behavior is an important psychological process to understand for us to effectively advocate progressive mental health programs in our universities and counseling centers. Furthermore, It is essential to investigate further the flow of help-seeking behavior. Help-seeking behavior can also be extended not only with the decision to seek counseling and its first session, but to complete the counseling process. Empirical studies can be conducted to explore student /school culture profile, effectivity and relevance of our guidance programs, help-seeking across developmental stages and students who are at the peripheries of the university At the end of the day, it is the goal of this research, as well as mental health practitioners, to give the best service to students who need of are in need psychological assistance, that they be able to get the competent and compassionate professional help when they need it the most.

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TikTok and YouTube Videos in the Flipped Classroom Model to Improve the Learning Process and Motivate Students

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Abstract
Social media has become a very useful tool for learning in recent years. Millions of people access *YouTube*, *TikTok*, *Instagram* and other social media every day to learn. At the same time, more and more teachers are using these platforms to share their knowledge with the general public and bring it into the classroom. Materials of this type offer the advantage of supplementing various didactic techniques; one of them is the Flipped Classroom. This article presents the use of videos deployed in the *TikTok* and *YouTube* platforms with the Flipped Classroom model to develop grammatical competency in Spanish. The results showed a considerable score improvement among high school students attending the Tecnologico de Monterrey Mexico City campus. The entire sample, 140 students, increased their scores between 12 and 56 points out of 100 in the results of grammatical performance in Spanish. Additionally, the student satisfaction survey showed that 98% felt that the Flipped classroom methodology with *TikTok* and *YouTube* videos motivated them to learn grammar in Spanish. This study demonstrates the potential of the *TikTok* and *YouTube* platform resources to benefit the development of the grammatical competency in Spanish with this population. This study's methodology employing these resources could be replicated in various educational scenarios and different areas of knowledge. Moreover, it could be used for promoting complex thinking.

Keywords: Educational Innovation, Higher Education, Fipped Classroom, TikTok Videos, YouTube Videos

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Introduction

Several teaching methods have emerged because teachers continuously seek better ways to support their students. To help each student achieve successful learning, diverse methods such as Collaborative Learning, Project-Based Learning, Gamification, Blended Learning, Flipped Classroom, and many more have emerged, and, of course, the traditional teaching method (de Medeiros et al., 2018).

To implement these models, teachers have also resorted to various tools of all kinds. As technology increasingly permeates social development, teachers have adopted these resources to enhance the teaching-learning process. Thus, technology has become a primary element in the education sector, facilitating teaching that combines traditional and virtual teaching modalities and spaces (Abad-Segura et al., 2020).

Within this context, we aimed to find a methodology to boost Spanish grammatical competency in high school students at PrepaTec Mexico City. Our research focused on the Flipped Classroom model created by Jonathan Bergmann and Aaron Sams (2012) and the use of digital resources designed for the social media *TikTok* and *YouTube*.

The Flipped Classroom is a methodology where the teacher abandons classroom lessons and independent homework assignments for students to complete outside of class to reinforce what they have learned. On the contrary, the students take the central role, working independently outside the class to study the lesson through a resource provided by the teacher; subsequently, they present themselves to class prepared to perform activities that consolidate learning under the teacher's guidance (Bergmann & Sams, 2019). The following diagram by Sangermán et al. (2021) illustrates the teaching process of the Flipped Classroom model (Figure 1).

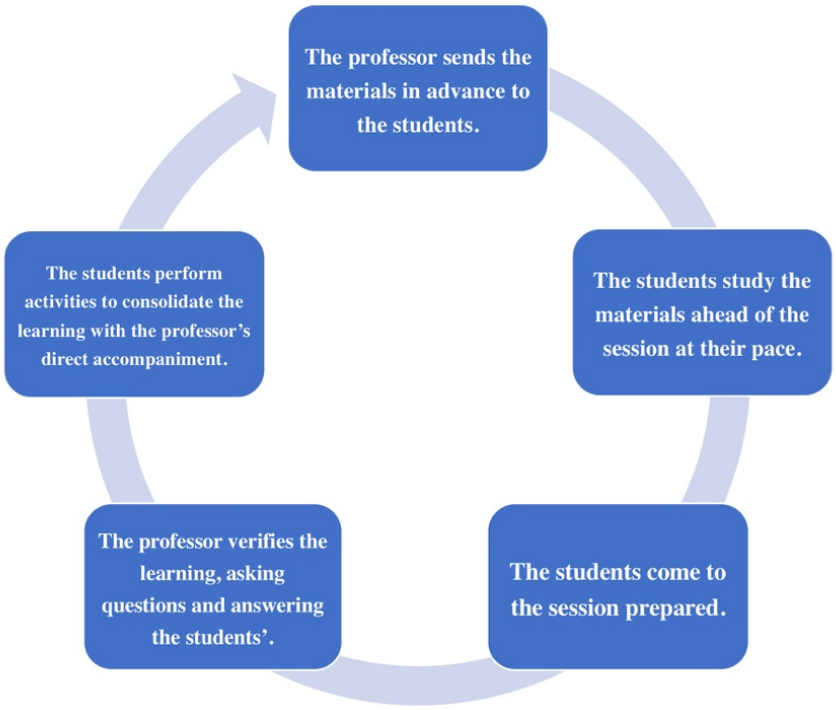

Figure 1. The Flipped Classroom Model.

According to Chen Hsieh et al. (2017), the Flipped Classroom model motivates students to learn, improves their ability, makes them more competent, keeps them more involved in learning tasks, and makes them more active. It is a model that transforms students' skills to become self-directed learners. Students learn more and better than in the traditional model.

TikTok and YouTube videos for education

YouTube is a social media booming in recent years for various purposes. The platform appeared in 2005 and quickly ranked as the second-highest trafficked network worldwide after Google (Vizcaíno et al., 2019). Approximately one-third of the world's Internet users use *YouTube*, generating more than two billion monthly accesses (YouTube, 2021). The primary users of this content are people between 18 and 34 years of age who are content creators or consumers. Most of its platform usage is passive (Bernal & Carvajal, 2020).

For several years, teachers from various areas of knowledge have ventured into *YouTube* for educational purposes to develop their content with two main objectives: a) training their current students in their school systems and b) instructing the diverse users of this social media.

The educational videos designed for this network have a high illustrative, informative, and formative potential for students. They facilitate teachers' guidance and allow delving into the topics beyond traditional face-to-face teaching (Gómez, 2014). *YouTube* users find these videos of great value because they can learn specific academic content quickly, attractively and without cost.

TikTok also has boomed in recent years. Created in 2016 for the Chinese market, this technology platform was first known as *Douyin*. In 2017 it launched internationally; by 2018, it was the most downloaded application in the United States. In 2020 it was already present in more than 150 countries with one billion monthly active users. Although its creators and audience are people of various ages, almost 50% are between 16 and 24 (Becerra-Chauca & Taype-Rondan, 2020). This platform allows creating and sharing short videos of 3 seconds up to 3 minutes, edited with visual and auditory backgrounds (voices or music), filters, effects, transitions, and other applications that comprise an attractive audiovisual product for the audience (Pantoja, 2020).

Like professionals in other areas (doctors, chefs, cosmetologists, many others), some educators in recent months have taken their teaching beyond the classroom and the customary platforms by disseminating their lessons in short videos that impact the younger generations of digital natives (Ibáñez, 2020). These resources are of great help not only to their students but also to all users accessing the platform, meaning the teachers' contributions transcend borders.

Table 1 shows the monthly active users and their ages of both social media: *YouTube* and *TikTok*.

Social media	Monthly active users	Main ages of users
YouTube	2.6 billion	18 - 34
TikTok	1.0 billion	16 - 24

Table 1. YouTube and TikTok monthly active users.

Regarding the format of the videos of both social media, this differs in both cases. In the case of *TikTok* videos, this platform offers the possibility of recording videos between 15 seconds and 3 minutes. Although it supports the use of images with voice over, content creators prefer to show their face and speak to the camera directly. Some add music and text. The format of the shot is vertical. *YouTube* videos, on the other hand, can be up to 12 hours long. The format of the shot is horizontal and it is more common to find videos with voice over on this social media than on *TikTok*. These can also be musicalized, include texts and effects in their transitions as they have a longer duration. Figure 2 shows an example of both formats. Table 2 shows some advantages and disadvantages of each of these platforms according to the experience in creating the videos for this study.

Figure 2. YouTube and TikTok video format.

	YouTube		TikTok	
	Advantages	Disadvantages	Advantages	Disadvantages
Time	Allowing 12-hour recordings makes it easy to present more content in a single video.	The teacher can make videos so long that they lose the attention of the students.	The 3-minute limitation forces the teacher to be concise and capture the students' attention better.	If a topic presentation takes just an extra second at 3 minutes, it forces the videos to be split or remade.
Design	It requires to use an additional tool to record and edit the video, which allows the use of a good one.	It does not offer recording and editing tools, another tool is required to create the videos.	It offers the necessary tools to record and edit the video.	It does not offer a wide variety of resources for video design: fonts, colors, images, transitions, etc.
Focus	Only interrupt videos of a certain length with commercials, not short ones. Ads can sometimes be skipped.	Sometimes it shows too many commercials.	The video is not interrupted.	It is very easy to slide the screen and be distracted by more and more videos.
Attraction	It is more attractive to a wider range of people.	For some young people it is considered a tool for adults.	It is very attractive to young people.	Many adults are not interested in it, some parents even consider it harmful to their children and do not allow it.

Table 2. Advantages and disadvantages of YouTube and TikTok social media for educational videos

The Flipped Classroom Model with TikTok and YouTube videos for teaching linguistics

The Flipped classroom model supported by videos from the *YouTube* and *TikTok* platforms has been tested and supported by various studies where implementation has occurred to develop language competencies. In Russia, for example, a study was carried out with this methodology (Chilingaryan & Zvereva, 2017) and concluded that the model increased motivation, concentration, independence, creativity, critical thinking and student participation. Suárez, Vélez and Londoño (2018) demonstrated that this methodology helps significantly improves students' performance and promotes greater motivation, even resulting in having fun while developing their competency. Nasution (2019) had similar results by also working on language proficiency through the videos of this platform. He concluded that these reduce students' cognitive loads, and they like the various learning styles.

More recently, Sangermán et al. (2021) highlighted that this methodology produces favorable student performance results and that they show greater satisfaction when studying Spanish grammar. Also, Mahasneh et al. (2021) concluded in their studies recently that the *YouTube* platform was an easy, innovative, attractive, and friendly tool for students in the same area of knowledge.

Regarding the *TikTok* platform, although not much has been written yet about its use for educational purposes since its function in this area is relatively new, more and more research confirms its relevance to support the teaching-learning process. Koniah et al. (2021) confirmed that learning grammar through this tool resulted in most participants feeling

motivated and interested in learning. The studies of Porcher (2021), who has also worked with the platform, report that students consider *TikTok* videos to help develop grammatical competence. Afidah et al. (2021) also showed in their studies that almost 90% of their participating population preferred to study with *TikTok* videos and that these are better for developing linguistic competence than other types of materials. Aziz and Sabella (2021) also conducted a study that showed more progress in students' grammatical competencies when using *TikTok* as a teaching tool.

Methodology

This study was carried out among students enrolled in the subject "Communication and Art" in the Department of Spanish and Literature at the private high school PrepaTec CCM in Mexico City. This subject is one of the five official courses in which the linguistic competency of the mother tongue is developed: Spanish. It is taught during the third semester of this preparatory school and mainly develops oral and written production and reading comprehension. Its duration is 16 weeks. The first five weeks include reviewing some fundamental grammatical aspects to develop students' skills properly. This course is often unattractive to students because of the topics' nature, and they have been constantly reviewed in previous courses. This means that students do not feel motivated to learn and their performance is low.

Therefore, this study aimed to help students improve their Spanish grammatical performance and competency. Specifically, the objective was to evaluate the relevance of using videos from the *TikTok* and *YouTube* social media in the Flipped classroom model to improve grammatical competency in Spanish.

The population participating in this research consisted of 140 students in the third semester of this educational institution. Their ages were between 16 and 17; 71 were women, and 69 were men. These students were divided into five classes, three with one teacher and two with another (Table 3).

SUBJECT	CLASS	STUDENTS	PROFESSOR
Communication and Art	1	27	Professor A
Communication and Art	2	28	Professor A
Communication and Art	3	29	Professor B
Communication and Art	4	30	Professor B
Communication and Art	5	26	Professor B

Table3 Participant population distribution.

A standardized test of 30 direct questions and multiple-choice items with four answer options was designed for the performance evaluation. All the grammatical topics that marked the official program of the subject were included: parts of speech (nouns, adjectives, articles, pronouns, verbs, adverbs, prepositions, conjunctions and interjections), types of simple sentences (enunciative, interrogative, exclamative, desiderative, imperative, exhortative,

probability, and doubtful) and syntactic analysis (nuclei, modifiers of the subject, and complements of the predicate). Table 4 shows examples of the test questions.

GRAMMAR TOPIC	QUESTION
Verbs	In which option is there a participle? A) Manifesting B) Entertain C) Assisting D) Demolished
Syntactic analysis	Select the sentence that has a direct object. A) Those tall girls are foreigners. B) Daniel thought a lot all day. C) Don't tell any more lies, Sonia! D) Were you with your friend in the afternoon?

Table 4. Sample of test questions.

The test was designed by two teachers with more than 15 years of experience teaching the subject who participated in its design and continuous updating. We applied the Hernández-Nieto Content Validity Coefficient (CVC) (2021) to confirm the instrument's validity. Five teachers who are experts in language teaching were summoned. They evaluated each test item according to clarity, adequacy of the language, correct writing, and precision, focusing on what was evaluated and not inducing the answer. The results showed that the validity of the test was excellent.

The Total Content Validity Coefficient was: 0.990. According to the CVC evaluation scale (see Table 5), this result indicates that the content validity of the test is excellent (Hernández-Nieto, 2011).

.00 a .40	Unacceptable
.41 a .60	Very low
.61 a .70	Low
.71 a .79	Moderately low
.80 a .90	Good
.91 a 1.00	Excellent

Tabla 5. Escala evaluativa del CVC según Hernández-Nieto (2011).

Subsequently, the instrument reliability test was conducted with the parallel testing method. From the first instrument designed (Test 1), another (Test 2) measured the same contents at the same cognitive level. The same model was followed, changing only a few words that did not alter the content. The tests were applied to a group of 15 students with an interval of three weeks. The equivalence coefficient was calculated (Sánchez, 2007). The result obtained was an equivalence coefficient of 0.983585. This indicated that the tests were equivalent and reliable.

To measure students' opinions on the use of *TikTok* and *YouTube* videos with the Flipped Classroom model, we designed a nine-item questionnaire. We considered the benefits that the creators of the Flipped classroom model (Bergmann & Sams, 2019) ensured. Some questions used in a previous study on this methodology to develop grammatical competence were also considered (Sangermán et al., 2021).

Before starting the course, the study's designer teacher trained the other professor involved in how to implement this methodology. The profile of both professors can be seen in Table 6. A meeting covered how to implement the Flipped Classroom model with *TikTok* and *YouTube videos*. It included these resources, the design requirements for the consolidation activities, the guidelines to direct the questions section, the recommendations to follow up on the learning and provide feedback to the students, the training that should be given to them and, finally, the logistics for applying the tests and the opinion survey.

Professor	Education	Teaching experience	Educational interests
Professor A	Bachelor's Degree in Communication Master's Degree in Education and Communication Doctorate in Education (in process)	25 years	Educational technology, innovation, student motivation, social networks for education, youth interests.
Professor B	Bachelor's Degree in Communication	29 years	Innovation, teaching techniques, student motivation, fun for students.

Table 6. Teachers' profiles.

At the beginning of the course, all students took Test 1, so we could diagnose their grammatical competence. The participating teachers applied it during the class hours in each class. The test was previously designed on the *Google Forms* platform, and the test results were entered into an Excel spreadsheet.

Subsequently, each teacher presented the course methodology to the students in their classes and trained them to work with the videos independently and responsibly. The training included establishing the appropriate time to watch to avoid interruptions, preparing the space to improve concentration, pausing to take notes, performing the exercises that some videos include, returning to review a topic, and, finally, taking a few minutes in the end to reflect on their learning. That same afternoon, the teachers sent the *WhatsApp* link to the first *TikTok* video to the students in their classes. Afterwards, every afternoon, the students received the link to the next video that they had to study to be prepared for the next day's class. During the following weeks of the course, the process of the Flipped classroom model described in the introduction of this article was carried out. Figure 3 shows the process followed in this study for the implementation of the methodology.

Figure 3. Process for the implementation of the methodology.

It is important to mention that each class was taught with the class structure shown in Table 7 (Sangermán et al., 2021).

Activity	Description	Time
Opening	Small warmup activity that integrates prior knowledge without addressing the latest topic.	5 mins.
Questions and answers	Space for student questions about the topic; also questions from the professor to validate the learning covered in the video.	5 mins.
Consolidation, production	Activity where the students demonstrate their mastery of the topic; development of products or execution of various activities assigned according to the learning style of each student.	30 mins.
Closing	Final clarification of questions, quick summary of topic learning and instructions for the next video (what to focus on, how to approach the new topic, how to do the exercise if there is one, etc.).	10 mins.

Table 7. Class Structure using the Flipped Classroom Model.

14 *TikTok* videos and 2 *YouTube* videos were used, all of them previously designed by the professor in charge of the study. The duration of the first was one minute, while those on *YouTube* ran about five minutes. It was decided to record all the videos of the parts of speech on *TikTok* due to the fact that they are shorter topics. The two larger topics (parsing and types of simple sentences) were made into longer videos, the ones on *YouTube*. It should be noted that *TikTok* videos were recorded directly on that application, while those of *YouTube* were designed on the *PowToon* platform and, subsequently, posted to the social media. The video design considered:

- **The duration**: In the case of *TikTok* videos, the application only allowed a maximum duration of one minute at that time. We intended *YouTube* videos to be not more than 5 minutes. Sangermán et al. (2021) point out that students' attention spans drop sharply after the first three minutes of watching an educational video.

- **The content and the script**: We followed formal design process phases for audiovisual works in making these videos: pre-production, production, and post-production. For each video, we developed a script with updated content information written considering the conciseness, clarity, and adequacy of the language for natural content exposition.

- **The practice:** In the case of *YouTube* videos designed through the *PowToon* platform, the voice was added to the different scenes. However, the *TikTok* videos required rehearsals before recording so the teacher would speak fluidly and naturally.

- **The image:** In both types of videos, we intended quality, attractive, dynamic, and stimulating images. For the *YouTube* videos, pre-default *PowToon* templates with these elements were selected. In addition, we sought to use a variety of colors, illustrations, animations, and visual effects. The *TikTok* videos used diverse and not visually oversaturated recording spaces. We varied the shots (American, medium, and medium-short), changed clothes and hairstyles, and even simulated characters.

- **The text**: The text was a support element for the oral explanation. We sought to present the essential content with concise information, straightforward typography, contrasting colors and a size large enough to be seen without difficulty. The topic name, content highlights, examples, and some exercises were the elements considered when composing the text.

- **The audio:** In both the *TikTok* and *YouTube* videos, we ensured that the voice was clear, enjoyable, simple, and as natural as possible. Diction, intonation, fluidity, rhythm, and volume were emphasized. It is also important to note that the recording space avoided ambient sounds that could affect the audio. Videos from both platforms were enlivened with background music. Care was taken to make it attractive and stimulating to the audience. The music could not obstruct the clarity of the exhibiting voice, so motivating instrumental music offered by the platforms for free was used.

It is important to mention that the study's designer teacher made all the videos used for this research from start to finish. However, the different activities that involve the creation of a video can be distributed among different teachers according to their skills.

Table 8 provides links to some examples of the videos, and Figures 4 and 5 show some screenshots. All the videos used in this study can be found on the *TikTok* account @artiesangerman and the Artemisa Sangerman *YouTube* channel.

Topic	Platform	Link
Adjectives	*TikTok*	https://www.tiktok.com/@artiesangerman/video/6971580272202583301?lang=en&is_copy_url=1&is_from_webapp=v1
Prepositions	*TikTok*	https://www.tiktok.com/@artiesangerman/video/6987915486050684165?lang=en&is_copy_url=1&is_from_webapp=v1
Active and passive voice	*TikTok*	https://www.tiktok.com/@artiesangerman/video/6979374819330608389?lang=en&is_c
The simple sentence and its types	*YouTube*	https://www.youtube.com/watch?v=bzDFGEAw5w0

Table 8. Examples of videos used.

Figure 4. Screenshot of one of the YouTube videos.

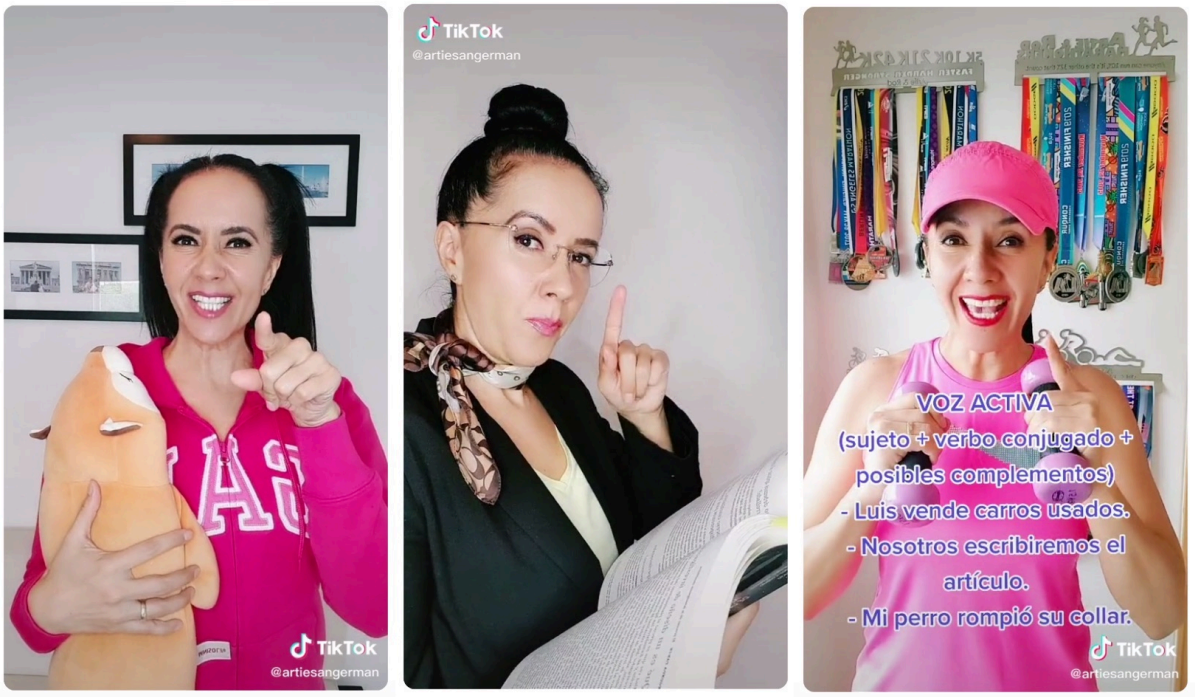

Figure 5. Screenshots of some of the TikTok videos.

Both teachers used the same videos to teach the contents, but each had the creative freedom to design the class consolidation activities following the guidelines.

At the end of the grammar period, we applied the final test (Test 2) through the *Google Forms* platform and compared the results with the diagnostic test applied at the beginning of the course (Test 1). Subsequently, we gave the opinion survey to the students to know their perspectives on the Flipped classroom model using *TikTok* and *YouTube* videos, also answered through *Google Forms*.
To know the teachers' perspectives on their experience with the processes of the Flipped classroom model and *TikTok* and *YouTube videos,* we applied a survey to them at the end through the *Google Forms* platform.

Results

The comparison of the tests showed a substantial difference between the scores in the diagnostic test (Test 1) and the final test (Test 2). The sum of points obtained in the diagnostic test was 5903, while in the final test, it was 9,950. Figure 6 shows the sum of points in both tests and their difference.

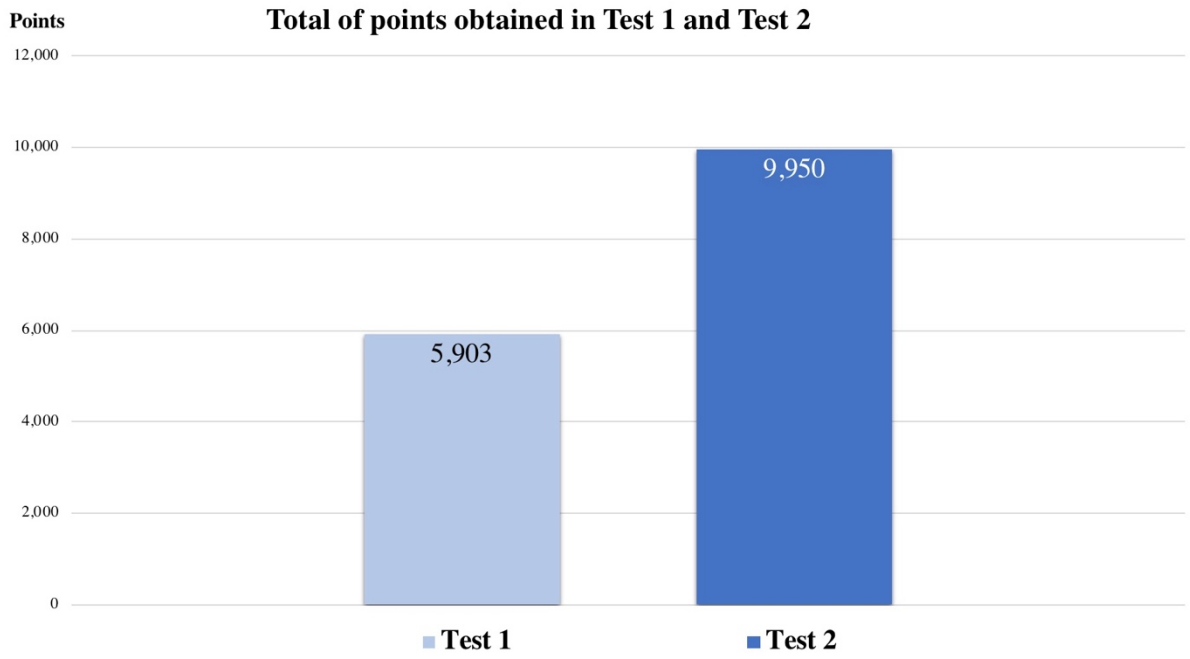

Figure 6. Total points earned by students in Test 1 and Test 2.

It is important to note that 100% of the students increased their point scores. Table 9 shows the distribution of the points difference between Tests 1 and 2. The smallest amount increase was 12, and the largest was 56 out of 100 total points.

This table shows that the most frequent recurrence is 23 points among 14 students; twelve students increased by 28 and 33 points. At the lower end were two students who increased the most in the second test, more than 50 points. Figure 7 graphically shows the distribution of the points difference between Test 1 (diagnostic) and Test 2 (final). It is also important to note that the average of increased points is 42, the mode is 23 points, and the median is 31.5.

Points Difference	Frequency
12	4
13	3
15	1
18	7
19	3
20	4
21	5
22	4
23	14
24	3
25	2
26	7
27	3
28	12

29	4
30	5
31	5
32	3
33	12
34	5
35	3
36	4
37	3
38	6
39	2
40	3
41	3
42	1
43	3
44	2
47	1
49	1
54	1
56	1

Table 9. Distribution of points difference between the diagnostic test and the final test.

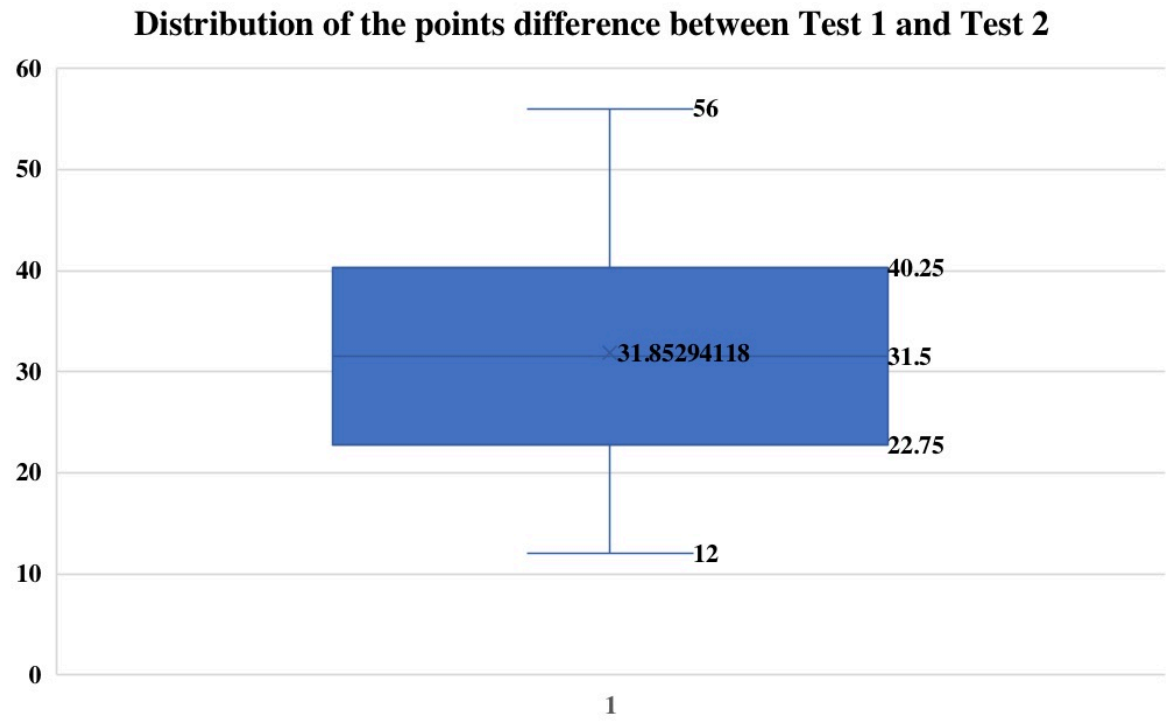

Figure 7. Distribution of points difference between Test 1 and Test 2.

Figure 8 shows the grades obtained in both tests and the difference in points obtained by each student. It is meaningful to observe the trend lines of the starting points (diagnostic test) and

endpoints (final test). The behavior of Test 1 with respect to Test 2 shows a growing difference; while in Test 1 the trend is negative with a value of -0.0795, in Test 2 the trend is positive with a value of 0.1283.

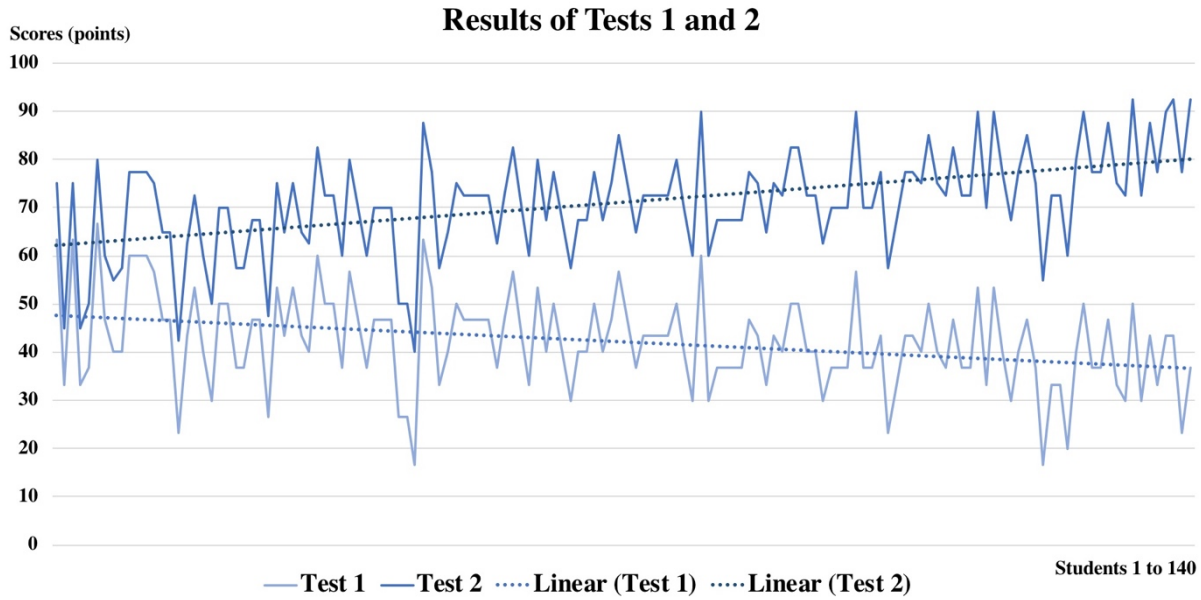

Figure 8. Grades obtained in Test 1 and Test 2.

Regarding the students' perception of using the Flipped Classroom model with *TikTok* and *YouTube* videos to develop their grammatical competency in Spanish, 137 of the 140 answered: 53 from teacher 1, and 84 from teacher 2. Below are the results of the responses (see Figures 9 to 17).

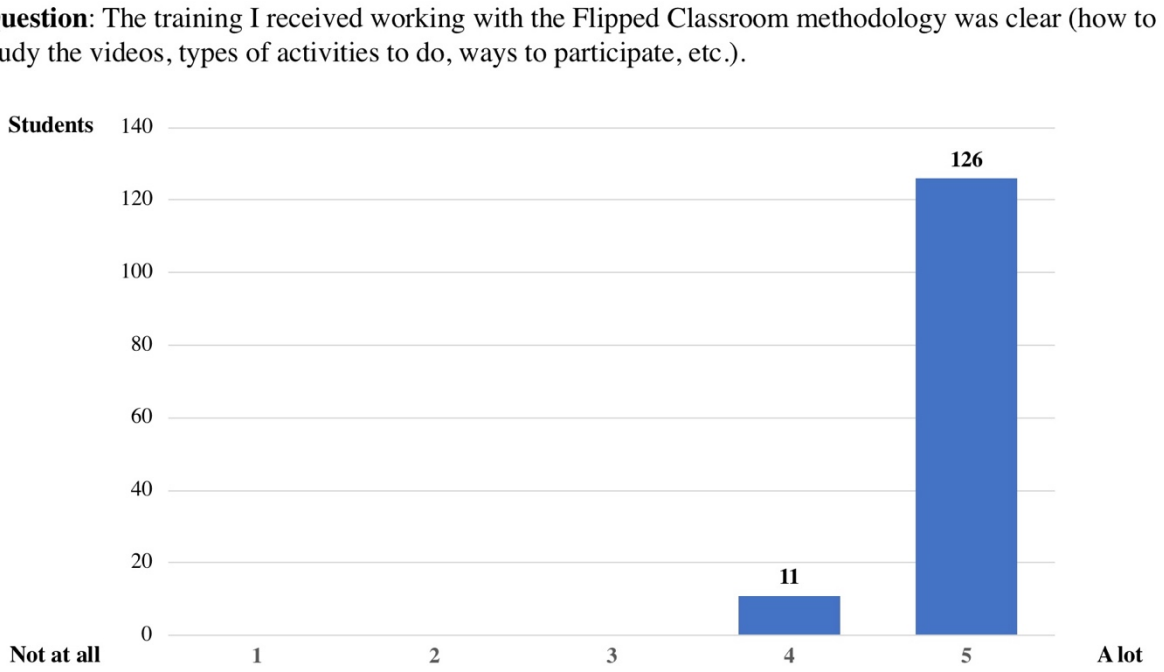

Figure 9. Students ' opinion on the training they received under the Flipped Classroom model.

Question: The percentage of course videos that I watched was approximately

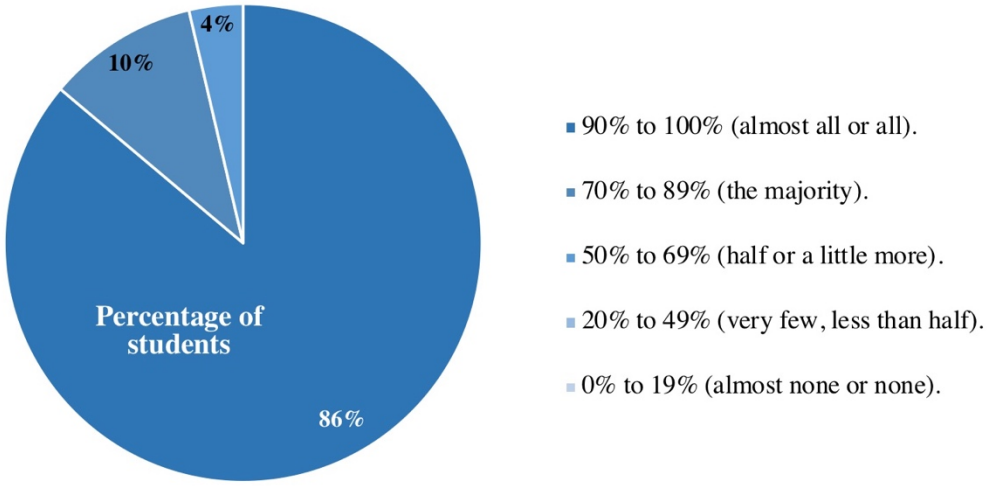

Figure 10. Percentage of videos viewed by students.

Question: The learning resources used for this methodology (TikTok and YouTube videos) were sufficient to develop my grammatical competency.

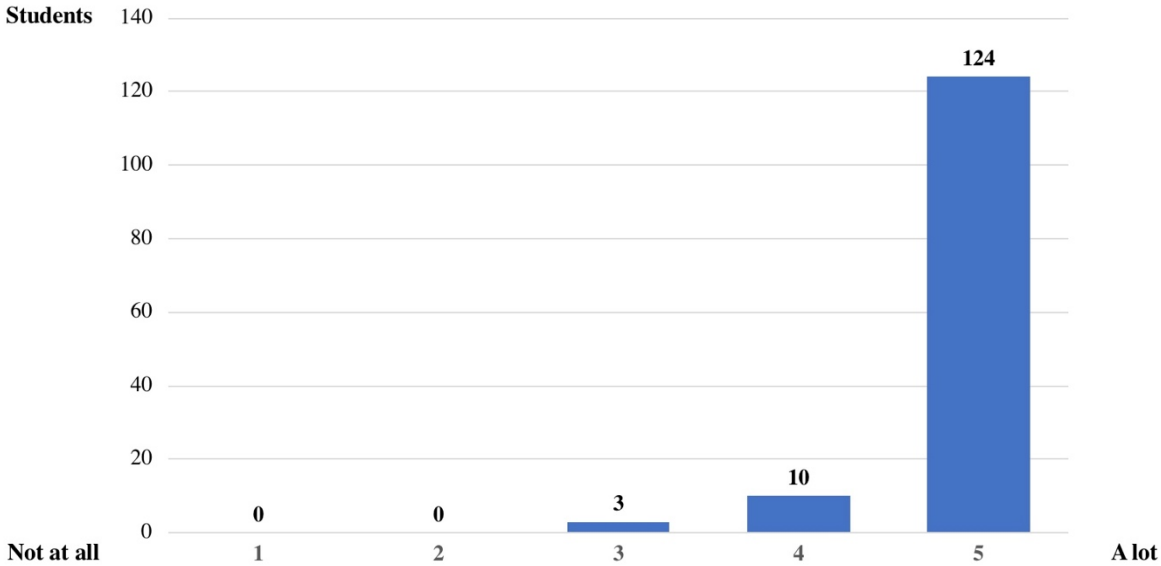

Figure 11. Students' opinion on the relevance of TikTok and YouTube videos to develop their grammatical competency in Spanish.

Question: The consolidation activities performed in the sessions helped me strengthen my learning.

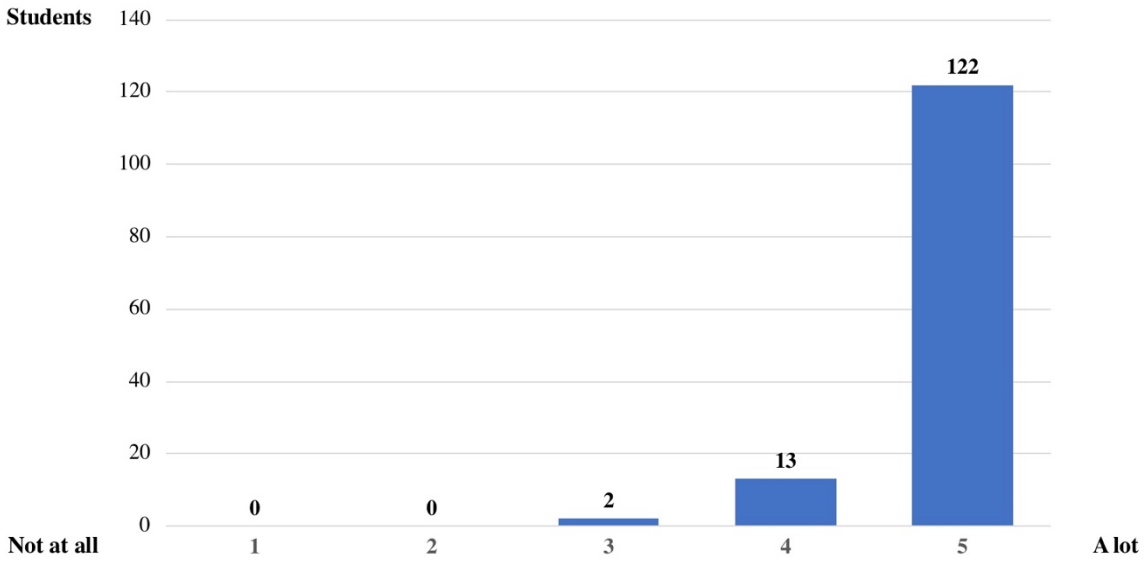

Figure 12. Students ' opinion on the benefit of the consolidation activities.

Question: The feedback and followup I received throughout this part of the course was clear, precise, and beneficial to my learning progress.

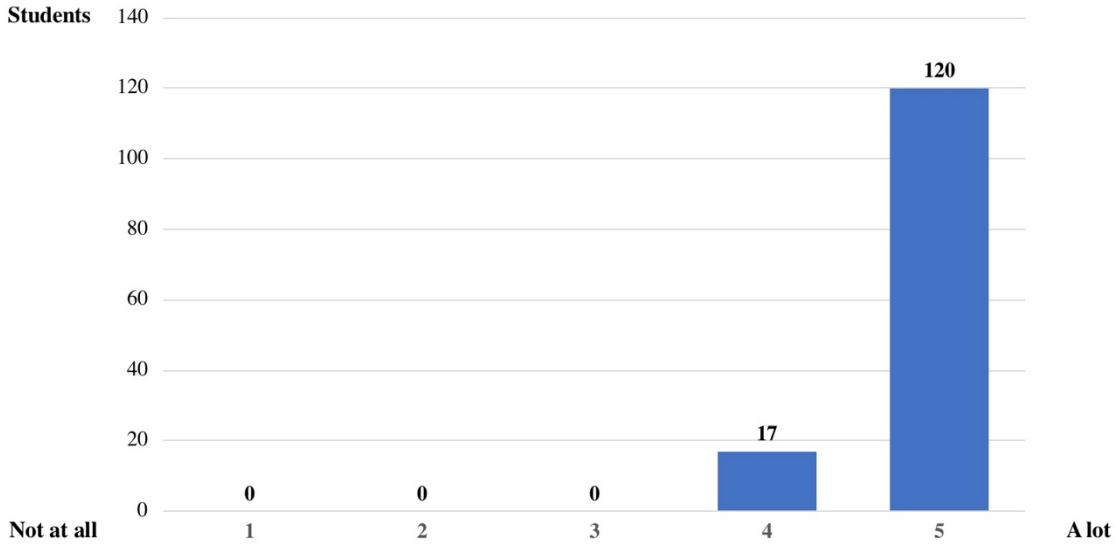

Figure 13. Students ' opinion on the feedback and follow-up received.

Question: The best part of the videos was (you can select more than one option):

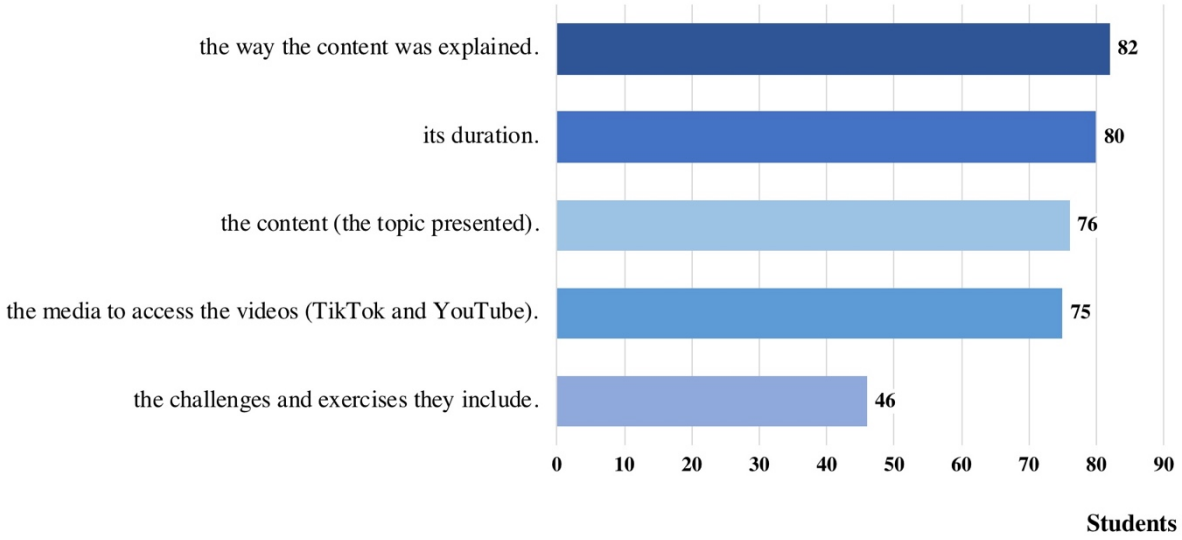

Figure 14. Students' opinion on the aspects of *TikTok* and *YouTube* videos that they considered most beneficial.

Question: The main difficulty I had with this methodology was

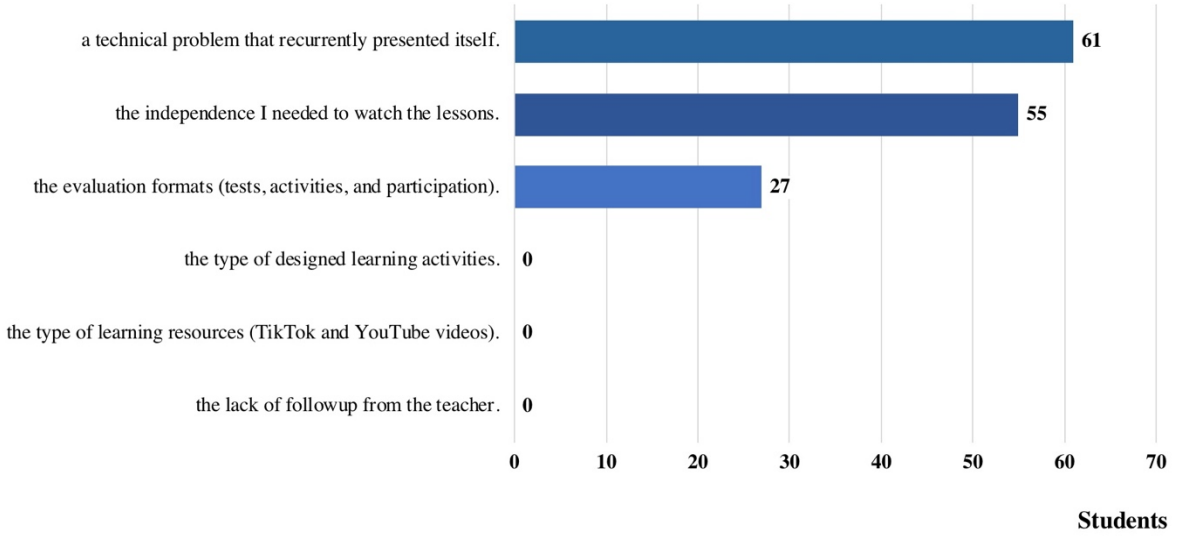

Figure 15. Students' opinions on the most significant difficulties they encountered when learning with the Flipped Classroom model with *TikTok* and *YouTube* videos.

Question: I feel that the Flipped Classroom method used in the segment of the course helped me improve my Spanish grammar competency.

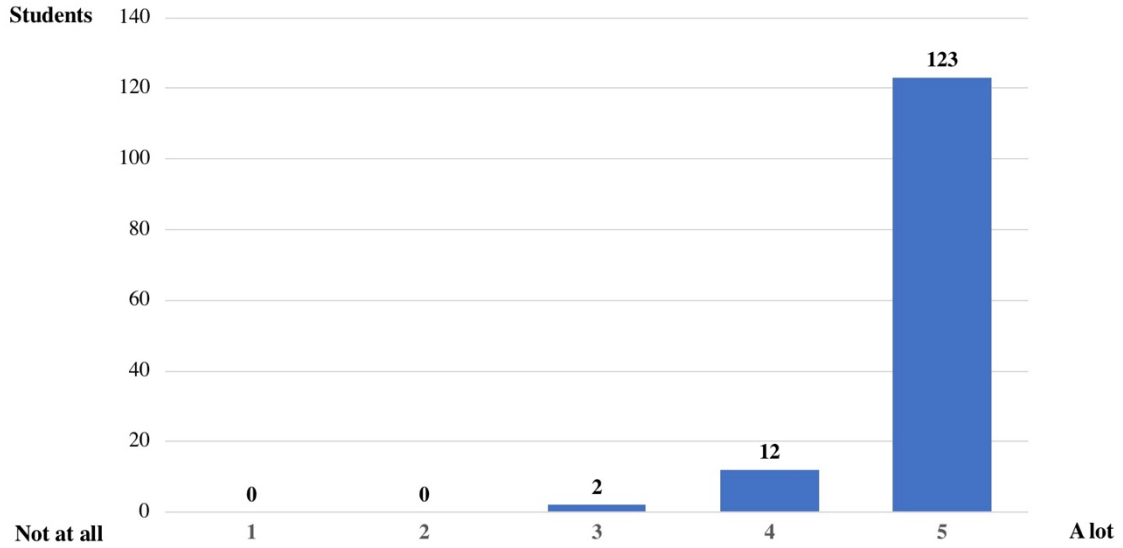

Figure 16. Students' opinion on the relevance of the Flipped Classroom model with TikTok and YouTube videos to develop their grammatical competency in Spanish.

Question: I feel that the Flipped Classroom method with TikTok and YouTube videos used in this segment of the course motivated me to learn Spanish grammar.

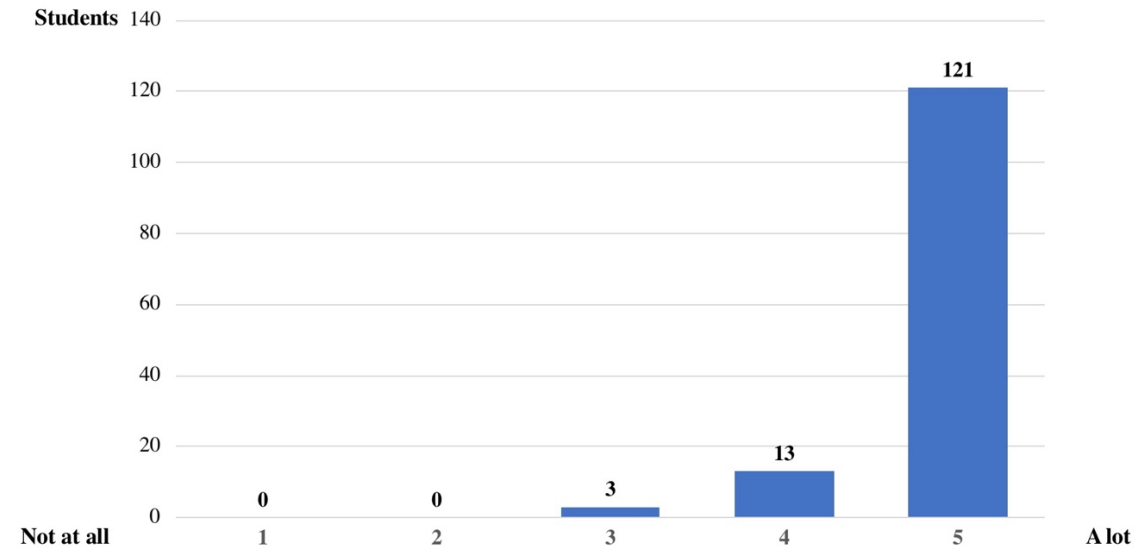

Figure 17. Students' opinion on the motivation generated by TikTok and YouTube videos to develop their grammatical competency in Spanish.

Regarding the opinion of the professors involved in implementing the model, their survey results are summarized below (see Table 10).

Questions about TEACHING	Professors' answers
For me, the new role I had to assume in planning this methodology was	1. **not complex. (2 professors)** 2. a little complex. 3. somewhat complex. 4. complex. 5. very complex.
My course preparation with all the components of this methodology was	1. **not complex. (2 professors)** 2. a little complex. 3. somewhat complex. 4. complex. 5. very complex.
I consider the greatest advantages of developing this grammatical competency were	☐ **the videos. (2 professors)** ☐ the evaluation and feedback. ☐ the question and answer sections. ☐ **the mastery of the topics achieved by the students. (2 professors)** ☐ **the activities/challenges that I designed to consolidate the topics. (2 professors)** ☐ **the different roles assumed by the students and teacher. (2 professors)** ☐ **the different activities executed at home and in the class. (2 professors)** ☐ none; I perceived no advantages in the Inverted Classroom methodology.
I consider the greatest disadvantages of this methodology were	☐ understanding it. ☐ organizing my time. ☐ guiding the students. ☐ designing consolidation activities. ☐ having to give assessment, feedback, and followup. ☐ **designing the videos if I had to do it. (1 professor)** ☐ **none; I perceived no disadvantages in the methodology. (1 professor)**
Select the greatest benefits you saw in your students during their learning process with this methodology.	☐ **I saw them more motivated. (2 professors)** ☐ **Their questions diminished. (2 professors)** ☐ **Their participation increased. (2 professors)** ☐ **They came better prepared to class. (2 professors)** ☐ **They showed better mastery of the topics. (2 professors)** ☐ **They did their activities with more success. (2 professors)** ☐ I perceived no differences from the traditional model.
Select the greatest difficulties you perceived in your students during their learning process with this methodology.	☐ Lack of organization. ☐ Feelings of frustration. ☐ Task oversaturation (causing stress). ☐ Continuous confusion about the learning contents. ☐ **I did not really perceive that they confronted major difficulties. (2 professors)**
From my perspective, the Flipped Classroom method can be more beneficial than the traditional model for the development of grammatical competency.	1. I do not agree. 2. I slightly agree. 3. I somewhat agree. 4. I agree almost totally. 5. **I completely agree. (2 professors)**
I consider that the videos as a medium to teach grammatical content to the students are	1. not relative. 2. slightly relative. 3. somewhat relative. 4. relative. 5. **very relative. (2 professors)**

Table 10. Opinion of the participating teachers on the Flipped Classroom model with TikTok and YouTube videos.

Discussion

The present study's findings provide evidence that the Flipped classroom model is efficient for developing language skills, as reported in several studies, some mentioned in the introduction of this work. The findings also show that *TikTok* and *YouTube* videos are valuable resources to enrich this methodology. In this research, 100% of the participating students improved their performance in Spanish grammatical competency, showing that, despite the belief that social media are tools only designed for entertainment, they can be used for learning, including by the students in a school system.

In addition to these resources' efficiency in the learning process, the study revealed that they increased the students' motivation to learn. Ninety-eight per cent of the students surveyed reported that the methodology used with *TikTok* and *YouTube* videos increased their motivation to learn Spanish grammar. Ninety-nine per cent also reported that they found this methodology beneficial for learning the topics related to their grammatical competency.

Finally, this study indicated that the teachers found high value in the Flipped Classroom model and the use of *TikTok* and *YouTube* videos. The professors involved reported that it did not involve more work despite being a new methodology for them. They also highlighted the benefits they perceived in their students, such as increased preparation, participation, and motivation.

On the other hand, the risk of involving social media in the learning process, especially with young students, cannot be ignored. These tools are full of great distractions for students, including dances, jokes, beauty tutorials, life tips, and film reviews. It is easy for users of all ages to become distracted and captured by this type of content, which would be adverse to the objective of learning. That is why it is imperative to train teachers well to know how to train students well in managing these tools. It is also crucial to design the videos attractively, perhaps following the methods used by *influencers* and the trends taking place in the networks. In this way, students will find these materials also stimulating.

Conclusions

The methodology implemented in this study proved to be a great support for the improvement of the grammatical competency in Spanish for this population. Not only did it help students increase their performance, but it also kept them more motivated to learn. There are various methodologies and tools to support the teaching-learning process, as mentioned at the beginning of this article; social media hand in hand with a didactic technique can become a very relevant option for this.

The present investigation proves that a teacher's contribution to social media is enormous, showing how to design a class to improve learning. In this and other studies, it has been shown that audiovisual materials are the language of the XXI century. It is not easy to visualize today's classes without the support of these types of resources. Additionally, the materials designed in the social media formats of *TikTok*, *YouTube*, *Instagram* and *Facebook* (short videos with one minute of duration: *"Shorts"* and "*Reels"*) have two benefits. First, the format is attractive and familiar to students, especially young people. The short duration aligns with their attention spans using a resource of this type. Second, the teacher's contributions to the users of social media are also of great value. It is a gift made in a world where daily sharing is routine.

There is still much work to be done regarding incorporating social media materials into the classroom. This study and others have demonstrated the value of such learning resources for student motivation and support for teachers. However, it is a fact that, due to their novelty in education, tools such as *TikTok*, *Instagram*, *Metaverse,* and augmented reality must be more explored to understand their usefulness for teaching in various knowledge areas.

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Grade Inflation: Comparison of Competencies Among Public Schools Before and During The COVID-19 Pandemic

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Abstract
The aim of this study is to find traces of grade inflation during the pandemic on selected public schools in the Division of Bulacan. This phenomenon has been an issue across educational institutions since there was an implemented leniency on assessments during this period. The researchers focused on the average performance of the schools in the mathematics subject, which came from two different school years: prior and during the pandemic. Data was analyzed using frequency distribution and descriptive statistics. Then, the grade differences between the two time periods were analyzed using a paired t-test. Findings reveal a significant increase in the general average of the mathematics subject per school, which jumped from 87.93 to 91.7. Implications include a possible existence of grade inflation towards the public schools. The researchers suggest that students that will graduate during the pandemic period may not be as competent as their previous predecessors.

Keywords: Grade Inflation, Pandemic, Mathematics, Average Performance

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Introduction

The advent of the pandemic has increased the burden on teachers in conducting several types of classes. At the start of the unprecedented event, there have been many challenges in the implementation of remote learning across the globe. Institutions have made innovations soon after, but some countries have been suffering its effect on the education sector.

Particularly, in the Philippines, there has been a problem regarding the ever-evolving educational system, which has strained students and teachers alike. Ever since the Department of Education implemented the new K-12 curriculum, lots of overhaul in terms of grading system, merit system, and content was applied quickly. In emphasis, the Department of Education in the country has introduced a series of orders that would mandate these changes. For instance, DepEd Order (DO) No. 36 s. 2016 cited new policies in recognizing students who have shown competence per grading period (Department of Education, 2016). The old system, which introduced an ordinal list of top achievers, was abolished, `and replaced by a merit system based on a specific range of grades. However, there were changes brought on the DO No. 018, s. 2021 version suspended some awards that are meant to be awarded in a face-to-face setting (Department of Education, 2021).

On the other hand, these changes that have been presented would lead to another problem, which is grade inflation. Many factors have been identified by researchers, including the Students Evaluations of Teaching (SETS). Stroebe (2020) noted that these tools do not assess teaching performance, and university administrators' extensive use in hiring, promotion, and merit increases choices encourages ineffective teaching and grade inflation. Students must earn high grades, and faculty members must earn high SETs. In the Philippines' case, grade inflation has been prevalent since private schools tend to change their teaching roster every school year because of the implementation of SETs.

Nordin, Heckley, and Gerdtham (2019) emphasized that grade inflation is unjust and may imply poor human resource allocation. They have noted that its possible explanation is the difficulty quantifying and predicting causal grade inflation effects. They find that grade inflation affects earnings mostly through the university and field of education chosen rather than through enrollment itself because attending higher-quality colleges and pursuing high-paying fields of education significantly affect earnings. On the other side, this culture harms high-skilled students enrolled in upper secondary schools without grade inflation and, surprise, low-skilled women enrolled in "lenient" schools. This act results in widespread inequity and, possibly, adverse welfare implications.

Literature Review

The phenomenon of grade inflation occurs when students are not given grades based on their merit, knowledge, or effort but rather are given greater grades than what they deserve or should receive. Also, there is an upward trend in awarded grades with the absence of a matching improvement in academic excellence over some time (Khan, Munir, & Afzal, 2021). Chowdury (2018) emphasized that grades or marks are crucial for sorting and signaling pupils in academic institutions worldwide, from primary schools to colleges. Students' grades should be indicative of their learning outcomes. However, during the pandemic, most teachers have become lenient on tasks because of the policies implemented by different institutions, which contributed to the false sense of students that they have been performing well. Baglione and Smith's (2022) research revealed that students believe

that *A* grades are not given excessively; yet they believe that some students earn higher grades than they deserve. Thus, grades are viewed as a reliable indicator of accomplishment. There were no significant differences in perceptions of grade inflation by gender or GPA. However, women believe instructors give higher grades for greater student assessments (Baglione & Smith, 2022).

On the same token, researchers conducted a similar study that highlighted the consequence of the pandemic on higher education. The researchers used interviews, weekly diaries, and documentation about the course's transition to the online environment to collect data. The findings of their study indicate that there were disparities in instructors' ability to migrate online, available technology, course delivery issues and modifications, and communication with students. Students' reactions to transferring online were similar, with minor grade inflation (Vigil, Marian, & Szabo, 2020; Schwartz, Szabo, & Mahiko, 2020).

Objectives of the Study

The general aim of the study is to present evidence of the grade inflation phenomenon in the Division of Bulacan using the average competencies of schools in terms of their student's performance in the Grade 10 Mathematics before and during the pandemic.

Specifically, the researchers sought to attain the following objectives:

- To present distribution of the schools' average grades in Mathematics before and during the pandemic;
- To present descriptive statistics that would emphasize the grade inflation before and during the pandemic, and
- To compare the competencies of the schools using their students' average Grade 10 Mathematics performance before and during the pandemic.

Methods

In order to know if there is indeed an instance of grade inflation in the public high schools of Bulacan, Philippines, the researchers pooled data from the schools which are under the jurisdiction of the Division of Bulacan. Overall, there were 86 schools in the division. The researchers have sought permissions from the institution they are connected to and wrote a letter of permission to the said division and were handed a data containing the average performance of the students in the Grade 10 Mathematics subject per school.

Moreover, the researchers used cross-sectional data that was taken from two points in time. Particularly, the researchers were given the data from two (2) school years, SY 2019 – 2020 and SY 2020 – 2021 which captured the average performance of the students per school in Grade 10 mathematics before and during the advent of the pandemic.

Consequently, the data was analyzed using various statistical methods and with the aid of computer software. The average grades among the schools were analyzed using grouped frequency distribution and descriptive statistics such as the measures of central tendency and variability. Finally, in order to know if there is a presence of possible grade inflation, the researchers used an independent samples t-test to compare the performance of the schools in terms of their students' competencies in Grade 10 Mathematics before and during the pandemic.

Results

The researchers presented the following findings sequentially to attain the research objectives.

Frequency Distribution of the Schools' Mathematics Performance.

There are five schools in the SY 2019-2020 with an average grade equal to or less than 79.73, equivalent to 5.8% of the distribution. However, no schools obtained such average grades for SY 2020-2021.

Moreover, sixteen schools in the SY 2019-2020 obtained an average grade within the class interval of 79.74-84.32, equivalent to 18.6% of the distribution. A major decrease has been seen in the succeeding school year as there are only two schools (2.3%) with average grades falling within the range. Thirty-two schools in the SY 2019-2020 obtained an average grade within the class interval of 84.33-88.98, equivalent to 37.2% of the distribution. A major decrease has been seen in the succeeding school year as there are only 11 schools (12.8%) with average grades falling within the range. For SY 2019-2020, this is the median class interval.

Next, nineteen schools in the SY 2019-2020 obtained an average grade within the class interval of 88.99 - 93.64, equivalent to 22.1% of the distribution. A major increase has been seen in the succeeding school year as there are 53 schools (61.6%) with average grades falling within the range. The class interval is noted as the modal class for the two school years. Furthermore, for SY 2020-2021, this is the median class interval. Ten schools in the SY 2019-2020 obtained an average grade within the class interval of 93.65 - 97.71, equivalent to 11.6% of the distribution. An increase has been seen in the succeeding school year as there are 19 schools (22.1%) with average grades falling within the range.

Furthermore, there are four schools in the SY 2019-2020 with an average grade greater than or equal to 97.72, equivalent to 4.7% of the distribution. However, there is only a single school (1.2%) that obtained such an average grade for SY 2020-2021.

Learner performance was different when the average grades in Mathematics for 2019-2020 and 2020-2021 were compared. This pattern could be affected by the Department of Education's grade policies. The grading systems used in the two school years were different, with SY 2019-2020 using DepEd Order No. 8 S. 2015, and SY 2020-2021, on the other hand, used Deped Order No. 31 S. 2020. The quarterly assessment component was removed during the pandemic, which was a significant shift in the grade systems. This result may be due to the Answer keys being provided at the end of each self-learning module in all academic disciplines. This notion could be one of the reasons for the improvement in math skills among students. The answer keys' main purpose is to assist parents in helping their children answer activities.

Table 1. *Grouped Frequency Distribution of Schools' Average Grades in Mathematics 10*

School Year	Grades (Classes)	Frequency	Percent
2019 – 2020	<= 79.73	5	5.8
	79.74 - 84.32	16	18.6
	84.33 - 88.98	32	37.2
	88.99 - 93.64	19	22.1
	93.65 - 97.71	10	11.6
	97.72+	4	4.7
	Total	**86**	**100**
2020 – 2021	79.74 - 84.32	2	2.3
	84.33 - 88.98	11	12.8
	88.99 - 93.64	53	61.6
	93.65 - 97.71	19	22.1
	97.72+	1	1.2
	Total	**86**	**100**

Average Grades in Mathematics.

In terms of the mean, the year 2021 has a greater average grade in Mathematics 10 across 86 sampled schools, with a value of 91.7019, compared to the mean for 2019, which is 87.9343. Under DO 8 s., 2015 and DO 31 s., 2020, the average grade of schools for 2019 can be classified as Very Satisfactory, while an Outstanding rating for 2021.

The average grades for 2021 are more bunched together than 2019, as attested by the standard deviation for both years. The higher the SD, the more dispersed the data appears.

Since the skewness for both periods is in a negative value, the distribution is negatively distributed or skewed to the left, implying a satisfactory performance within the groups, as the higher valued scores congregate on the right side of the distribution. Furthermore, since the mean is less than the median, the distribution graphs adhere to the skewness value, implying a negatively distributed distribution. Since both values for kurtosis are < 3, it implies that the distribution is platykurtic.

Table 2. *Descriptive Statistics of Schools' Average Grades in Mathematics*

Descriptive Statistics	***SY 2019 – 2020***	***SY 2020 – 2020***
Mean	87.9343	91.7019
Median	88.055	91.795
Std. Deviation	5.52005	3.19296
Variance	30.471	10.195
Skewness	-0.129	-0.405
Kurtosis	0.152	0.988
Range	27.64	17.37

Comparison of Competencies.

To validate the significant increase in the average grades in mathematics across two time periods, the researchers used a two-tailed independent samples t-test. The previous section

showed that the mean grade from SY 2019 – 2020 is 87.93, and the mean grade from SY 2020 – 2021 is 91.7.

A preliminary test was done to choose whether equal variances should be assumed. Upon looking at the p-value of Levene's Test for Equality of Variances, the assumption that there are unequal variances is assumed since its value is less than 0.05, which is the significance level.

A closer look at the independent samples t-test revealed a computed t-value of -5.479 with a p-value of 0.000. Since the t-value exceeded the confidence interval of (-5.12741, -2.40771), the researchers present sufficient evidence that there is a significant difference in the Mathematics average grade of schools across the two different periods. It means that the researchers could also conclude that there was a significant increase in the competency of the public schools before and during the pandemic. However, a possible phenomenon of grade inflation might be taking place.

Table 3. *Comparison of Schools' Average Grades in Mathematics*

Independent Samples t-test	**Statistics**		**Grades**	
			Equal variances assumed	***Equal variances not assumed***
Levene's Test for Equality of Variances	F		17.444	
	Sig.		.000	
t-test for Equality of Means	t		-5.479	-5.479
	df		170	136.153
	Sig. (2-tailed)		.000	.000
	Mean Difference		-3.76756	-3.76756
	Std. Error Difference		0.68765	0.68765
	95% Confidence Interval of the Difference	Lower	-5.12499	-5.12741
		Upper	-2.41013	-2.40771

Discussion

The study's findings indicate that the average grade in Grade 10 Mathematics increased by approximately 3.77 points before and during the pandemic. However, there is a growing suspicion of grade inflation. As Khan, Munir, and Afzal (2021) stated, grade inflation occurs when students are not assigned grades based on their merit, knowledge, or effort but are instead assigned higher grades than they deserve or should earn. With that considered, this study has a disadvantage in that no follow-up interviews with public-school teachers were conducted due to the pandemic's limits and their calendar constraints.

Consequently, the researchers propose that future research should focus on private schools, as most of them use SETS. Strobe (2020) elaborates that these instruments do not evaluate teaching performance, and their widespread usage by university administrators in determining hiring, promotion, and merit increase decisions promote inadequate teaching and grade inflation.

Conclusion

In conclusion, the researchers are in the affirmative to find traces of grade inflation in the Division of Bulacan. Moreover, they also suspect that the lenient practices of teachers have led to this phenomenon. While there is no suspicion about the students' competencies, the researchers reiterate the importance of upholding integrity while considering the needs of the students during the pandemic.

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Neoliberal Principles: Lecturers' Perspective

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Abstract
Many researchers agree on the notion that neoliberalism is shaping the world today and some even argue that the economics curriculum promotes this ideology because of its emphasis on transferable and flexible skills. The contention is that there is a strong connectivity between neoliberal discourse and economics. Therefore, it is fundamental to investigate if economics lecturers subscribe to neoliberal principles. The study utilised a qualitative research method using focus group interviews. Data analysis revealed that neoliberal principles inform the teaching of economics and that on their own, these principles are sound. Accordingly, this ideology should not be criticised for causing economic and social hardships because the real danger to society is inequality and unemployment , these are the defining economic challenges faced by many societies today. Therefore, narrowing the inequality gap should be each nation's fiscal policy priority.

Keywords: Perspectives, Neoliberalism, Principles, Employability, Entrepreneurship

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Introduction

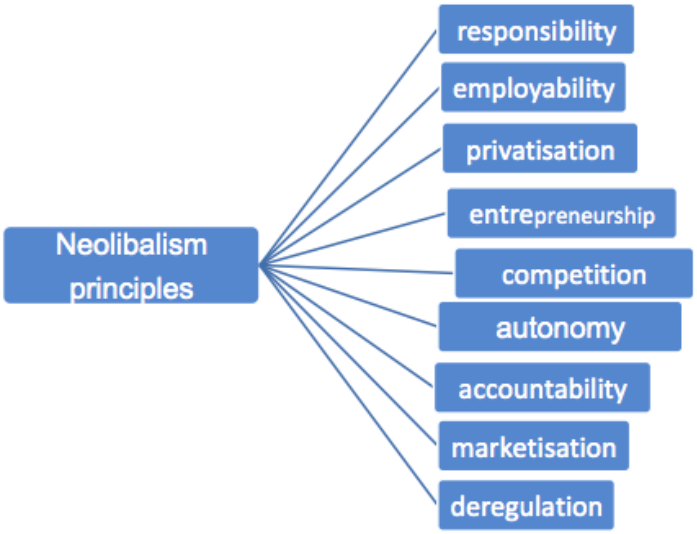
Neoliberalism is described as the economic practice where human well-being is advanced through entrepreneurial freedoms and skills by advocating strong private property rights, free markets, and free trade (Gray, O'Regan & Wallace 2018). The core rationale of neoliberalism is that scarce resources should be spent on activities that are used to produce maximum economic and social gains (Slocum, Dimitrov & Webb, 2019). Some scholars contend that neoliberalism is the dominant ideological and economic paradigm of our time, and its principles are incorporated in most of the societal sectors (Mikelatou & Arvanitis, 2018). Other researchers even argue that entrepreneurship education (EE) has become a significant theme in higher education because it promotes neoliberal ideals (Laalo, Kinnari & Silvennoinen, 2019). Higher education institutions, as the producers of knowledge, research, and innovation, are mandated to produce graduates with innovative business ideas. This idea is consonant with the one echoed in the Europe 2020 strategy which emphasises that school curricula should focus on creativity, innovation, and entrepreneurship (Laalo et al., 2019). The message is that entrepreneurship education needs to be encouraged in higher education.

Although neoliberalism curriculum promotes economic growth through the encouragement of entrepreneurial skills and employability skills critics are of the notion that neoliberal ideologies lean towards a market-based system in which education becomes training for the global tourism industry, rather than a public good which should be used to uplift society as a whole (Kantola, & Squires, 2012). In this system, scholars are no longer seen as the experts in the field, but rather as facilitators or trainers who groom the next generation of employable workers. The ultimate goal should be to end poverty and promote quality education, decent work, and economic growth.

Research identified some of neoliberalism principles as accountability, marketisation, responsibility, deregulation, autonomy, entrepreneurship, competition, privatisation, employability, and minimal government intervention (Lakes & Carter 2011; Furlong, 2013; Zuidhof, 2014; Moore, 2016; De Costa, Park & Wee, 2021; Besley 2019; Rodríguez, González-Monteagudo & Padilla-Carmona, 2021).

Figure 1 Below is synthesised from the literature review.

Figure 1: Neoliberalism Principles



Two principles that are central to this research paper are employability, and entrepreneurship because they are the key competences in lifelong learning (Murthy, & Machet, 2021). It is the responsibility of higher education institutions to produce graduates who are employable and at the same time possess entrepreneurial skills in order to ease their transition to the labour market (Sin & Amaral, 2017).

This research was therefore conducted to assess the extent to which lecturers develop employability and entrepreneurial skills in students through their pedagogy. Lecturers were chosen because researchers find academics to be the ones assigned the major responsibility for developing employability skills in higher education (Sin & Amaral, 2017). Therefore, lecturers were interviewed to find out how they cultivate the culture of entrepreneurship and develop employability skills in their teaching of economics.

In the framework of neoliberal policies, the employability approach focuses on the acquisition of key skills. The argument is that opportunities should be offered to students to improve their employability skills. Conversely, this notion is criticised by neoliberal opponents who contend that these skills are unevenly distributed and, therefore, scarcely available to underrepresented students (Rodríguez et al., 2021). However, neoliberal supporters argue that the neoliberal approach leads to the acquisition of key skills and there is no alternative (Orton, 2011).

Problem statement

Students' enrolment into institutions of higher learning is increasing yearly (Chakraborty, 2021; Jiang & Ke, 2021) hence there is always access labour supply in the labour market. The labour market is no longer able to absorb all the graduates looking for employment. Unemployment has become a global problem. For instance, in South Africa, the unemployment rate among fresh and old graduates is alarming (Mseleku, 2022). According to Statistics, SA (2022), it stood at 34.9 % in the third quarter of 2021. It is therefore fundamentally important to find out if lecturers put entrepreneurship and employability skills as the core objectives of their teaching. The two principles are very crucial because graduates need to be prepared for the world of work and they should also be able to create employment for themselves and others. The excess labour supply in the labour market, needs innovative and creative minds to create job opportunities. Entrepreneurial skills are of great importance especially during times when labour supply is greater than the demand as is currently the case. Graduates who possess entrepreneurship and employability skills will succeed in today's labour market (Forrier, De Cuyper & Akkermans, 2018). Accordingly, graduates should be encouraged and motivated to create, manage, and develop businesses (Baldwin et al 2019).

Employability

Recent decades have witnessed employability becoming more and more visible and forming part of the teaching agenda of most higher education institutions (Fallows & Steven, 2000).The employability approach is based on the acquisition of key skills and these policies are based on neoliberal perspectives (Rodríguez et al., 2021), with a greater focus on the labour market and the relationship between training and employment (Hernández-Carrera, Padilla-Carmona & González-Monteagudo, 2020).

Entrepreneurship

The promotion of entrepreneurship education in higher institutions of learning gained a lot of momentum especially in the 1990s (McMullen, 2019) and has been given much attention as a promising career path (Kuckertz, 2021). Higher education institutions should therefore foster the entrepreneurial spirit among their students by focusing on the development of entrepreneurial competences. Research findings show that graduates can only be motivated to develop entrepreneurial mindsets if lecturers act as entrepreneurial role models for students (Gibb, 2011 & Peltonen, 2015, 2008). The need for entrepreneurial skills has challenged educators to reconsider what to teach and how to teach with the aim of encouraging students to be innovative and risk-takers (Canziani et al., 2015). In the teaching context, entrepreneurial orientation is intertwined with the teacher's professional competence (Tarasenko, 2018). This view is supported by Gibb (2011) who posits that being entrepreneurs means that the lecturers should demonstrate entrepreneurial behaviour in their teaching.

Entrepreneurship has been recognised as an important discipline for poverty alleviation. The European Union identified entrepreneurship as one of the eighty competencies needed for lifelong learning which people need for individual personal fulfilment and development. Such competencies include active citizenship, social inclusion, and employment (European Union, 2006 quoted in Laalo et al., 2019).

Methodology

The research paper employed the qualitative research method using focus group interviews. Ten lecturers were interviewed in order to understand how they equip students with entrepreneurship and employality skills. Focus group interview should include from 5 participants to 10 participants, (Bolderston (2012). For this reason, data was collected from ten lecturers who participated in this study. The focus was on entrepreneurship and employability skills because they are emphasised in most of the policy initiatives that promote innovation and competitiveness in education (Dahlstedt & Hertzberg, 2013). The participants were purposefully selected. The selection was based on subject specialisation. All the participants have experience in teaching Economics in higher education. All the questions asked were formulated based on literature findings about entrepreneurship and employability skills as neoliberal principles.

Results

Lecturers are aware of the importance of employability and entrepreneurship skills. Most of them encourage employability skills such as communication skills, project-based learning, teamwork, problem-solving and interpersonal skills through their teaching strategies and assessment methods. They are also aware that employers are expecting well-rounded graduates, hence there is a need to constantly innovate course structures and ensure that students are upskilled for employability. Data analysis show that lecturers lack competences because as teachers, they need to demonstrate entrepreneurial behaviour in their ethos and practices. Participants also pointed out that they need adequate professional training and motivation and emotional support in order to teach effectively. Training would assist them to act as entrepreneurial role models for students since entrepreneurial orientation is intertwined with a teacher's professional competence. The research participants also reported that they

are not against neoliberalism principles if implemented to suit specific contexts; it should not be a one size fits all.

Discussion

Lecturers require cognitive, conative, and affective competences (Peltonen, 2015). They should use methods that promote entrepreneurial skills (Fayolle & Liñán(2014) Institutions need to provide platforms that connect students with the actual business world (Ruskovaara & Pihkala, 2014). Other factors which foster entrepreneurship skills can be through projects with clients, excursions to companies and inviting entrepreneurs as guest speakers to share their stories with the students. Additionally, lecturers can effectively promote employability and entrepreneurial skills by having a good understanding of a variety of educational philosophies and theories that underpin entrepreneurship education pedagogy and practice (Bell, 2021). Therefore, entrepreneurship education should be part of the overall curriculum offered by HEIs (Kuckertz 2021). All higher education institutions should be encouraged to teach entrepreneurial programmes that equip students with entrepreneurial mindsets as well as promote employability skills.

Conclusion

Employability and entrepreneurship skills cultivation should be at the forefront of the higher education learning environment. The ultimate goal should be to reduce the unemployment rate through job creation and also the promotion of quality education. Graduates should be given the opportunity to better assess whether they should pursue an entrepreneurial career or search for employment. Thus, employability and entrepreneurship skills should be part of every graduate's toolkit. The recommendation is that higher education institutions (HEIs) should teach entrepreneurship education to all graduates regardless of their disciplines. The importance of entrepreneurship education and the promotion of employability skills should not be marginalised by universities.

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Creation Research in Digital Painting

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Abstract
The research purpose of this paper is to conduct digital learning through digital painting in order to enhance undergraduate students' digital painting skills, art appreciation, and creative ability. The study subjects are university students. In the digital painting courses, we will mainly focus on the images of animation characters. The research methods will make it possible for students to operate the digital software and hardware practically, to learn the composition of the painting and the design of the color. Furthermore, students will interact with others and join a discussion; at the same time, teachers will help them to record their learning process. And at the end of the course, all their works will be collected and compiled into a personal portfolio. Students can learn how to operate the digital painting software based on the original animated images. After they are proficient in it, teachers encourage students to create scripts of animation stories and animation characters and also improve their painting skills, camera movement skills, and composition design. After the creations are done, students can upload their works on a digital platform that everyone can appreciate and observe. The research results of this paper summarize three conclusions. First, digital painting can boost students' understanding and operation of digital painting software. Second, digital painting can also allow students to have a creative imagination. Third, digital painting provides opportunities for students to observe and exchange ideas on online platforms.

Keywords: Digital Painting, Handed Painting, Art Pedagogy, Digital Creation

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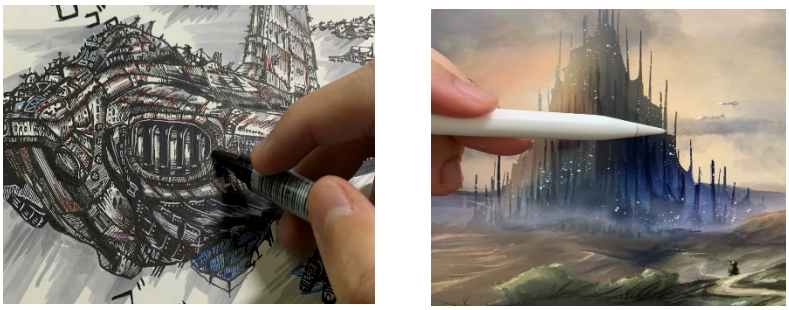
Introduction

In recent years, widespread digital computers and pads using would drive the art creation from handed painting to digital painting. In 2019, due to the impact of COVID-19 pneumonia, the convenience brought by the Internet age has made distance teaching and distance learning frequently, which fits the form of digital creation. To establish an online platform for the observation and discussion of the art courses, as well as to provide modified suggestions, feedback comments from mentors are the key issues. Additional implementation classes of art education on the internet need to propose in pedagogy. Those are included but not limited. Students could create artworks on the Internet, observe, discuss, and modify their works, could record the whole process, could put the draft, modifying, final, and revised works into picture albums, and could convert the achievement into a public or commercial demonstration. Based on the concept, the research would carry on about 20 members of the Animation Club at National I-Lan University in Taiwan. (https://www.facebook.com/withniuacgclub) , The research applies in the Animation Club courses at an appointed date and time every biweekly. [1-3]

Handed Painting and Digital Painting

Handed painting is a traditional art creation using materials and painting techniques to achieve the purpose of creation. A new type of creation can combine computer, graphic tablet, software, and selective programs to achieve artistic creation [4]. Handed painting includes various types of painting, like watercolor, oil, sketching, and crayon painting. Handed painting needs various tools for different art paintings, as shown in Fig. 1(a). on the contrary, digital painting needs only a few tools which usually require a digital pen and an electric drawing board correspondingly. The drawing digital package or software would be put under consideration, as shown in Fig. 1(b).



(a) (b)

Fig.1: (a) Handed painting needs various tools for different art paintings; (b) Digital painting requires a digital pen and an electric drawing board correspondingly.

Handed painting is quite intuitive for the basics and beginners. When choosing one type of painting for the beginning learners, required minimal and cheap tools have been readily available for several centuries. Of course, well-trained handed painting is recognized and considered to transfer to digital painting easily. However, there are existed expensive special tools, pigments, and consumables for advanced learners. For beginning learners, there is a long trip for learning. Furthermore, difficult preservation of works from moisture, loss, fire, and aging would decrease the progress of learning and douse the enthusiasm of learners. For digital painting, there are seemingly simple tools, a digital pen and an electric drawing board correspondingly, in the beginning stage of the handed painting learners. The

advantages would not possess quick creation and easy modification only, but also could be preserved, transmitted, duplicated, and reappeared achievedly. In addition, complicated digital image processes and effects are possible. On the other hand, trained digital painting is not necessarily to be able to transfer to handed painting. For artists, it may not be easy that digital painting software needs to be selective and well-familiar.

Tab. 1: the advantages and disadvantages of handed painting and digital painting

	Handed Painting	Digital Painting
Pros	• Hand-painting is quite intuitive for the basics and beginners. • Minimal required tools are cheap and readily available. • Trained handed painting is recognized to transfer to digital painting easily.	• Seemingly the simple tools. A digital pen and an electric drawing board correspondingly. • Creation quickly and modification easily. • Digital drawings could be preserved, transmitted, duplicated, and reappeared. • A complicated digital image process and effect are possible.
Cons	• Expensive for special tools, pigments, consumables, etc., • For beginning learners, there is a long trip for learning. • Difficult preservation of works from moisture, loss, fire, and aging, etc.	• Trained digital painting is not necessarily to be able to transfer to handed painting. • Digital painting software needs to be selective and well-familiar. • Electricity is necessary.

Elements between Handed Painting and Digital Painting

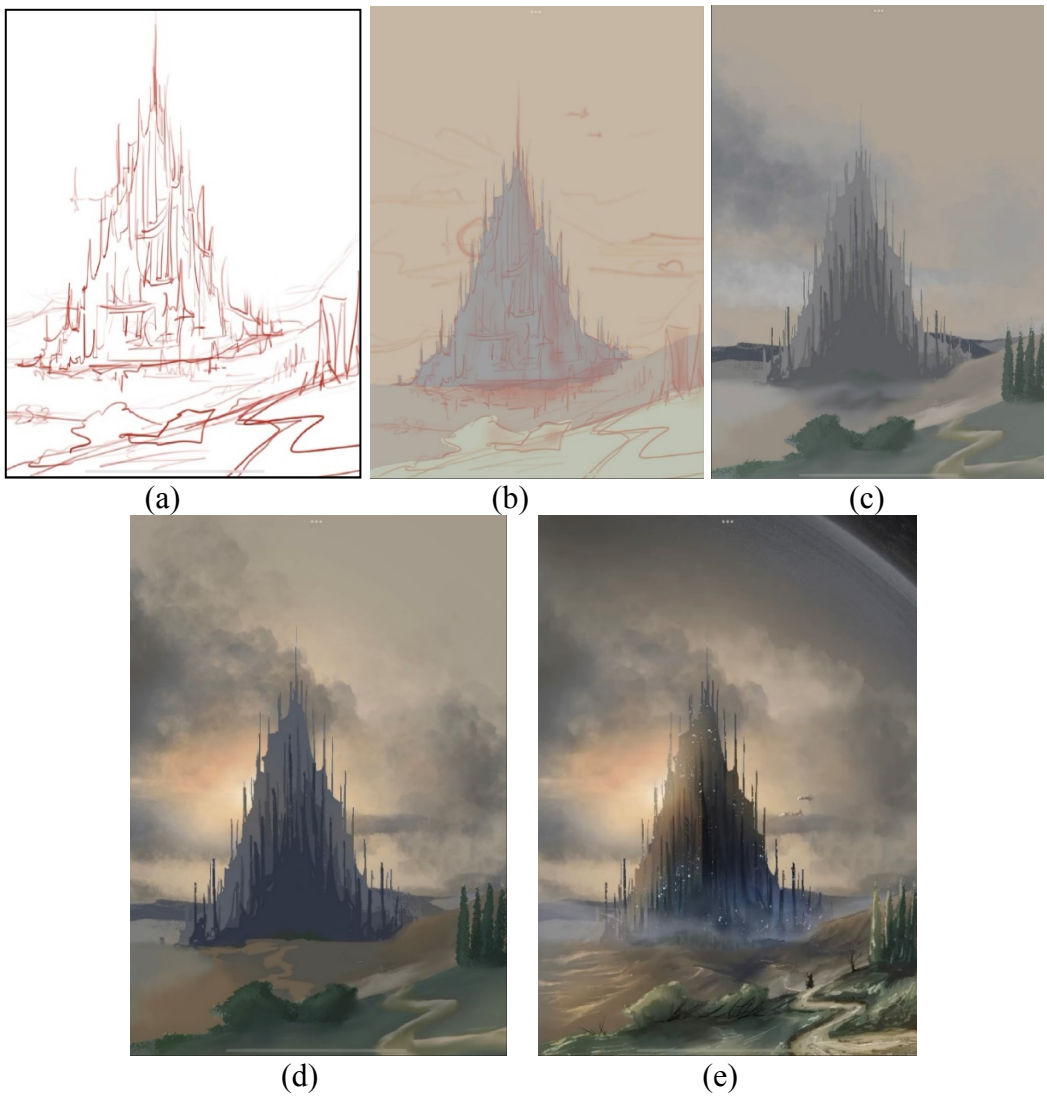
There are several elements to observe the differences between handed painting and digital painting. The first element is the brush. When artists create, they always hope to express creations more abundantly on the screen. In addition to colors and brushstrokes, it is nothing more than a variety of brushes. Virtual brushes can easily add and define the size, concentration, and shape of the brush in digital painting resulting in completed more different performances. The second element is the rendering. The difference between handed painting and digital painting is found in the use of media and rendering techniques. Watercolor painting is an obvious example. When in handed painting, artists usually add water to lighten the color[4]. However, different techniques could be achieved in a variety of ways, such as erasing, covering, and other covered icons, to achieve a similar performance while digital painting. The third element is canvas and layers. A physical canvas cannot have too many layers of brushstrokes on it, and the acceptable number of smears varies depending on the paper quality. Oppositely, if the memory capacity allows, the digital canvas can be added infinitely as layers and can also be smeared and modified indefinitely. The final element is the aspect ratio and color effects. Use the warp and perspective tools to correct the composition and shape of an image quickly. You can also use filters and color saturation to adjust the color of the picture.

Elements application in practical examples of digital painting

Based on the previous differences, four practical examples, character, landscape, light effect, and object adding, are proposed below. Those elements would be shown the application in the practical creations. Fig.2 is a graph of a character that would highlight color render, shadows, and light direction. When creating a character of a draft, the appearance of a trench soldier in World War I, waving a shovel would be presented. The rough lines roughly draw the shape and shadow of the character, as well as check whether there is any inconsistency in the painting, as shown in Fig.2(a). After the draft is finalized, some lines will be simplified to erase unnecessary lines. Notice that to pay attention to the change in thickness. The lines close to the shadow should be thicker, and the lines that are more affected by the light should be thinner or even disappear, as shown in Fig.2(b). In color rendering, the color block rendering would be adopted. Compared to the thick coating applied directly, the clear distinction method is more suitable for beginners. After we determine the inherent color of the object, we can proceed to the next step, as shown in Fig.2(c). Shadows and lights would be added to try to maintain the integrity of the picture. After confirming the general shape, we added details and highlights to lighten the key points we want to express, as shown in Fig.2(d). Finally, use color correction on the picture to achieve the final effect, as shown in Fig.2(e).

Fig. 2: the progress of the practical character example

The second practical example is a landscape creation. What needs to be paid attention to in landscape painting is perspective. Suppose it is large, far, or small. Distant objects will become very light in color due to their relationship with the atmosphere. On the contrary, the closer the object is, the more it can show the original color of the object. First, a towering building would be drawn to erect in the wilderness. In order to grasp the sense of distance and make sure that the proportion of the picture is appropriate, a landscape draft is shown in Fig.3(a). To draw the background color, what we want to present is the city near dusk. The contrast from the field to the city forms a sharp contrast, as shown in Fig.3(b). The city is a dense and irregular cone shape, and the tower in the middle is soaring into the sky. The work would be added with details and layers, as shown in Fig.3(c). The light source would be added. We want to make an occluded light source so that it can see through the clouds to increase the richness of the light, as shown in Fig.3(d). Adding layers and points of light to the building complex increases the complexity of the city. Of course, this is very fast, and the objects in the distant view do not need to be displayed in too much detail. This will shorten the sense of distance between the far and near. On the contact surface with the ground, A cool-colored style would be chosen to try to add and create a sense of mystery and traces of human activity. Finally, adding spotting and color correction would complete the final product, as shown in Fig.3(e).

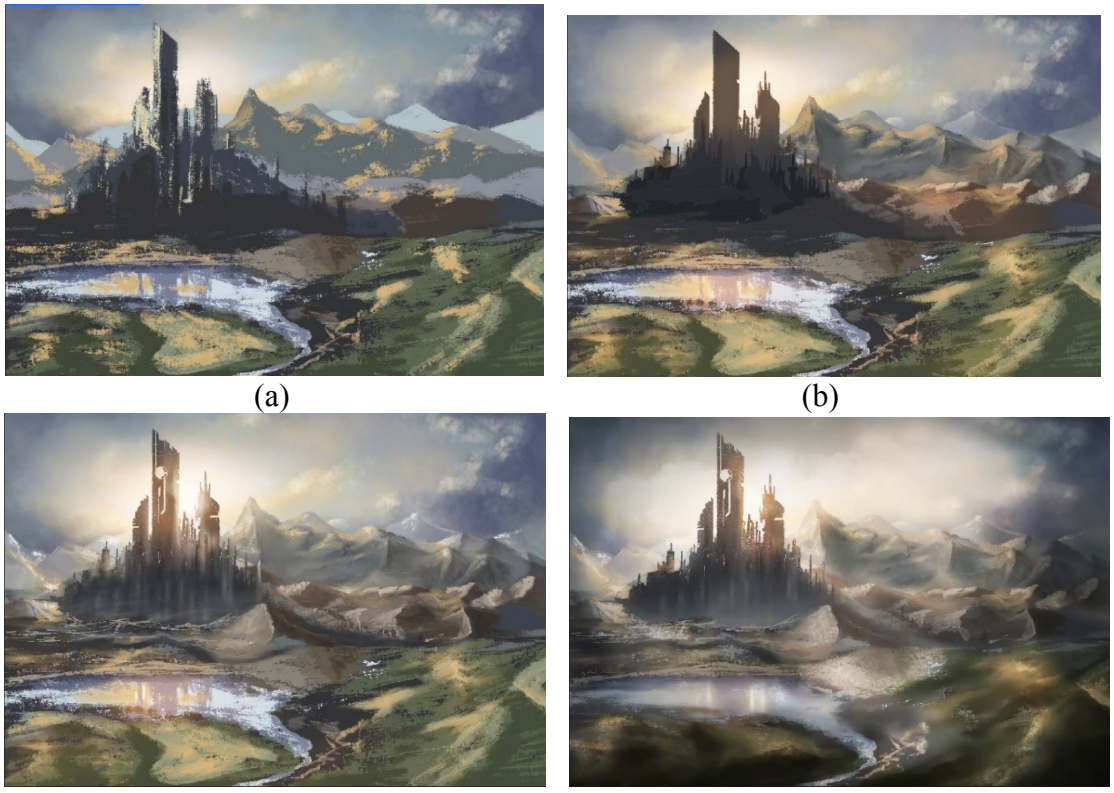


(a) (b) (c)

(d) (e)

Fig. 3: the progress of the practical landscape example.

The next practical example is a creation with a light effect. In this example, we tried to sketch without lines and just paint the shapes with brushes. The picture can be brought into the state faster. When the artists face the needs of the commercial, a variety of concept maps can be produced more quickly so that the team can understand the artists' ideas, as shown in Fig.4(a). After confirming the outline, the smear tool would soften the noise effect brought by the brush and preserve the brush strokes. Furthermore, adding shadows and ambient light would create an atmospheric feeling, as shown in Fig.4(b). Fill in the details of the city. The city would have a kind of sense of technology. Geometric shapes with the modification enhanced the flavor of a modern building. Besides, increase the contrast between the backlight and the foreground, as shown in Fig.4(c). Finally, the clouds are modified into a form similar to God's light. A slight over-exposure would make the picture look foggy to create a sense of mystery, as shown in Fig.4(d).

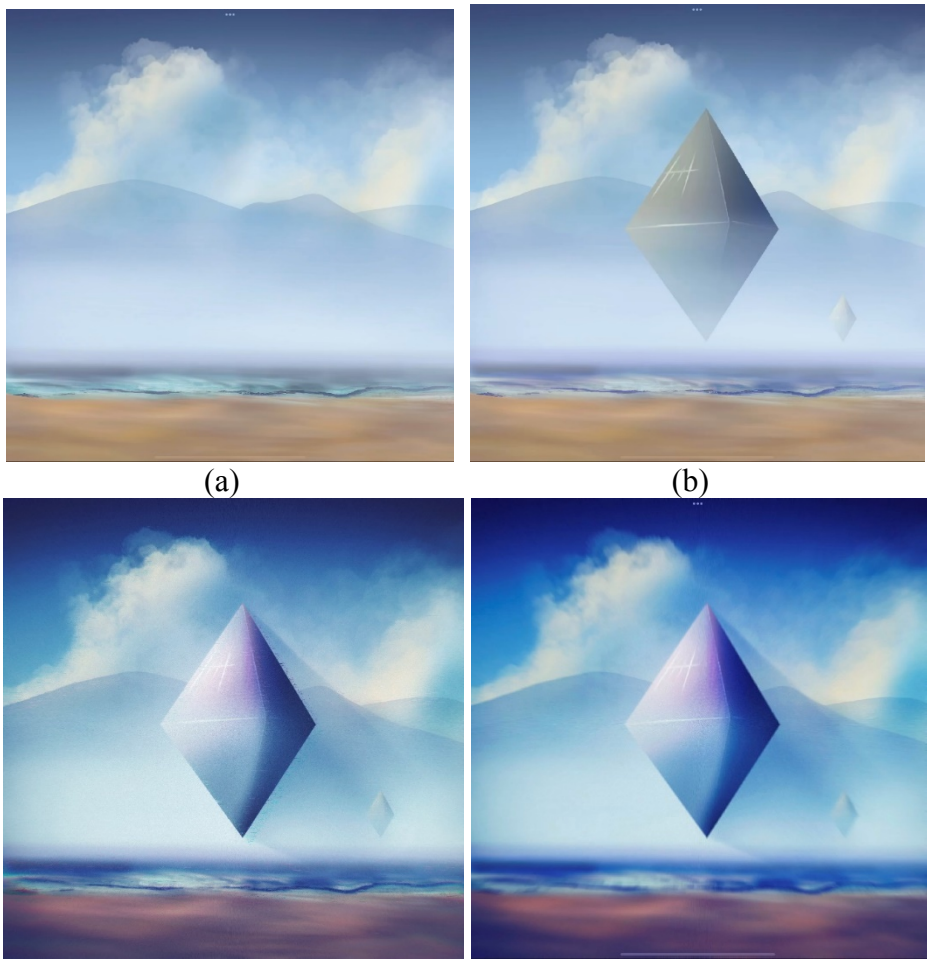


(a) (b)

(c) (d)

Fig. 4: the progress of the practical example with a light effect.

The last practical example is a creation adding an object. In this example, we want to add special-shaped geometric man-made objects on the beach. Surrealism can make the artist show his imagination and characteristics very well. First, draw the background, a simple beach, and ocean, and the shape of the mountain is faintly revealed in the back, as shown in Fig.5(a). Adding a geometric object (octahedron) into the sea, it looks like a super-large artificial body, and a little sci-fi flavor makes the picture more interesting, as shown in Fig.5(b). Put on the filter. The filter can generate the tone conversion of the picture very quickly, showing a completely different feeling of the picture. The filter is also a double-edged sword, and it can bring a certain degree of effect to the picture. Although the degree of completion of the picture is not so high, in the face of the filter effect, the artist should use it with caution, as shown in Fig.5(c). Finally, add some special effects and sharpening corrections to achieve the goal, as shown in Fig.5(d).



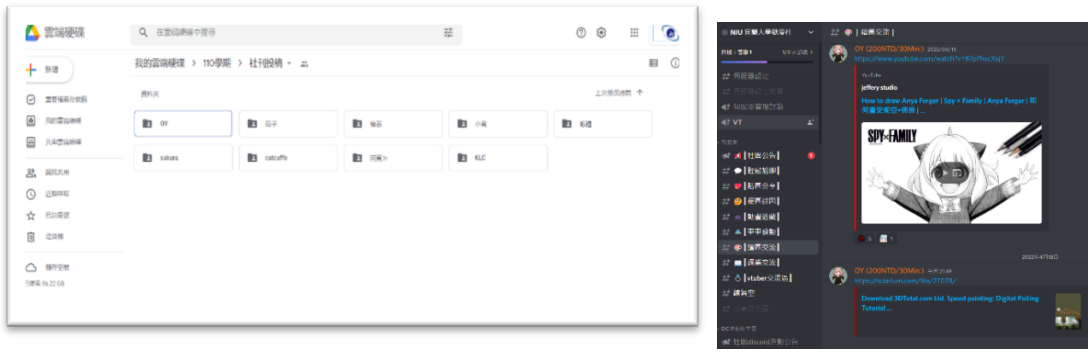
(a) (b)

(c) (d)

Fig.5: the progress of the practical example with an object addition.

Community and Gallery Platform

Google cloud HDD or iCloud would be employed to collect student works and final works. These folders are personal, and the permitted accounts can freely view other folder contents, as advisers or teachers, could observe and guide them online. Connections between the internet and popular community could make the exchange of opinions more convenient and soon. Students and artists would get feedback and corrections faster. The platform would make the artworks modify quickly and accomplish maturely.



(a) (b)

Fig. 6: Community and Gallery Platform

Conclusion

This paper tried to conduct digital learning through digital painting to enhance beginners' digital painting skills, art appreciation, and creative ability. The differences between both are presented, and listed the advantages and disadvantages of them to distinguish the elements, which would approach the digital painting learning quickly. Besides, The research methods would make it possible for students to operate the digital software and hardware practically, to learn the composition of the painting and the design of the color. Amazingly, creations in the digital painting are easy to create, replicate, edit, modify, and save in a digital system. Digital painting could communicate and publish online. It is better to learn digital painting directly than to transfer from handed painting to digital images. Four examples, characters, landscape, a light effect, and object addition, are explained in the research. Obviously, the painting style, perspective, and composition design in digital painting are changed soon. Therefore, three conclusions are summarized. First, digital painting can boost students' understanding and operation of digital painting software. Second, digital painting can also allow students to have a creative imagination. Third, digital painting provides opportunities for students to observe and exchange ideas on online platforms.

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Exploring Wellbeing Related Issues Arising From the Unregulated Use of Screen-Based Technology During Breaktimes in an International Middle School Environment

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Abstract
The following study uses a design-thinking and mixed methods research approach to elicit students' views on the use of screen-based technology during break periods. An interest in this area emerged due to a noticeable reduction, in recent years, in the number of students spending time in outdoor play areas during morning and afternoon breaks. The context of the study is Year 1 of the IB Middle Years Program in an International IB School, in the Netherlands, which implements an inquiry-based approach to teaching and learning. The school is a 1:1 laptop, tablet, and ipad school, and the students, who are 11-12 years old, have unregulated open access to screen-based technology during lunch and break-times. This first part of the study, in line with the initial stages of the design-thinking process, involved initial exploratory interviews followed by whole-group surveys, and whole-group discussions to better understand the issue at hand. The findings indicate that students engage in a wide variety of screen-based activities during break-time, they have a range of opinions on how screen-based technology affects their well-being, and they hold differing perspectives on the need for the current levels of access to change. The students raised a number of questions surrounding the unregulated use of screen-based devices during break-times, and in a follow-up study they proceeded with design thinking approaches to generate practical solutions to the issues that were raised through this initial inquiry.

Keywords: Digital Technology, Wellbeing, Middle School

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Introduction

One-to-one laptop and ipad based programs have become a common feature in international school environments, and their use has generated a range of perspectives concerning the potential benefits and drawbacks. Research indicates that the moderate use of these devices can have a positive impact on student learning (Lei and Zhao, 2008), social connection (Charmaraman, 2017), anxiety reduction (George and Odgers, 2015), and stress reduction (Modecki, 2021), which contrasts with research that highlights the negative impacts (Kokkinaki, 2010)(Twenge, 2020a). Some of the concerns raised regarding the use of screen-based devices with younger students include the impact on cognition, sleep, and levels of physical activity (Merga, 2015), and a Danish study, on the use of ipads during break-times, demonstrated that children are less inclined to interact with others when they are on their ipads (Schilhab, 2017)**.**

Conflicting perspectives and a shortfall in conclusive research on the impact of digital devices on the wellbeing of students prompted this independent study, within an international school context, to explore the implications of the unregulated use of laptops, tablets, and ipads during break-times. An interest in the topic arose following a rise in the number of students staying inside the main school building during lunch and break-times. Play areas that were once frequented by middle school students had become sparsely populated as students congregated or sat alone in the library and in hallways with their laptops, tablets, and ipads, even on sunny days. Consequently, this study seeks to uncover students' perspectives surrounding the use of laptops during lunch and break-times, using a design thinking approach, to determine whether there is a perceived need, on the part of the students, for changes to be made to current practices.

Given that the students stood to be directly impacted by the outcome of the study, it made sense that they were included in the study in a participatory manner. Their perspectives, in line with the principles of design-thinking, informed the gradual unfolding of the inquiry which was comprised of two phases, the first of which is detailed in this paper. This initial stage included exploratory interviews, followed by surveys, and discussions with all of the Year 1 students in the Middle Years Programme. Prior to the detailing of this initial phase, it is important to consider insights that can be gleaned from research related to the topic.

Review of Literature

In general, studies reflect a trend that points to a decrease in student wellbeing in schools since 2012 following the introduction of smart technology (Twenge, 2018). In the US, students began spending more and more time on screens, both at school and at home, and less and less time on physical activity and less time involved in in-person social interactions. Twenge found that this reduction in in-person interactions led to a corresponding increase in loneliness, results that reflect the findings of a later global study carried out across 37 countries which indicates that twice as many adolescents experienced loneliness at school in 2018 compared to 2012 levels (Twenge *et al*., 2021). A related study in Turkey demonstrated that levels of loneliness were positively correlated with the amount of time spent on screens (Ekinchi *et al.*, 2019).

The amount of time spent sitting inside on screens has also been linked to a reduction in exercise despite the fact that research indicates the importance of exercise for both mental and physical health (Carron *et al*., 2003). In general, research by Gökbulut (2019), indicates

that boys spend more time on screens than females, with boys' who are addicted to gaming, exhibiting lower levels of physical activity, and a lower sense of belonging in school compared to female students (Hazar *et al.*, 2017). In addition, a study by Wallenius (2010) which measured students' cortisol levels, suggests that long hours on ICT may cause physiological stress responses that impact attention, persistence and memory, as well as the capacity to manage social interactions in the real world, especially in busy school environments.

Interestingly, a study by Smahel (2015) indicates that children do not need to be overusing technology for the use to cause symptoms of stress. Even with moderate use, children in this study indicated physical symptoms including headaches, tiredness, and sore eyes, and mental symptoms including cognition deficits, aggressive behaviour and sleep difficulties. These problems manifest even after short periods online. This study indicates the need to pay attention to a broader range of young people with studies, as opposed to focussing specifically on excessive users.

Despite an increasing body of research that profiles the negative impact of digital technology on users, there are a number of studies that highlight the positive aspects of technology use. For example, a review of literature by Charmaraman (2017) demonstrated the beneficial aspects, including a greater sense of belonging, personal contentment, social connectivity, and emotional expression. Another study by George and Odgers (2015) highlights the role of digital technology in skill-building among shy adolescents. A further study by Wu *et al.* (2016) found that adolescents' sense of connectedness to friends and school are increased with the use of internet technology and that this connectedness is supported by positive relationships from real world experiences. This study suggests that real-life social skills are still a necessary foundation for students to be able to use technology in a beneficial way. The study recommends that schools focus on the development of social skills for real-life situations alongside the development of digital landscapes that promote connectedness among students.

Indeed, a number of emerging studies highlight that not incorporating digital technology in a moderate way in schools could prove detrimental for students' wellbeing. According to Dienlin & Johannes (2020), both low and excessive use are related to decreased well-being, whereas moderate use is related to increased well-being. Studies highlight the benefit of moderate use for stress reduction, in particular, especially when students use online programs or apps for coping with life stressors, and with managing negative emotions (Modecki, 2021).

Natural dispositions, it seems, are a determining factor in the level of use of digital technology by students. For example, individuals with a high preference for aloneness use padlets to reduce their stress levels (Leung, 2015), and a review of literature by Smith *et al.* (2021) indicates that the impact of technology on loneliness and isolation depends on whether the users are extrovert or introverted, and whether they are socially anxious, or whether they have an innate need to belong. Indeed, the review suggests that digital technology may offer valuable opportunities for less threatening social engagement for adolescents who lack interpersonal skills and confidence.

Despite the proliferation of research that explores both the positive and negative aspects of technology use among adolescents and children, there are limitations to this research. The primary concerns, according to Dienlin & Johannes (2020) are the lack of large-scale samples, the lack of research showing causal effects of digital technology use, and the lack of

consensus surrounding definitions and research methods. To begin to address this issue Orben and Przybylski (2019) carried out an analysis of large-scale social data sets in the US and found that the association between digital technology use and wellbeing was negative but very small, and too small, in their perspective, to warrant significant policy changes without further investigation. Similarly, a systematic review of research in this area by Orben (2020) makes the same point that the association between digital technology and wellbeing is weak and they call for greater consistency and efficiency in research.

Overall, there is a growing sense that the relationship between the use of digital technology and student learning and wellbeing is complicated. As Smith *et al.* (2021) claim, digital technology can have positive or negative impacts on student wellbeing, depending on how it is used, for how long, and by whom. This has prompted Dienlin & Johannes (2020) to suggest that extreme digital use may be the result of pre-existing socio-psychological problems as opposed to the direct cause of them. This perspective is important to consider, they assert, to guide the development of a deeper understanding of the factors governing gaming addiction.

Recent studies on gaming addiction have found that males, in particular, are more addicted to digital games that females and young people who play physical sports appear to demonstrate lower levels of addiction (Ekinchi *et al.*, 2019). The research suggests that a positive way to reduce gaming dependency is for parents and educational institutions to provide more opportunities for sports (Hazar & Hazar, 2018), and a study carried out in India goes as far to suggest that a national policy is needed to recognize and address technology addiction as a public health problem (Amundhan *et al.*, 2021).

Physical activities, however, are tied in with the need for outdoor areas that are conducive to movement and games. Indeed, a meta-analysis of studies carried out on the impact of outdoor spaces and greenery on students highlight the importance of being outside on the reduction of mental fatigue and increased cognitive function (Mason *et al*., 2022), both of which are primary side effects of the regular use of screens. A recent study carried out in Canada indicates that lower levels of outdoor activity are not due to an increase in screen time, but also due to an emerging belief among young people that it is safer to be indoors (Michaelson *et al*., 2020). These studies indicate that both practices surrounding the use of digital technology and changing perceptions in relation to nature have gradually led to a disconnection between young people and the outside world.

Research Approach

A design-thinking and mixed methods approach involving both quantitative and qualitative data was used, to explore students' perspectives, and to provide a holistic understanding of the current use of laptops, padlets, and ipads during break and lunch-times. The participant students were all in Year 1 of the Middle Years Programme, they were 11-12 years old, both male and female, and they came from a wide variety of countries and cultures.

To gather initial insights, I carried out open-ended interviews with two individual students, a Dutch boy and a Japanese boy, who were frequently inside on laptops during breaks. These insights informed the drafting of survey questions which were administered to the whole year group of 98 students. The specific questions guiding the initial survey were: Who is using technology regularly during the breaks? Who is going outside regularly? Who is happy with the current use of technology during breaks? Who feels that current practices could change?

The resulting quantitative data was shared with the students using simple pie and bar graphs, and in line with design thinking approaches, the surveys were followed by whole-group discussions with all five classes, of approximately 20 students each. The follow up discussion-based questions included: What are the laptops and other devices being used for at break-time? What are the perceived benefits or downsides of unregulated digital technology use during breaks? Are there others points that need to be raised? The resulting qualitative data was categorised into common themes, organized into an an easy-to-read table, and shared with the students.

Findings

The initial interviews with the two male students indicated that being on the laptops was perceived as a welcome break from school. The students played games together, as it was exciting, and both were keen to point out that it was not just game-playing, they also had some good chats together about other things. They felt that they went outside sometimes, but that it was hard to combine getting food and going outside due to logistical issues. They volunteered suggestions on how to combine game playing, getting food, and going outside.

The follow up survey questions with the five Year 1 groups, indicated that about 26% of the grade level of students were using technology regularly during the breaks, 49% of the students were exiting the school building during breaks, 30% were fine with the current situation, and 62% believed there was a need for a change. These beliefs differed across the class groups, with some classes showing a collective desire for access to digital technology to stay the same, and other classes indicating a collective desire for change. The reasons given for laptop, tablet, and ipad use during breaks were multi-fold, and included an emphasis on video games, watching Youtube videos, listening to music, posting on social media, browsing, and completing class assignments and homework. Boys from across the classes were the more prolific users, with girls being occasional users.

During the class discussions, students indicated a wide number of perceived benefits of the use of the laptops during breaks, including the development of gaming skills, stress-relief, fun, collaboration on projects, communication with friends in other places, learning new skills, escape from boredom, and the covering up of friendships issues. Students also raised a number of concerns about being on screens at lunch and breaks and these included a lack of fresh air, a lack of exercise, attention deficit issues, eye strain and a lack of social contact with other students. Several of the students mentioned that they were no longer happy to be inside using their laptops, as they felt that they were addicted to laptop use, and believed that they were not able to stop using them, even when they wanted to. A number of boys felt under pressure not to go outside, and a few had developed what they described as a *fear-of-the-outside*.

The class discussions raised additional information indicating that the students had lost access to outdoor play areas following the recent expansion of the school, and a number of students felt that they had gravitated to their laptops, padlets, and ipads as an easy option during lunch and breaks as they no longer knew where they could play outside. Students suggested that they needed help and guidance with navigating their downtime successfully, and the majority of students suggested that they would like to see a reduction in the level of access to screens during breaks. These discussions led a group of the more prolific laptop users to suggest the use of the MYP design cycle to create concrete solutions to the current laptop issue. They formed a focus group, which led to the implementation of phase two of this study. The

second phase, which extends beyond the scope of this paper, involved a focus group of Year 1 students, teachers, and administrators, and the use of the design cycle to create student-led solutions.

Discussion

Much as technology plays a very important role in learning, it is clear, from the students' perspectives, that an overuse of screen-based technology can lead to a variety of issues that younger students have difficulty managing by themselves without support. Apart from this, students felt that it is important for teachers to realize that the students see their use of technology in multi-faceted ways. For many, it has become a therapeutic device that they are drawn to in order to calm their nerves and to relieve stress, for others it is a means to play games and have fun with their friends, and for others a way to temporarily disconnect from what is going on around them. Their perspectives reflect what research has to say in relation to the perceived benefits of digital technology in facilitating personal contentment, emotional regulation and expression (Charmaraman, 2017), connectedness to friends and school (Wu *et al.,* 2016) and skill- building (George and Odgers, 2015).

For the more vulnerable students, the use of screens had become a decoy to hide social anxiety and a lack of friendships, and from a student support perspective, this is obviously an issue that needs to be understood and addressed in a delicate manner. Smith et *al*. (2021) have found that technology use can reduce social anxiety by offering safe opportunities for connection and confidence-building for socially anxious students, but Wu *et al.* (2016) indicate that real-life social skills are still a necessary foundation to be able to use technology in a beneficial way. As a consequence, understanding the need for both, on the part of anxious students, in particular, highlights the need to support students in the development of technology-based connectivity skills alongside skills that are conducive to in-person interactions.

The importance of recognizing that students' natural dispositions play a role in their use of digital technology is important, especially when it comes to the use of laptops for the regulation of stress. As research indicates, individuals with a high preference for aloneness, gravitate to screens in order to reduce symptoms of stress (Leung, 2015), indicating that dispositions, such as introversion and extraversion may inform the use of the use of devices during breaks. This raises the point about balance, and the need for students to have a choice, especially considering the fact that low levels of access to technology can cause anxiety (Dienlin & Johannes, 2020) whereas moderate access could enable students to cope better with life stressors (Cheever *et al*., 2014) (Modecki, 2021). This is an important point to remember before instituting change.

Whilst honouring the complicated role of the use of laptops on student wellbeing, it was clear from the results of this study that a number of students, approximately twenty-five percent, were overusing their laptops during break-times. The issue involved boys, for the most part, and they primarily spent their time playing games, to the detriment of getting outside, to eating, or to getting physical exercise, in a number of cases. The fact that the more prolific indoor laptop users were boys reflects research findings (Ekinchi *et al.*, 2019), and, not surprisingly, the recommendations to address gaming addiction is to provide opportunities for outdoor activities and sports (Hazar & Hazar, 2018). Indeed, young people who spend time outside, and play sports regularly, are less likely to become addicted to digital use, in the first place (Ekinchi *et al.*, 2019). This raised important questions for the school with regards to

how it could better facilitate access to physical activities for students during lunch and break-times, and how to address the logistical issues that were causing students difficulty in getting outside.

The fact that a number of students were consciously aware of their addiction to devices, and the fact that they were visibly concerned about it was revealing, and this is a cautionary point for schools contemplating the unregulated use of digital technology during break-times. Even though gaming addiction may occur due to complex socio-psychological factors (Dienlin & Johannes, 2020), it does not diminish the point that the regulation of devices and time spent outside has a positive balancing effect. The emergence of a *fear-of-the-outside* on the part of a number of the boys who were gaming, was particularly interesting, especially given that this is a trend that has been observed in a Canadian study which found that more young people prefer to stay indoors due to the fact that they view the outdoors as unsafe (Michaelson *et al*., 2020).

When young people are encouraged to disconnect, however, and go outside, this fear fades, and they experience a greater sense of contentment and wellbeing. It is clear, however, that a number of the students in this study need support and guidance with reacquainting themselves with the outdoor areas, and with a range of activities that encourage physical activity and in-person social interaction with their peers. The upside of these options would not just address physical activity needs (Carron *et al*., 2003), but it could also lead to a reduction in mental fatigue (Mason *et al*., 2022), and an increase in a sense of belonging (Hazar *et al.*, 2017).

Conclusion

This study enabled this group of Year 1 students to critically reflect on their use of screen-based technology during breaks and lunchtime. An exploration of their perspectives indicates that technology use during breaks can have either positive or negative impacts on their wellbeing, depending on what the laptops are being used for, how regularly they are being used, and whether the students are adopting a balanced approach to their use. Overall, it is clear that the unregulated use of laptops had become a problem for a number of students due to the expansion of the school, due to addictive tendencies, and due to a lack of awareness on how to address technology related concerns by themselves. The majority of students were keen to see a change to current levels of access and practices, and they were motivated to find concrete solutions to the issue. Their perspectives and involvement led to a follow up inquiry involving a focus group of students, teachers and administrators and the use of the design cycle to generate workable solutions on a systemic level. Overall, there are positive pointers, here, for the benefit of open and transparent conversations with middle school students surrounding their use of screen-based technology during downtime periods at school.

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Educators' Perspectives of Emotional Support in South African Schools Amid COVID-19

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Abstract
The COVID-19 pandemic disruption in South Africa resulted in the Department of Basic Education (DOE) implementing measures to salvage teaching and learning in primary and secondary schools. While these measures are critical to strengthen teaching and learning in schools, the emotional well-being of educators who are drivers of teaching and learning are given less attention which can have serious consequences on the well-being the learners they are teaching. Evidence suggests that educators who lack intrapersonal, interpersonal and stress management skills or have not been developed to acquire these skills can impact negatively on learning and the overall emotional and social competence of their learners. Within this context, this study explored the primary educators' perceptions on the effects of the pandemic on the emotional well being and emotional support provided by the DOE. Conservation of Resources (COR) Theory informed this study. A case study was conducted using semi structured interviews. Overall, 30 educators were sampled as participants using a purposive sampling technique. All interviews were recorded, transcribed verbatim, and analyzed for thematic contents using the thematic content analysis framework. The findings revealed that the DOE gave minimal emotional support to educators and instead increased their stress levels. It is recommended that the DOE should address the emotional development for primary educators focusing on stress management and intrapersonal skills to ensure the improved quality of teaching.

Keywords: Emotional Support, Conservation of Resources Theory, Stress Management, Intrapersonal Skills, Educators

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Introduction and Background

The COVID-19 pandemic disruption in is a global phenomenon that forced most countries to shift their education systems in order to combat the risks brought by the disruption. In South Africa the disruption also resulted in the Department of Basic Education implementing measures such as, modification of the curriculum and transition to online teaching, using radio and TV programmes to salvage teaching and learning in both primary and secondary schools. While these measures were implemented the role of educators also changed and extended. The educators' role also expanded to that of an academic and non-academic support. Part of this nonacademic support role involves providing social and emotional support to students (Philipo, 2009). The change and expansion of the role of educators brought by COVID-19 increased rates in teachers' stress and burnout. In most countries including South Africa, educators were called upon to support students' academic development and well-being throughout this shift, while also navigating adversity and stress in their own lives (Collie, 2020). These, as (Ransford, 2010) alluded, can in turn significantly influence educators' effectiveness.

Furthermore, while the measures to combat the effects of COVID-19 are critical to strengthen teaching and learning in schools, the emotional well-being of educators who are drivers of teaching and learning are given less attention which can have serious consequences on the well-being the learners they are teaching. More so, in South Africa the context of which this study was located, many primary school educators have not had the benefit of being trained or developed emotionally (Engelbrecht, 2004). Evidence suggests that educators who lack intrapersonal, interpersonal and stress management skills or have not been trained or developed to acquire these skills can impact negatively on learning and the overall emotional and social competence of their learners (Clipa, 2017).

Various studies examined and reported on the effects of COVID-19 with regard to teaching and learning and professional life of educators globally (Kaden, 2020; Ashbury & Kim 2020) thus providing insight into how the pandemic affected the Educational environment. However there are few studies on effects of the pandemic on the emotional well-being of educators and emotional support provided by the Educational Departments. This study made an effort to close the gap by examining primary school educators 'perceptions on the effects of the pandemic on the emotional well-being and emotional support provided by the Educational Department in one Province in South Africa.

Studies on how COVID-19 affected the emotional well-being mostly focused on students and parents and not educators. The study by Ozer (2020) provided insight into how the Turkish government established a psycho-social support system involving specific helpline and guides in order cope with the negative psychological effects of COVID-19. The psycho-social support focused on students and parents. The support involved psychological counselors responding to the helpline calls to help the students and parents to cope with undesirable effects of COVID-19.

Although the study by Groarke, et al.(2020) focused on emotional well being of people in general, its findings suggested that supportive interventions should prioritize younger people and those with mental health symptoms leaving. Educators also grapple with issues of trauma, grief and loss in both their professional and personal lives that affect their emotional well-being negatively. This indicates that educator emotional well-being also needs attention, to improve school performance. Konu, Viitanen, and Lintonen (2010) as cited by Simmomns, et

al., (2019) emphasized that without teachers' well-being it is hard to build up students' well-being." Thus its vital to provide emotional support to educators.

Emotional Support and Social Support

Emotional support can be defined as the verbal and nonverbal processes by which one communicates care and concern for another, offering reassurance, empathy, comfort, and acceptance. It may be a major factor contributing to the effectiveness of self-help groups, within which members both provide and receive emotional support, and to attachment, in which the caregiver provides emotional support to the child. (APA Dictionary of Psychology). House, et al., (1988) classifies emotional support as a component of social support. Social support involves other categories such as informational, and tangible support. Social support may be regarded as resources provided by others, as coping assistance or as an exchange of resources (House, et al.,1988). Moreover, informational support involves support in the form of advice-giving, or in gathering and sharing information that can help people know of potential next steps that may work well. Tangible support includes taking on responsibilities for someone else so they can deal with a problem or in other ways taking an active stance to help someone manage a problem they're experiencing. These social support categories were necessary for providing insight into emotional support in this paper.

Theoretical Framework

In understanding the effects of COVID-19 on the emotional well-being of educators and emotional support given to educators during COVID-19, the study utilized the Conservation of Resources (COR) theory as a lens. COR theory is both a stress and motivational theory that outlines how individuals and organizations are likely to be impacted by stressful circumstances, what those stressful circumstances are likely to be, and how individuals and organizations act in order to garner and protect their resources. The COR theory postulates that stress is likely to occur when individual resources are threatened, when resources are lost and when individuals invests resources and do not recap the anticipated rate of return (Hobfoll & Shirom, 1988).

Individual studies and meta analyses have found COR theory to be a major explanatory model for understanding the stress process at work. Applications of COR theory to burnout, respite, and preventive intervention were detailed. Studies have shown that resource loss is a critical component of the stress process in organizations and that limiting resource loss is a key to successful prevention and post-stress intervention (Westman, et al., (2004). In the context of this study the primary educators had to make a rapid transition from normal to multi-modal teaching. There are individual resources that were threatened and lost due to COVID-19 that caused stress. Understanding primary educators' perceptions of the effects COVID-19 had on their emotional well-being and the emotional support given to them justify the relevancy of the COR theory for this study.

Principles of the COR Theory

Principle 1. The primacy of resource loss

The primacy of resource loss is based on the notion that that resource loss is disproportionately more salient than resource gain (Hobfoll,2012). Simply put, it is psychologically more harmful for individuals to lose resources than it is helpful for them to

gain the resources that they lost (Halbesleben, et al., 2014). This principle as Halbesleben, et al., (2014) assert, has several important implications. It suggests that losses at work will have more impact than similarly valued gains (e.g., a loss of pay will be more harmful than the same gain in pay would have been helpful). It also suggests that employment-related resource gains will take on greater meaning in the context of resource losses.

Principle 2. Resource Investment

The second principle of COR theory is that people must invest resources in order to protect against resource loss, recover from losses, and gain resources. These two principles, then lead to 3 major corollaries of COR theory and one critical finding that has emerged from the literature and which follows from these 3 corollaries.

Corollary 1. Those with greater resources are less vulnerable to resource loss and more capable of orchestrating resource gain. Conversely, those with fewer resources are more vulnerable to resource loss and less capable of resource gain.

Corollary 2. of COR theory states that those who lack resources are not only more vulnerable to resource loss, but that initial loss begets future loss. This is a critical aspect of the theory, because it predicts that loss cycles will occur quickly and powerfully. Further, at each iteration of loss in the sequence, the cycle will gain in strength and momentum.

Corollary 3. Mirrors corollary 2, stating that those who possess resources are more capable of gain, and that initial resource gain begets further gain. However, because loss is more potent than gain, loss cycles will have more impact and more accelerated than gain cycles.

Finally, it both follows theoretically, due to the lifelong nature of loss and gain cycles across people's lifespans, that resources (or their lack) tend to aggregate in what we have come to call resource caravans. Thus, resources aggregate in resource caravans in both an immediate and a life-span sense.

Research Aim and Research Questions

The aim of this research was to examine the educators' perceptions on the emotional support amid COVID-19
This research addressed the following questions:

- What are the educators' perception of the effects of COVID-19 on their emotional well-being?
- How do primary school educators perceive the emotional support amid COVID-19?

Research Methodology

The study adopted the qualitative case study design with an aim to provide an in-depth understanding about the impact COVID-19 had on educators' emotional wellbeing and support measures provided by the department of education In South Africa (Creswell, 2010). The study also adopted an interpretive paradigm in order for researcher to understand the individual primary school educators and their interpretation of the world around them (Cohen, Manion & Morrison., 2007). The interpretive paradigm also enabled researchers remain within the boundaries of the "frame" to cover the main features of the research design

Sampling

Non-probability sampling in the form of purposive sampling was used to select 30 educators as participants for this study. For the purpose of this study I employed purposeful sampling, as it is appropriate to research where the investigator wants to discover, understand and gain insight and therefore must select a sample from which the most can be learned (Merriam, 2017).

Data collection Instruments procedures and analysis

Data collection instruments involved semi-structured interviews. Educators who teach in the primary schools, were asked to participate in the interview after they had been given information about the study. I used probes to provide a better understanding and obtain deeper information about the effects of the pandemic on educators' emotional well-being and emotional support they received from the DoE. Interviews were conducted over a period of four weeks. Adhering to the COVID-19 protocol educators were invited for telephonic interviews through emails. All participants were assured of strictest confidentiality and that the information they provided would not be divulged to anyone. Each interview was recorded and lasted from 30 to 40 minutes. Thematic analysis as suggested by Creswell (2012) was used in analyzing data for this study. Data were organized and categorized into themes and interpreted accordingly.

Results And Discussion

In examining the educators' perceptions of the effects of COVID-19 on their emotional well-being, it emerged that loss of professional socialization and support, strained professional relationship and anxiety and fear were themes identified from the data analysis.

Firstly the results revealed that educators perceived COVID-19 as having contributed to their loss of professional socialization and support. This loss was as a result of isolation or quarantine and loneliness leading to their emotional well-being being negatively affected. During COVID-19, educators' work routine was disrupted as they had to adapt to rotational system of teaching leading to any form of socialization they had with colleagues diminishing. Furthermore, the encouragement they received when engaging with one another during their planning meetings also decreased leading to stress and burnout. Losing resources such as these as COR theory indicate, became more psychological harmful to these educators .

Secondly the results showed that the pandemic contributed to strained professional relationships._The strained relationships were as a result of school leaders' inability to provide emotional support to colleagues with comorbidities during COVID-19. Educators also perceived the inability of the school leaders to provide emotional support as emanating from their lack of skills. The pandemic brought sudden change in the educational landscape that forced schools to adapt teaching and learning to accommodate the new normal. This exerted pressure on both school leaders and educators to salvage the curriculum. Consequently leading to fear and anxieties they could not managed.

Thirdly, the results indicated that COVID-19, brought fear, panic and anxiety in the teaching and learning environment both to learners and educators. There was a lot of uncertainty as some educators tested positive and nobody knew by then who is next. However as educators they needed to support their learners and one another emotional during these difficult times.

The pandemic has caused substantial stress and anxiety for primary school educators and that mental health and emotional well being impacted their engagement with their learners.

In examining how primary school educators perceive the emotional support in schools amid COVID-19, it appeared that there was inadequate emotional support for educators while substantial informational and instrumentation support were provided.. The results revealed that prior COVID-19 other colleagues and school management teams were sources of emotional support to primary educators in schools. However, amid the COVID-19 these emotional support sources diminished. The expressions of empathy, love trust and care that symbolizes emotional support became inadequate as school management teams were unable to support colleagues with comorbidities. Pandemic brought sudden change in the educational landscape that forced schools management teams to place more work load on the shoulders of colleagues including those with comorbidities in a bid to adapt teaching and learning to salvage the curriculum. Educators also perceived the inability of the school leaders to provide emotional support emanates from their lack of stress management and intrapersonal skills. The school management teams as well as educators lack these skills because they were never developed or trained.

It was also noted that other than emotional support schools were provided with substantial informational support by the Department of Education. Informational support involved offering advice on how to approach a problem as well as useful information and direction (House, 1981). In this study informational support was in the form of the helpline desk and pamphlets distributed in most schools. However informational support may not be useful in and of itself; instead, it helps individuals help themselves (House, 1981). The results in this study revealed that instrumental support consisted of offering tangible assistance or concrete help such as masks and sanitizers tanks stations placed in most of the schools for educators and learners to use in adherence to the COVID-19 protocol.

Based on the aforementioned results, emotional support in South African schools amid COVID-19 seemed to be lacking confirming the view that educators emotional well-being is often neglected. This is corroborated by Sayed, et al,(2021) whose research revealed that educators were also not provided with sufficient psycho-social support to manage their own pandemic-related anxieties. Teachers are a vulnerable population requiring support mechanisms to support both the cognitive and non-cognitive elements of their work.

According to the COR theory, when individuals loses resources at work they are more likely to experience strain in the form of burnout (Hobfoll, 2014). It was noted that educators in this study experienced loss at work in the form of loss of socializing with colleagues (resources) due to isolation or loneliness which in turn impacted negatively on their emotional well-being. Educators also experienced loss in the form of strained professional relationships. The loss of socializing with colleagues and strained professional relationship represent lack of emotional support. According to the COR theory, these are seen valuable resources As the COR theory postulates, when individuals loses resources at work they are more likely to experience strain in the form of burnout and physiological burnout.

Revisiting Principle 1 of the COR theory, which entails The Primacy of Resource Loss, it is noted that insufficient emotional support had greater impact on the educators stress level and the overall emotional well-being. Moreover, resource gains are seen as acquiring their saliency in light of loss which implies that in the context of resource loss, resource gains become more significant. In this study the gain become more significant in the recognition

that the pandemic has caused substantial stress and anxiety for primary educators in schools and that lack of emotional support impacts on the educators' emotional well-being and ultimately their engagement with their learners. Consequently recognizing human value in the form of compassion and care.

Implications and Recommendations

The responses of the participants and the findings of this research showed that were not provided with emotional support during COVID-19 informational and instrumental support was provided instead. It was also determined that the existing developments within the education system are not supporting or developing teachers' stress management, nor intrapersonal skills but are focused on curriculum delivery. The Educational Department should introduce professional development training programmes that equip educators with stress management, intrapersonal and interpersonal skills for resilience and healthy emotional well-being for themselves and their learners. It is recommended that the role of mentoring and coaching in supporting the holistic well-being and ongoing learning and development of educators should be considered. Furthermore Schools should review the role of school based support teams meant only for learners. School based support teams should also be established within schools for both learners and educators..

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Abstract
Through AI modeling work done with Otermans Institute, Dev Aditya has built several conversational AI-driven virtual teachers, some as Bots and some using humanlike form through technologies like deepfake, to provide one-to-one teaching and training to some of the most underserved learners in society. His first major humanlike prototype, OI AI, was a virtual teacher and trainer built to interact with and teach almost anyone globally. The first version of the virtual trainer was tested in a UNHCR BCF camp in Kurdistan, Iraq. Preliminary results have shown that this virtual trainer can provide continuous upskilling for such learners and has been considered to be warm and humanlike by its users. With smartphone and internet penetration now increasing in such camps, the potential of it upskilling internally displaced and refugee learners is massive especially when over 500 million people are displaced by either violence or war globally. This presentation will discuss this study briefly, its preliminary findings, and the next steps that have included teaching 5,000 such learners by embedding his latest model OTTO to the virtual teacher, which can generate questions, grade answers given by users, and create study summaries from any learning content given to it in close to real-time.

Keywords: Artificial Intelligence, Virtual Teacher, Upskilling

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Introduction

Otermans Institute (OI) is a global company upskilling unserved and underserved populations with the vision of upskilling a generation and make them employable. OI is providing a possible and likely solution physically, digitally and using AI. From remote schools, foundation-run organisations to United Nations camps in Iraq, OI has supported over 30,000 underserved learners to date. OI is aiming to upskill a vast number of learners by 2025 to make them more employable. The world has a shortage of teachers and millions of children do not have access to high-quality education especially in underdeveloped and developing countries. In addition, one billion young people will join the workforce in underdeveloped & developing countries by 2030 (Cann, 2020). In more detail, 520 million people are affected by violence, war or disaster and unable to skill themselves with 71 million displaced (United Nations, 2019). Furthermore, 1 million learners turn 18 every month in India without employability & transferable skills training (O'Connor, 2016) & 400 million young people in the MENA region will likely not have transferable skills training in the next two decades (WGBC, 2019). To solve this problem, and to be able to give everyone access to good, appropriate education, OI has created a conversational AI virtual trainer that can upskill learners at scale in their own time and based around individual learning and training needs. This solution called OI AI will offer a conversational AI virtual trainer providing continuous upskilling for such learners. With smart phone and internet access now increasing in such camps, the potential of it upskilling internally displaced people and refugee learners is massive especially when millions of people are displaced by violence or war globally. We conducted a usability study to evaluate the humanness of the virtual trainer.

Methods

Participants

This study was a pilot study. The study and the lesson were conducted in English, however English is not the participants' first language. A total of four participants who lived in a United Nations Refugee camp in Iraq took part in the study. The study received Ethical approval by the College of Health, Medicine and Life Sciences Research Ethics Committee at authors' institution. OI has provided weekly digital lessons via Zoom to the learners in the camp and therefore access to participants was not an issue.

Materials

The conversational AI Virtual Trainer

The conversational AI virtual trainer was developed using Deepfake which is a fake video created using digital software, machine learning and face swopping and two iterations were conducted. The first iteration had a structured dialogue flow which designed the lesson revision structure from start to finish. Once this was tested and a smooth dialogue flow was established, a separate open domain dataset was added to build conversational ability to address questions and comments from students that were outside the dialogue flow. The second iteration used unsupervised techniques including Natural Language Understanding (NLU) and CORE to handle intents and entities which are structured pieces of information inside a user message displayed in Figure 1.

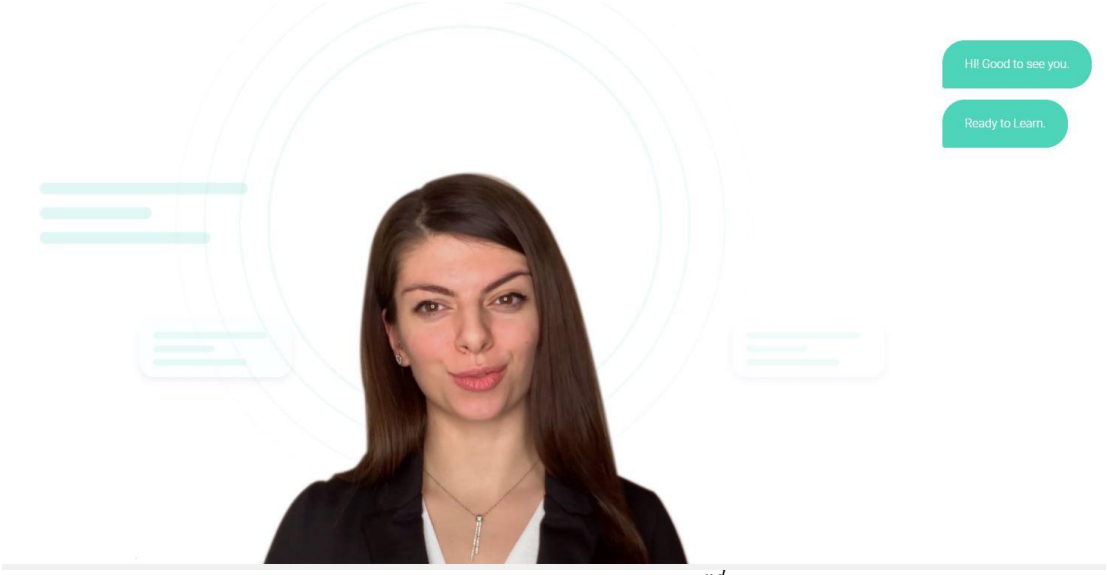

Figure 1. Virtual Trainer (2nd Iteration).

The virtual teacher (from now referred to as "she") was programmed to greet users and ask them if they were happy to begin learning. If users interacted with her without starting the learning process, she interacted with them like answering their questions and prompted them to start the lesson. Once the user started learning and the learning mode was enabled, she started the lesson. The lesson was on 'Setting Goals' using SMART. She started by asking learners about what they thought goals were and moved onto asking them about each element of SMART: Specific, Measurable, Achievable, Realistic and Time-bound. Once the lesson ended, she gave an overview of the correct answers.

Due to low academic and English spoken abilities of the users, as they have been displaced from their homes and are non-native English speakers, the probability of them giving incorrect answers to the questions asked by her was high. For this reason, she has been programmed to encourage users when they made mistakes and also to keep focus on the lesson until it is completed. These encouragements can be seen in Figure 2. These encouragements were appreciated by the users as they got excited as soon as they started interacting with her.

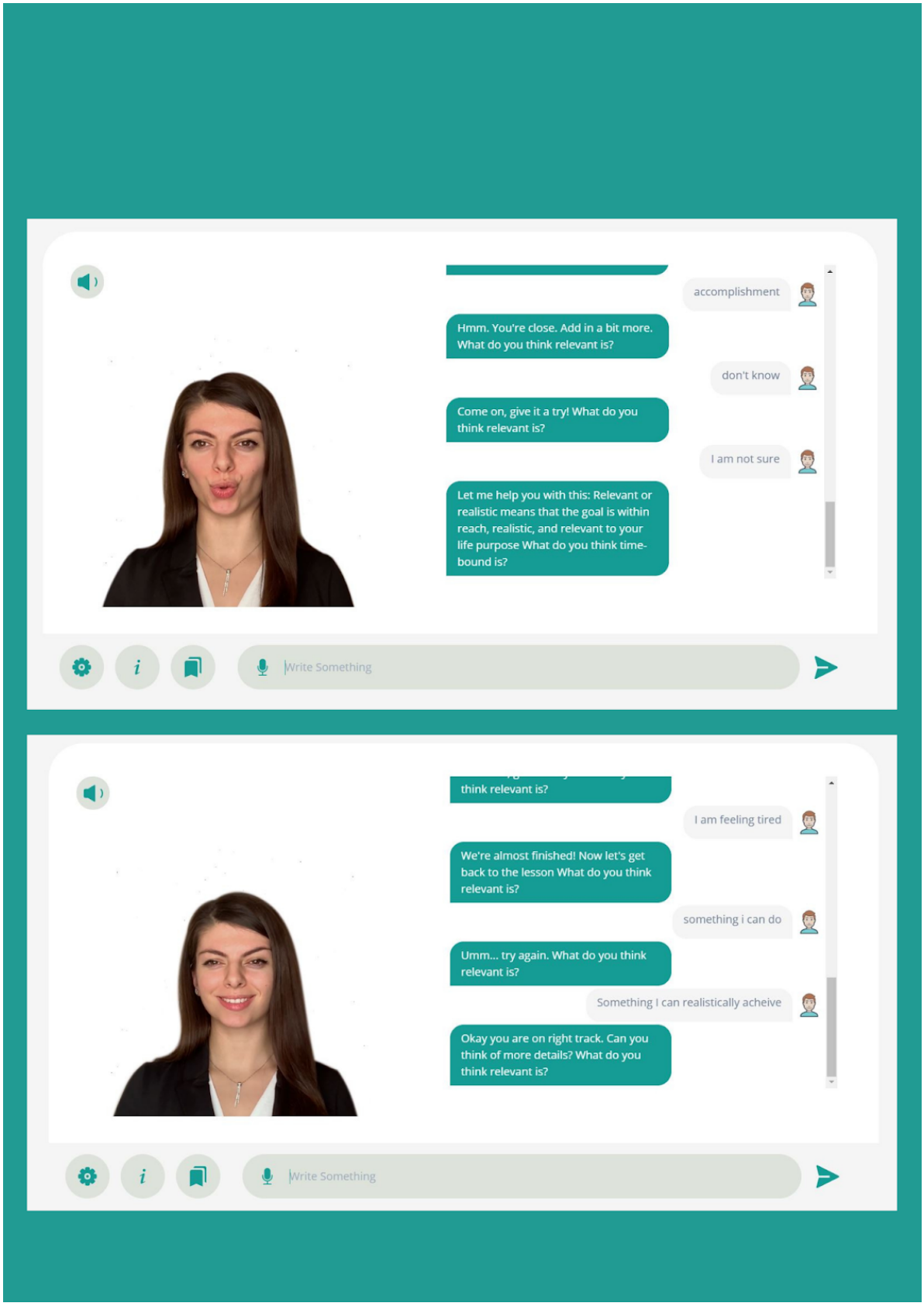

Figure 2. Conversational encouragement example.

Questionnaires

Participants were asked to complete an online survey using Qualtrics consisting of four sections to measure how they perceived the conversational AI virtual trainer.
System Usability Scale. The system usability scale (SUS) was used to assess how 'usable' the conversational AI virtual trainer was (Brooke, 1996). Usability of the conversational AI virtual trainer can be described as how easy to use and understand the receiver perceives the conversational AI virtual trainer. The SUS is a 10-item questionnaire using a 5-point Likert scale for each item that range from (1) 'strongly disagree' to (5) 'strongly agree'. This scale is commonly used to assess the usability of a range of systems. A high numeric value produced by ratings suggests that the system is usable. The benchmark for an unusable system is below 68 and a rating below 50 is cause for concern. Additional questions were added to evaluate the usability of the conversational AI virtual trainer which included:

a) To what extent do you think the virtual trainer is understandable from a trainee perspective?
b) How easy do you think it might be to use this virtual trainer in the future?

Question a) was rated on a 5-point Likert scale ranging from (1) 'very difficult to understand' to (5) 'very easy to understand'. Question b) was rated on a 5-point Likert scale ranging from (1) 'very difficult' to (5) 'very easy to use' in the future.

Competence and Warmth Scales. The competence and warmth scale (CSW) was used to investigate whether the participants thought that the conversational AI virtual trainer was both competent and warm (Fiske, 2012). The competence and warmth scale contains of 9 items where 5 items measure competence (competent, confident, independent, competitive and intelligent) and 4 items which measure warmth (tolerant, warm, good natured and sincere). The higher the score the higher the rated competence or warmth.

Social Attractiveness and Trustworthiness. The Social Attractiveness and Trustworthiness scale (SATS) was used to measure the participants perception of the conversational AI virtual trainer's social attractiveness and trustworthiness (Nass, 2000). The scale is comprised of 6 items 4 of which relate to social attractiveness (likeable, sociable, pleasant and friendly) and 2 of which relate to trustworthiness (trustworthy and reliable). The higher the score the higher the rated social attractiveness or trustworthiness.

Social Presence Measure. The Social Presence Measure (SPM) was used to investigate how users perceived the conversational AI virtual trainers' social presence following an interaction (Li, Kizilcec, Bailenson, & Ju, 2015). The scale is comprised of 5 items each are rated on a 5-point Likert scale ranging from (1) 'not at all' to (5) 'very strong'. The higher the score the higher the rated social presence.

Procedure

On the day, users were given a simple lesson on 'What are SMART goals?' by a member of the OI team which lasted 30 minutes. An extra 15 minutes were given to account for set-up, connection issues. The learning outcomes of the session was to get students to understand what goals are, understand the importance of setting goals, understand what SMART goals are, and be able to set their own SMART goals.

Following this session on goals, participants were given the opportunity to engage with the conversational AI virtual trainer whereby she would ask students questions which pertained to the lesson for 20 minutes. Following this, participants were sent a link to Qualtrics which contained a participant information sheet and were given the opportunity to ask questions before the consent form was signed; all participants gave consent to take part in the study. Then, participants filled in the questionnaires in the following order: SUS, CSW, SATS and SPM. Finally, participants were given a debrief and were thanked for their participation in the study.

Results

Results from the SUS showed that the users found the conversational AI virtual trainer was below benchmark, set at 68, for the usability of a program. However in relation to the other scales (CSW, SATS and SPM), the users found the conversational AI virtual trainer to competent, tolerant, have a sense of social presence when interacting with the conversational AI virtual trainer and found the trainer to be trustworthy. The results for all users can be seen in Table 1 below.

Table 1. User Evaluation of Conversational AI Virtual Trainer.

	Usability	Competence	Tolerance	Social Presence	Trustworthiness	Social Attractiveness
User 1	62.50	25	20	18	11	17
User 2	35	25	20	21	10	15
User 3	62.50	25	19	20	20	26
User 4	62.50	25	20	21	10	15

Participants also expressed that they found the conversational AI virtual trainer difficult to understand (2 users), better to understand (1 user) and easy to understand (1 user). In addition, users expressed that they found the conversational AI virtual trainer difficult to use (2 users), okay to use (1 user) and easy to use (1 user). When they were asked how likely they were to use the conversational AI virtual trainer again participants expressed that they were unlikely to use this again (1 user), neutral (1 user) and were likely to use this again (2 users).

Discussion

The aim of this user study was to evaluate how users perceived our conversational AI virtual trainer which will facilitate further development to provide unsupervised teaching to underserved learners globally. Overall, users reported positive feelings after being introduced to the conversational AI virtual trainer. The results showed that users found the conversational AI virtual trainer to be trustworthy, socially attractive, demonstrates a sense of social presence, tolerable and competent. However, they found the usability of the conversational AI virtual trainer to be the only limitation, which could be due to some some language barriers. Using Deepfake in the conversational virtual teacher was very successful as participants reported the conversational AI virtual trainer as socially present, trustworthy and socially attractive.

There were some limitations of the current study. Th user evaluation was conducted using an online survey only which means there is an absence of (non)verbal communication. Future work could conduct a focus group to gather information about the perceptions of the conversational AI virtual trainer for a deeper understanding. This user study was the first of

many in the development of the conversational AI virtual trainer that meets individual user's needs.

Future research will also explore the usability of our conversational virtual teacher with a different group of users. Currently, conversations are ongoing to conduct a similar study with 50 underserved learners in India.

Finally, work is ongoing to implement additional features in the design of the virtual teacher. This includes generating questions, grading answers given by users, and creating study summaries from any learning content given to it in close to real-time. Once this has been implemented, the aim is to test this revision tool with 5,000 users.

Conclusion

OI has a vision to promote access to learning in underserved countries and communities. To achieve this vision, a conversational AI virtual trainer has been developed to equip such global with employability skills. The aim of this study was to evaluate this conversational AI virtual trainer from four users in a UN refugee camp in Iraq. The users expressed that the conversational AI virtual trainer was socially attractive, warm, competent, trustworthy, tolerant and socially present. However, the usability of the conversational AI virtual trainer will need to be improved. Future work could investigate this further using focus groups or interviews to explore the usability of the conversational AI virtual trainer with detailed questions and conversations with the users. The implications of this work are important to upskill a generation of learners globally.

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Providing 12-17 Week Transferable and Employability Skills to 30,000 Underserved Learners Across 8 Countries – A Truly Cross Border System

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Abstract
Otermans Institute (OI) is a global micro-organisation upskilling unserved and underserved populations globally with the mission of making them employable. Currently working in more than eight countries, supported by UKRI grant funding, and having worked with governments of 3 nations, it is providing its pedagogy and training digitally to underserved and rural learners. OI aims to upskill 750 million learners, mostly rural, by 2025 and its delivery has proven successful in 3 continents which makes it truly cross border effective. From remote schools to foundation-run organisations to UNHCR supported camps in Iraq, 0I has supported over 35,000 unserved learners to date. Through immersive research across 3,200 kilometers in South Asia, 0I developed a blanket curriculum and teaching & training method that can upskill 200 million learners just in India today. The same system can be replicated in other Southern Asian countries and was deployed in Pakistan, Afghanistan, Bangladesh, Nepal, and Sri Lanka where 80 million other students can benefit immediately. Currently, this system has been taken by governments in India, by the Department of Works and Pensions in the United Kingdom and was taken by the Technical Education Department of the Government of Afghanistan before the government fell. The original methodology of the research and curriculum development will be presented in the talk along with the latest results of its delivery with two separate rural cohorts from South Asia which was delivered in partnership with UNICEF.

Keywords: Upskilling, Underserved and Unserved Communities, Global Curriculum, Employability Skills, Transferable Skills

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Introduction

Otermans Institute (OI) is a global company upskilling unserved and underserved populations with the vision of upskilling a generation and make them employable. Through immense research both in the literature as well as field trips to South East Asia, we identified that there is a skills gap which is the difference between the skills required for a job and the skills employees/graduates actually possess. In other words, there is a disconnect between the expectations of employers of the skills graduates have and the skills graduates have gained during their degree. Reducing the global skills and employability gap has been a challenge for social innovation for many decades. Whilst significant progress has been made, over 750 million potential learners still lack access to basic transferable and employability skills training which leads to unemployment or low-income employment all over the developing world (Mansour and Dean, 2016). In addition, across 10 countries in Asia and Africa, we have seen there is no soft skills and transferable skills training from a formative age which is making their young populations unemployable in Industrial Revolution 4.0.

OI is providing a possible and likely solution physically, digitally and using AI. From remote schools, foundation-run organisations to United Nations camps in Iraq, OI has supported over 30,000 underserved learners to date. OI is aiming to upskill a vast number of learners by 2025 to make them more employable. This paper describes the development and implementation of our blanket employability curriculum to upskill millions of learners.

Our research consisted of four stages (Figure 1):
1. We went to many different places mainly in South East Asia and observed classrooms and we spoke to teachers in a focus-group style to discuss their opninios and views on skills development of their learners.
2. We taught students ourselves in different school settings in South East Asia to find out the status quo.
3. We use research and best teaching practices from the UK such as team-based style learning, project-based learning, and interactive teaching and learning.
4. We gathered insights from governments and NGOs.

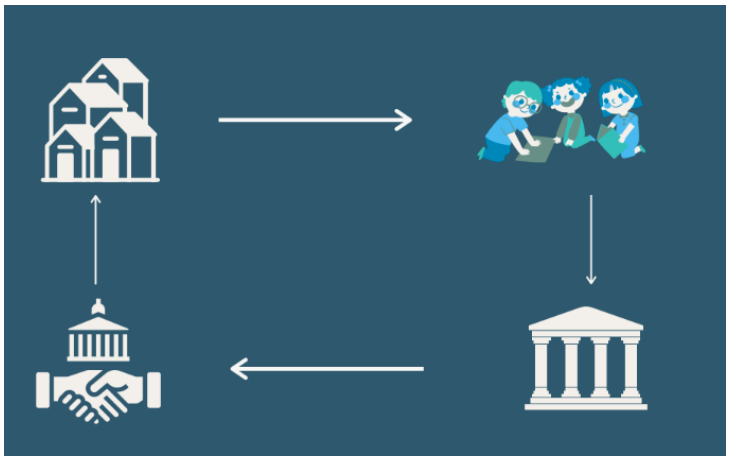

Figure 1: Our immersive research.

Based on immersive research, we developed our global blanket employability curriculum. This curriculum consists of weekly online lessons over Zoom with learners. Learners can come from a variety of different countries but are coming from underserved and unserved populations/communities.

Method

In order to test the effectiveness and success of our blanket employability curriculum we collected and analyzed data. Our data collection using a triangular method (Figure 2):
1. Learner feedback: This was collected regularly via an online survey at the end of lessons.
2. Trainer feedback: This was collected after each lesson via an online survey.
3. Independent observer: This is data from our independent observer who pops in and out of the different breakout rooms to observe the lessons.
For the purpose of this paper, we focus on the data collected in the following countries to test the effectiveness of our employability curriculum:
a. Afghanistan and UN camps in Iraq (underdeveloped communities)
b. Remote schools in Pakistan and Sri Lanka (developing communities)
c. NEET learners in the UK (developed communities)

Figure 2: Our methods

Results

Learner feedback:
Results from the learner feedback showed that i) learners across the different countries now understand more about transferable skills and ii) that they are very satisfied with the programme (Figure 3 and 4).

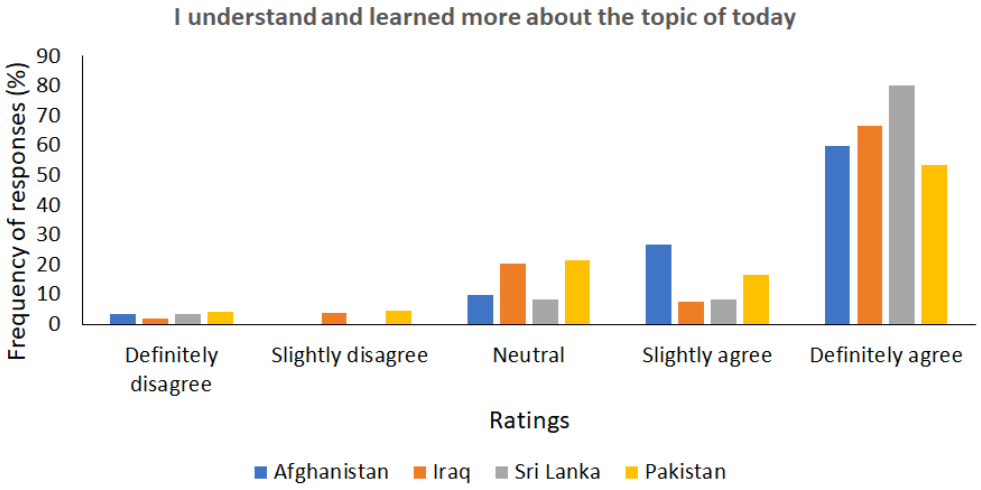

Figure 3: Learner's understanding of the topic.

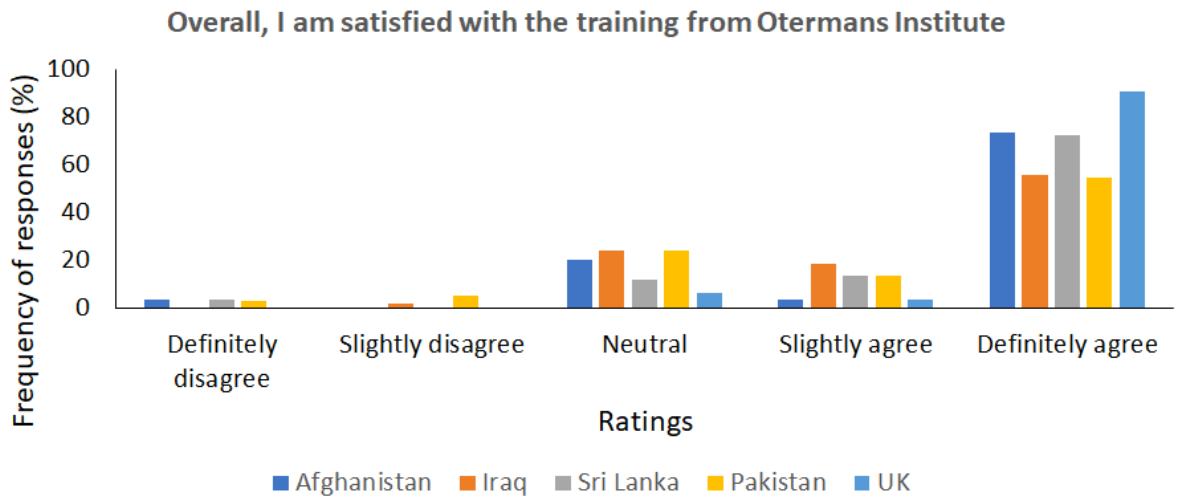

Figure 4: Learners' satisfaction with the programme.

In addition, learners were also asked to describe the programme in one word. Overall, all responses were very positive and learners showed enthusiasm for the programme which main consisted of 'very good', 'excellent', and 'amazing' (Figure 5).

Figure 5: Learners' one word about the programme.

Trainer feedback

Results from the trainer feedback show that teaching our curriculum across borders is effective as trainers reported that i) learners are very engaged (irrespective of background) and ii) the vast majority of lessons went very well (Figures 6 and 7). Trainers reported on a range of activities that worked well during the lessons showcasing the effectiveness of our teaching methodology. Activities that worked best were the quiz at the end of the lesson, interactive activities and discussion (Figure 8).

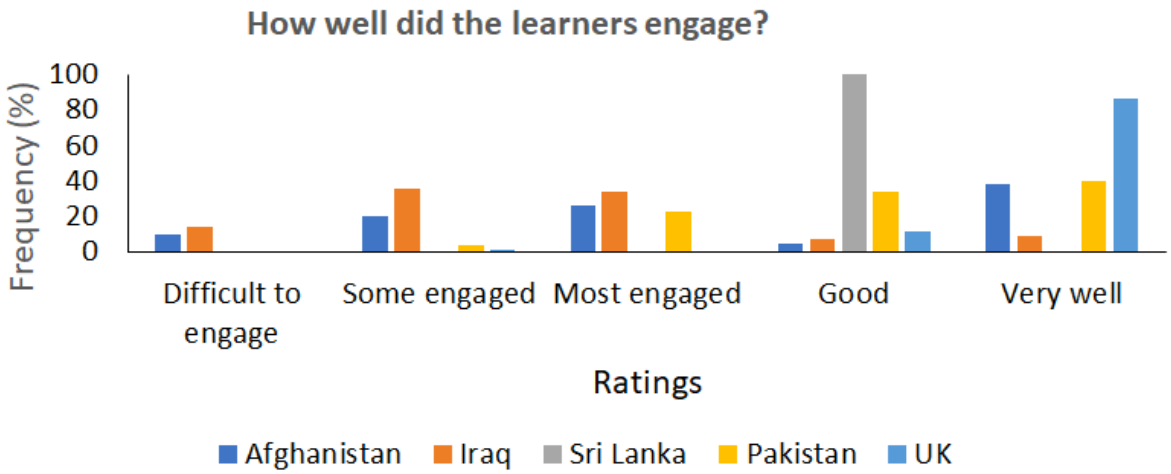

Figure 6: Trainers' feedback on learners' engagement.

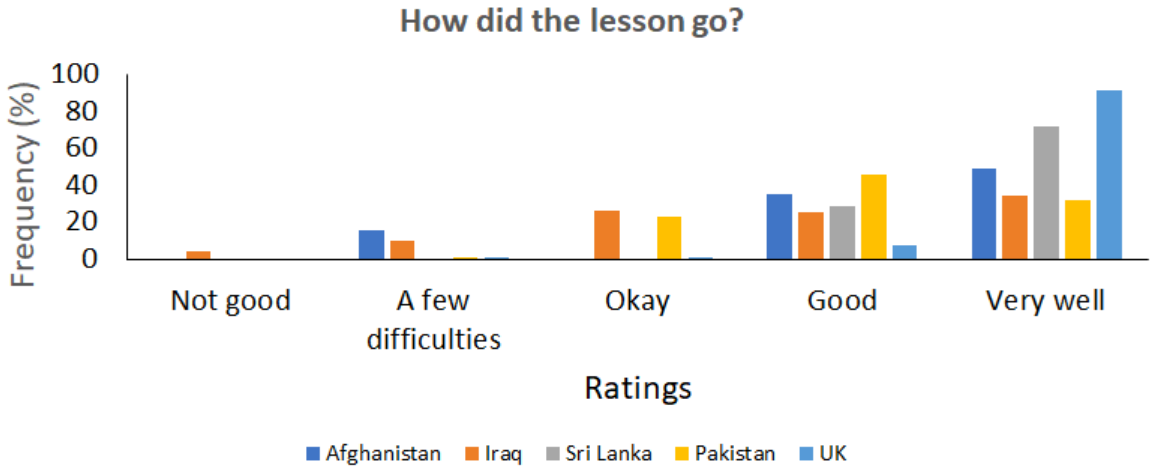

Figure 7: Trainers' feedback on the lessons.

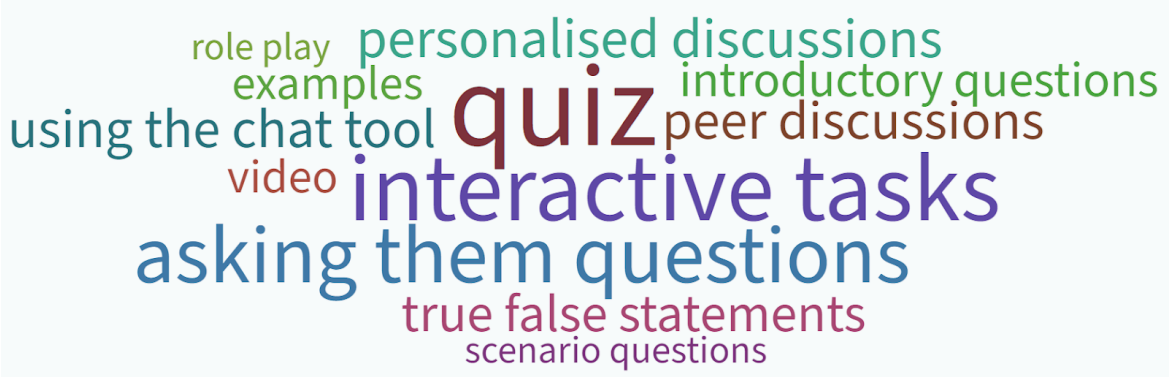

Figure 8: Trainers' responses to activities that went well.

Conclusion

We have supported over 30,000 unserved learners to date ranging from foundation-run organisations in Afghanistan and UN-camps in Iraq (underdeveloped) to remote schools in Pakistan and Sri Lanka (developing), to NEET learners in the UK including with the UK Government (developed). Results show that our employability curriculum and training method is a truly cross-border employability training system.

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Catching Up: An Observational Study of Underserved Primary and Secondary Student Mindsets When Introduced to Educational Robotics

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Abstract
Student attitudes toward STEM subjects decline as they progress through primary and secondary school, making interventions even more critical for students in these age groups. Integrating educational robotics into the classroom has been shown to increase student perceptions of STEM topics while also having many other positive learning benefits such as increased mastery of STEM concepts and STEM degree achievement. Furthermore, research on mindset in school-aged children found that students who held growth mindset beliefs had higher learning outcomes, persistence, and self-esteem compared to students who held fixed mindset beliefs. In this observational study, an educational robotics curriculum was implemented across grades 3–8 in an urban private school consisting primarily of underserved, minority students. The same robotics kit was used across all ages with differentiation in the STEM labs taught to different ages. The technology teacher—the principal investigator for this study—recorded results from a growth mindset survey and journaled about student reactions to the robotics curriculum as the school year progressed. Observations about student prior experience, attitudes, self-beliefs, and mastery are used to draw insights on the effects of educational robotics for underserved student populations. As the body of research on STEM learning through educational robotics expands and robotics increasingly becomes considered a standard in primary and secondary education, it is critical to consider the needs of students encountering robotics for the first time and how to support and grow their attitudes and mindsets.

Keywords: Educational Robotics, STEM learning, Mindset, Resilience, Underserved Students

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Introduction

Educational robotics has become increasingly integrated into primary and secondary school curriculum for its ability to combine science, technology, engineering, and math (STEM) concepts with valuable 21st century skills. Government agencies have focused on the necessity of STEM education for all students as well as the need for interdisciplinary solutions that have real-world applications and combine skills such as critical thinking, communication, and collaboration (National Science Foundation; National Science and Technology Council). A meta-analysis found that educational robotics increased student learning across STEM topics (Bentini). Robotics also helps increase student attitudes and positive perceptions toward STEM learning across a range of ages (Nugent et al., 2010; Robinson, 2005; Rogers & Postmore, 2004). This is especially critical, as students can begin to form negative attitudes toward STEM subjects as early as fourth grade (Unifried et al., 2014). For young students, educational robotics fosters critical thinking and problem-solving skills while also helping to form positive perceptions of STEM topics (Renninger & Hidi, 2011; Wigfield & Cambria, 2010; Tai et al., 2006).

While student perceptions of STEM subjects and educational robotics are valuable for their future interests and success, their beliefs on their *ability* to learn and succeed using educational robotics is also a critical line of research. For several decades, Carol Dweck and colleagues have been studying implicit theories of ability (also called mindset) and how those affect student behavior and outcomes. Dweck (1991) studied children who were presented with a set of questions wherein some were intentionally too difficult for them to solve. The children were identified using two groups (helpless or mastery) based on their reactions to the difficult problems. The children in the helpless category began to describe themselves as failing the task, became pessimistic, and their problem-solving strategies became less sophisticated. They defined themselves as having limited ability. However, the students in the mastery category displayed increased concentration, increased self-talk of instructions and problem-solving strategies, and spoke positively of being able to master the difficult problems. Dweck (1991) proposed these different responses and behaviors from the children were related to their conceptions of their own ability. Students with a fixed mindset believe ability is a static entity and cannot be controlled while those with a growth mindset believe ability can be changed incrementally with effort.

Blackwell et al. (2007) identified that what students believe about their ability corresponded to types of goal setting, approaches to dealing with failure, and responses to challenges. Students with a fixed mindset often have performance goals, believe failure is due to low ability, and develop helpless attitudes when challenged. Students with a growth mindset often have mastery goals, believe effort is worthwhile, and will employ new strategies or increased effort when challenged. Blackwell et al. also identified that middle school students with fixed mindset decreased in math grades over time while students with growth mindset maintained or increased. Dweck (2008) argued that mindset has a relationship with challenge-seeking, resilience, self-regulation, and that mindset can be changed. Researchers have found similar relationships between mindset and self-beliefs and increased achievement (Paunesku et al., 2015; Yeager et al., 2019; Claro et al., 2016).

An educational robotics curriculum using the VEX GO robotic kits was introduced to students ranging from third to eighth grade at a small Catholic school consisting of under-served, minority students. The technology teacher (first author) planned to conduct research on student self-beliefs and attitudes over time, as none of the students had previous

experience with robotics. Through observation and journaling, patterns emerged related to student mindset on ability. This study aims to provide initial findings on mindsets of traditionally underserved students through a brief survey as well as an analysis of the teacher's observations. As studies have found that mindsets are meaningful for minority and low-income students (Aronson et al., 2002; Claro et al., 2016), investigating how the students at STBCA perceive their ability when introduced to educational robotics can provide insights into future practices to benefit students.

Methods

There were a total of 101 students in the third through eighth grade classes at Sister Thea Bowman Catholic Academy (STBCA) in Pittsburgh, Pennsylvania. STBCA is an urban school that receives scholarships through the Extra Mile Foundation and all students are 100% supported by a free/reduced lunch program. All students in this study were African American. In an initiative to better support STEM learning for students, STBCA introduced an educational robotics program. Each grade would receive one hour of robotics instruction each week. Parent/guardian permission was obtained for students to participate in the research project. As none of the students at STBCA had prior experience with robotics, several pre- and post-surveys were planned to measure self-beliefs and perception of STEM topics and robotics. The PERTS growth mindset survey (PERTS, 2015) was distributed part way through the curriculum to gauge student mindsets after initial teacher observations. This instrument, developed at Stanford University, has been shown to have acceptable reliability and validity (Hanson, 2017; Farrington et al., 2012). As part of the research, a journal was kept to record observations of each class, their responses to the robotic curriculum, and notes and relevant quotes from the students.

The VEX GO robotic kits were selected as the robot for Sister Thea Bowman Catholic Academy. The VEX GO robotic kit is a plastic construction set of the beams, pins, plates, sensors, motors, etc needed to build a wide variety of robots. This robotic kit was also beneficial in the use-case at STBCA because the younger students were able to manipulate the plastic pieces with their level of strength and dexterity, while the older students were appropriately challenged through the range of complexity of the robot builds themselves. The kits can also be packed and unpacked, so a single classroom set was used by each class throughout the day. With the robot was also a coding software, VEXcode GO, where students coded certain robot builds to move based on a challenge. While there is a more advanced robot recommended for middle school students, due to no previous experience in robotics and for consistency, the same robotic kit of Vex GO was used for all grades third through eighth.

A full curriculum is included with the VEX GO robot that includes different unit topics with individual STEM labs. The STEM labs are interdisciplinary and align to standards. The teacher created a curriculum plan with a set of STEM labs and activities differentiated by elementary students and middle school students. Some STEM labs were completed by all grade levels, while other labs and activities were completed only by older or younger students based on their level of difficulty. Each grade received a total of 13 weeks of robotics curriculum that included basic builds (following build instructions), creative builds (free-build, student choice), and application builds (interdisciplinary STEM goals).

Results and Discussion

Mindset Survey

The PERTS mindset survey consists of three "fixed-worded" Likert scale questions (PERTS, 2015; Hanson, 2017) that included statements such as, "You can learn new things but you can't really change your intelligence." The responses ranged from "strongly agree" to "strongly disagree" and were coded to numeric values 1 to 6; a lower score indicates fixed mindset (range 3 to 10.5) and a higher score indicates growth mindset (range from 10.5 to 18). Question scores were added for each student, and a mean score calculated for each grade. The results in Table 1 show the number of students and mean results for each grade. No consistent trend in mean mindset score is apparent by grade level. This could be due to the small number of responses by grade. It was also observed that each grade level had unique attitudes depending on the individual students in each class, which is mirrored by the variation in scores here. For instance, the overall growth mindset mean score for the 8th grade students was strongly influenced by a few students with strong growth mindsets. All grades were split between strong to moderate growth and fixed mindset scores, resulting in mean scores near the middle. One interesting case is the fixed mindset score of 8 for the 3rd grade students, however. It is possible that the fixed-worded statements with the Likert scale were difficult for these young students to interpret.

In two studies using this same three question instrument (Blackwell et al., 2007; McCabe et al., 2020), the mean mindset score was reported as 13.35 (their original mean was 4.45, as it was divided by the number of questions). The mean mindset scores are lower across all grades and in four of six grades, the mean is fixed mindset instead of growth mindset. While the limitation of these results is the small number of students in each grade, the results indicate that a fixed mindset is more prevalent in this sample of students.

	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
n	12	15	13	17	9	14
Mindset Mean	8	10.2	10.3	13.2	9.4	11.5

Table 1. Mean mindset scores by grade.

Observations

Introduction to Robotics

All grade levels were introduced to robotics at the most basic level with a simple robot that followed step-by-step build instructions. Choosing a simple build was intended to ensure success for the students, as we were aware fostering early success could help increase is engagement. Even with beginning a basic build, drastic differences were observed between grades. On the first introduction, third through fifth graders made comments such as, "I love robots. Wait, what are robots?" and "It was hard, but fun." These younger students were generally enthusiastic, even when they weren't sure what they were going to be doing. This response contrasted starkly with attitudes from the sixth through eighth graders, who shared thoughts such as, "This packet is too long," "We can't get this all done," and "I don't know which way to connect it." The older students displayed apathy or dread when first introduced

to robotics, and expressed doubt and helpless behavior before beginning the builds at all. One interesting statement that revealed the lack of prior experience with construction in general was an eighth grader who asked, “Is this like legos? I never got to play with legos.” It was notable that when introducing robotic builds to underserved students who did not have experience with robotics (or often construction toys in general), the younger students jumped into the builds with excitement and enthusiasm while the middle school students approached initial builds with much more trepidation.

In addition to initial attitudes toward the robotics curriculum, the different aged students also responded differently to the process of construction. The younger students opened robotic kits right away and both members of the team were involved in taking out pieces, turning them, manipulating them, and seeing how they could fit together. Middle school students looked at the kit for much longer before opening them or touching any of the pieces. Younger students rarely read beyond the first page of instructions before diving in, while the middle school students would often read the entire instruction booklet, would often take only one piece out at a time, and were much more hesitant to try out how pieces would fit together.

Creative Builds

As the STEM lab curriculum progressed, builds became more creative and complicated. Some labs intentionally gave students choices, and students were given opportunities to design their own robots. When students were challenged to do their own creative build of any design they wanted, there were, again, differences observed between the ages. Younger students received the challenge and met it with excitement and creativity. Students stated things such as: “We get to build whatever we want!”, “'I made a rescue helicopter and now I’m going to make a whole rescue team,” and “I made a swing set with people.” By contrast, the older students stated they did not have any ideas, saying things like, “I don’t know what to build.” They asked how to make a ladybug, when the sample was a very similar butterfly, and another student made a table. Overall, the middle school students displayed less creativity and risk-taking, and struggled when not provided with explicit instructions.

Introducing STEM and robotics was intended to be a natural situation to help students learn resilience. Learned helplessness had been displayed by students in other academic areas, but it was hoped that the hands-on construction opportunities would provide a fun setting to foster resilience across grades. Initially, learned helplessness was observed particularly with older students. Many groups in the middle school grades would immediately ask for assistance without trying on their own first. One group stated, “I want to make a car and make it move, but I don’t know how, and you have to show me and help me.” Meanwhile, when the younger ages wanted to build a car or tractor, they would try on their own before asking for help. However, with time, the older students began to display more resiliency. One of the middle school students shared, “We had the idea of a clock. But then we gave it up because we couldn’t find a way to make two moving hands.” In later STEM labs, gears were introduced to show how to make independent moving objects, and at that time, that same group did go back to make the clock they had originally planned. While students gave up quickly when confronted by a challenge in the first instance, it was exciting to observe in future weeks the connection to deeper learning and the effort the students put forth to retry their original idea of the clock build. This was an important example to those students that they could accomplish their goals with the right information and effort.

Synthesis/Application Builds

The next level of robotics builds involved application and synthesis builds. It was during these builds that students needed to account for a changing situation and appropriately change their build to reflect the new scenario. Students displayed a fluidity in thought process to create new ideas that correctly responded to the changing scenario. It was interesting to observe that in this situation there was less of a difference between age groups, and in some groups, the older students excelled more than the younger students. Some quotes from the younger students were, "I love seeing the frog change, so I made the cave bigger" and "I want to make a tree but had to use yellow because there were the only ones bent that looked more like a branch." The middle school students also showed flexibility in their thought with statements such as, "I'm Jamaican so I'm making a Jamaican front and he needs a coconut tree" and "I want to make a rock, but we don't have brown. [Partner:] We can improvise and make a rock shape." It was with these builds that all grades showed rich social-emotional discussions, as they had to work together to agree on their build, and showed a willingness to try new things with the conceptual confines of the scenario.

As the robotics curriculum concluded, students summarized their experiences with some wonderful quotes and observations. Third through fifth grade students shared thoughts and feelings such as, "I want to build all the time. I have lots of ideas still in my head," "I like doing things with my friends, even when we don't get along. In this class you need a partner, and I like that," and "I like that I can find different ways to do things. I can make it my own." Middle school students shared thoughts such as, "I didn't know my brain could do this," "I had to be okay with being confused, but I didn't like it," and "I thought all this would be too hard, and I didn't want to do it. But you made me. And I actually got it to work." The enthusiasm of the younger students remained throughout the entire STEM curriculum. It was most exciting that the middle school students began to make some positive shifts in their thinking and showed enjoyment and appreciation for the robotics program by the end.

Conclusion

The students at STBCA represent an urban, minority demographic group who had not previously had access to educational robotics. Students did not have robotics at home, and some had no experience with construction toys at all. Introducing the students at STBCA to educational robotics provided an opportunity to observe their attitudes, perceptions, and mindsets. In this unique case where a single teacher could deliver the robotics curriculum from third to eighth grade, trends in student attitudes and mindsets across age groups became apparent over time. Research by Dweck and colleagues identified that students who had a growth mindset also had high resilience, persistence, adopted new problem-solving approaches, and had higher STEM scores. Meanwhile, students who identified as having a fixed mindset were more pessimistic, gave up more easily when faced with difficulty, were performance rather than mastery motivated. Similar attitudes were observed in the STBCA students as they were given challenges in the robotics curriculum. Younger students were generally more eager to try on their own, express creativity, and problem-solve. Older students displayed helpless attitudes initially and difficulty with creativity, but did display shifts in attitude and perceived ability as the curriculum progressed.

The results of the PERTS mindset survey showed lower mean mindset scores than had been reported in the literature, and most grades had students who identified as having strong fixed or growth mindsets. Some students who presented strong resistance and helpless attitudes

toward the initial robotics challenges began to gain confidence and shift their attitude over time. These observational cases suggest that success with robotics could influence student self-beliefs. As research has found student mindsets can be shifted, future research could be done to evaluate student mindsets before and after a robotics curriculum that incorporates a mindset intervention treatment. Given the range of mindset beliefs present across all age groups, shifting mindsets using educational robotics could be a valuable long-term benefit for students. When the robotics curriculum was initially planned, it was known that the access to robotics for the first time would begin to bridge an access gap for these traditionally underserved students. However, it became clear through observation that the challenges introduced through robotics were helping the STBCA students catch up for lost time in robotics and STEM topics, but in self-beliefs and mindset as well.

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Teaching the M in STEM with Robotics: Exploring Understanding by Design for Curriculum Development to Teach Math Concepts Using Robotics

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Abstract
STEM (Science, Technology, Engineering, and Mathematics) education has been at the forefront of national education policies and school reform for the past several decades, and the continual advances in technology and educational research bring new methods of STEM learning. Educational robotics have been introduced to the classroom space as a tool to teach STEM concepts. Research has found that robotics helps students learn STEM concepts and fosters a positive attitude toward STEM subjects. However, there is little research on the curriculum used to teach STEM concepts via robotics, and more specifically, trying to teach mathematical concepts. In this paper, I apply my knowledge and practice of teaching mathematical concepts via robotics—both as a former classroom and collegiate mathematics teacher as well as a current Director of Instructional Technology for VEX Robotics—to evaluate curriculum. Using Understanding by Design as the theoretical framework for curriculum development, I assess how this framework guides robotics curriculum to address math concepts specifically. The elements analyzed were: essential questions, understandings, and assessment evidence. As educational robotics becomes increasingly integrated into classrooms, it is necessary to evaluate the curriculum that is created to apply said robotics, and how pedagogical frameworks serve the goal of integrated STEM learning. This analysis can then be used to help guide further research and development of STEM curriculum, particularly curriculum that focuses on teaching mathematical concepts using robotics.

Keywords: STEM, Robotics, Curriculum

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Background

STEM Education and Curriculum

STEM has become a world-wide educational initiative because of its connection to the development of 21st century skills, the need for more emerging technology specialists, and future jobs in emerging technology and workforce development (Herschbach, 2011). Much of STEM education incorporates hands-on, active learning, project-based learning, teaching for understanding, and various other pedagogical frameworks that align with our understanding of how students learn. However, there is currently little to no research about or standardization of STEM curricula, leading to vastly different interpretations of what should be taught and how it should be taught (Herschbach, 2011). Furthermore, STEM includes content areas, like science and mathematics, which have well-established teaching practices and curricula associated with them. While the intention behind the global push for STEM education is sound, its practice is becoming increasingly disjointed, without a clear guiding framework for understanding.

The field of robotics, both industrial and educational, has been growing in popularity. Robotics can be used to not only attract students and hold their interest in the classroom, but they can be used to teach a wide array of topics that students may not have thought could have a technical or engineering component, such as music and art (Barreto & Benitti, 2012). This attracts students with many different fields of interest to the opportunity to learn STEM concepts. Educational robotics have been introduced to the classroom space as a tool to teach STEM concepts. Research has found that robotics helps students learn STEM concepts and fosters a positive attitude toward STEM subjects (Khanlari, 2013). More specifically studied in this paper, is teaching mathematical concepts using robotics.

Not only are the components of STEM important in isolation, but teaching and learning them in an integrated manner allows students to get to experience them in a true contextualized form. For example, learning about the Cartesian Coordinate system by itself is important, but abstract. In the workforce, rarely would an individual work with the coordinate system out of context. Teaching this concept in an integrated manner, alongside other math, science, technology, and engineering concepts allows students to make sense of abstract concepts, as well as answer the question, “when would I ever use this in real life?” (Herschbach, 2011).

Understanding by Design (UbD) Pedagogical Framework

The UbD framework is about planning. More specifically, planning with the concepts in mind that students should walk away knowing at the end of the curriculum (the end goals) (Wiggins et al., 2005). Planning with the end goals in mind focuses curriculum on student understanding and the ability to effectively use concepts learned in context. This method of planning with the end goals in mind, also known as backwards design, occurs in three-stages: identify desired results, determine acceptable evidence, and plan learning experiences and instruction. This can be seen in the UbD Design Template as Figure 1 (Wiggins et al., 2005).

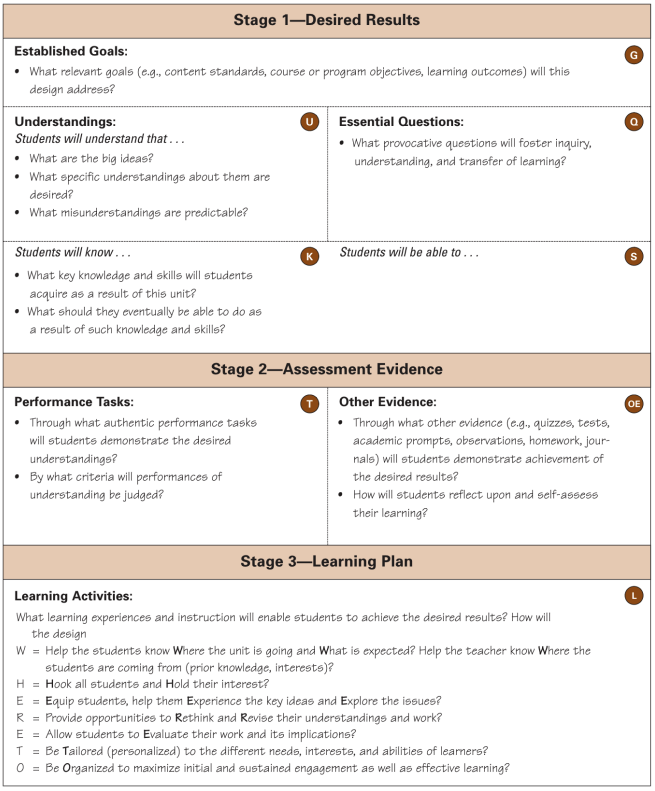

Figure 1: UbD Design Template

Within the desired results stage (also known as stage 1), there are certain elements that are involved in the planning. These elements include first establishing the goals. Are these goals related to content standards, certain learning outcomes, or objectives of a particular course? These are prompts that help facilitate the designing and writing of the goals. It's important to have goals, to ensure both the educator and the student have a shared understanding of what is expected. Once the goals are established, the understandings and essential questions are to be written. The understandings are focused on big ideas. Not only are discrete understandings of the big ideas to be outlined here, but also possible or common misunderstandings. This helps to ensure a clear distinction between what students will understand, and some potential concepts that may also lead to misunderstandings or confusion.

Next are the essential questions. Essential questions are written in order to foster inquiry, understanding, and the transfer of learning concepts. These should be questions that require students to think critically, that can be answered by the end of the design plan, and should not be simple yes or no questions. After essential questions comes identifying what students should know and be able to do. This is important to be explicit about to ensure what key skills students should have at the end of the design plan, and truly put all the learning and understanding into practice. This piece of the planning is making the application explicit.

After stage 1 (desired results) is stage 2: assessment evidence. Stage 2 is about planning and documenting what tasks students will engage with in order to show their understanding. Included in this planning is identifying certain criteria for the tasks, so both the educator and student have a clear picture of what is expected. Other aspects of this planning include evidence such as quizzes, tests, observations, homework, exit slips, or other means of capturing student knowledge. Students should also be presented with prompts or activities

that allow them to reflect and assess their learning. More specifically, can they answer the essential questions and does the student meet the certain identified understandings?

After stage 2 is stage 3: learning plan. The learning plan is outlining what the actual instruction is that the students will experience. This includes elements such as relating to students' prior knowledge and interests, providing them with opportunities to explore and experience key ideas, as well as the opportunity for students to evaluate their work and what it truly means in context. This is the essence of the UbD framework that is focused not just on teaching certain concepts, but ensuring that students develop a deep understanding of those concepts, and can demonstrate that understanding.

Understanding Authenticity

"Authentic" learning is a term that is used quite a lot in educational curriculum, but what exactly does it mean? Shaffer and Resnick (1999) suggest that there are four kinds of authentic learning: learning that is personally meaningful for the student, learning that is authentic in relation to the real-world (outside of the school space), learning that allows for thinking in the authentic space of a specific discipline, and learning where the means of assessment are an authentic reflection of the learning itself. Curriculum development, and more specifically robotics curriculum written to teach mathematical concepts, should be authentic in one or more of the suggested kinds of authentic learning to promote deeper understanding.

Purpose of the Study and Methods

There is little research on the curriculum used to teach STEM concepts via robotics, and more specifically, trying to teach mathematical concepts. In this study, I apply my knowledge and practice of teaching mathematical concepts via robotics—both as a former classroom and collegiate mathematics teacher as well as a current Director of Instructional Technology for VEX Robotics—to evaluate curriculum.

Using Understanding by Design as the theoretical framework for curriculum development, I assess how this framework guides robotics curriculum to address math concepts specifically using a qualitative journal approach from my own experience as a curriculum developer in the robotics field. The robotics curriculum analyzed and written was the VEX GO Parade Float STEM Lab Unit. More specifically, Lab 4: Calculating Distance and Lab 5: Turning, as these focused on math skills.

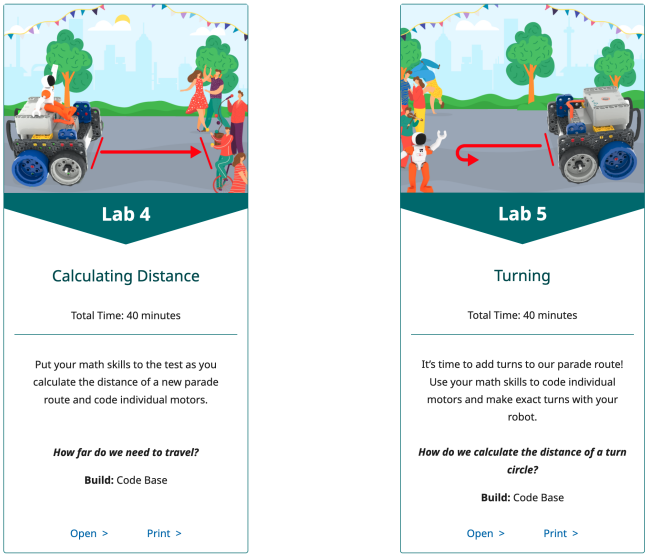

Figure 2: Labs 4 and 5 of the VEX GO Parade Float Unit

The elements of the Understanding by Design pedagogical framework analyzed in this Unit were essential questions, understandings, and assessment evidence.

In the entire Parade Float Unit, students learn to sequence behaviors in order to solve the authentic task of having to autonomously drive their robot to travel a parade route of a certain set distance. Students will design a parade float for their robot, and then use mathematical formulas such as circumference in order to code the individual motors of the robot to drive and turn on the parade route. In Lab 4: Calculating Distance, students first calculate how far one VEX GO wheel turn is. Then, using this knowledge, they calculate how many wheel turns are needed in order to travel the length of the entire parade route (48 inches). Students then will showcase and apply their learning in context by coding the robot to travel the parade route by using the number of wheel turns they calculated as the parameter in their code in order for the robot to travel the parade route.

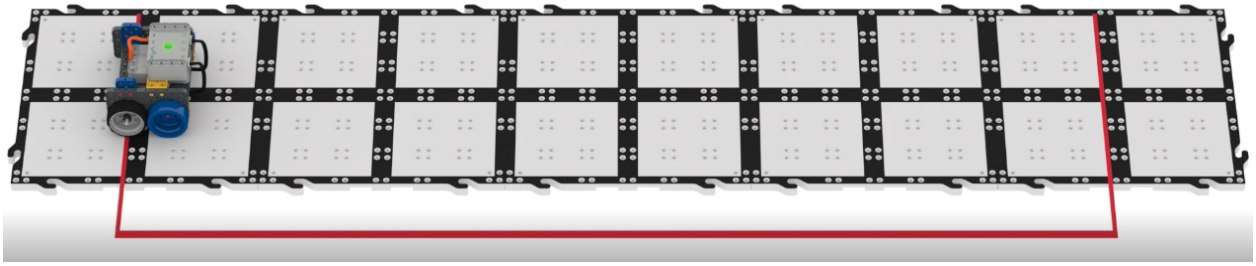

Figure 3: Lab 4: Calculating Distance Parade Route

In Lab 5: Turning, students first calculate how many wheel turns are needed in order to turn the robot 360 degrees. Students will then showcase and apply their learning in context by calculating how many wheel turns are needed to turn 180 degrees. Students will then code the robot to travel along the parade route, turn around 180 degrees, and then drive back to the start of the parade route.

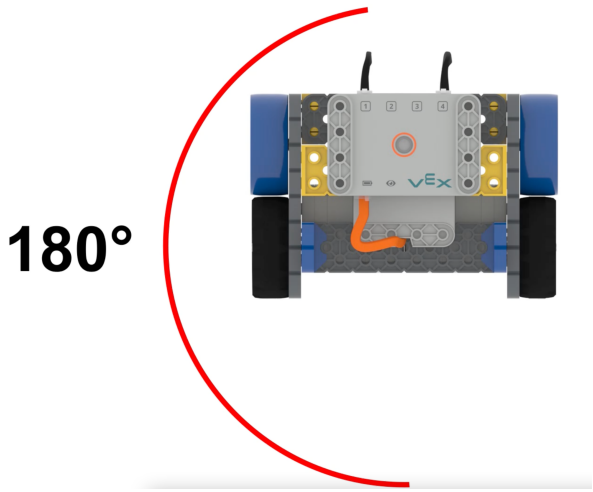

Figure 4: 180 degree turn of the Code Base

Analysis

Understandings

The purpose of the understandings are to target the big ideas for a particular concept or concepts. This is also a place to highlight possible misunderstandings. The understandings for the Parade Float Unit are: how to design a solution to an authentic problem, and how to sequence behaviors into the correct order to create a solution to a problem. The big ideas or concepts for these understandings are designing solutions to an authentic problem and how to sequence behaviors in order to solve that problem. When writing these Unit understandings, I wanted to adhere to the UbD framework for Unit understandings, that focuses on big ideas. Since the big ideas for this Unit are coding the Code Base in order to travel a predetermined parade route, I wrote the first understanding to be focused on solving an authentic problem. Referring to Resnick and Shaffer's (1999) types of authenticity, the authenticity of the problem for this particular Unit is adhering to specific constraints, which could be viewed the same as a car driving on the right side of the road, in the correct lane (learning that relates to the real-world outside of the school environment), as well as coding certain vehicles or even drones to complete a certain predetermined path (learning that provides an opportunity to think in a particular industry standard or discipline).

The second understanding is how to sequence behaviors into the correct order to create a solution to a problem. In this case, the authenticity of this understanding is sequencing in any sense, sequencing could be anything from the steps one takes to put shoes on in the morning, an outline of turn-by-turn directions, or the logical sequence of a coding program. Any of these aspects deal with learning that is meaningful to the student, learning that relates to the outside world, and learning that provides the experience of thinking as if one were in industry.

Based on this explanation, the understandings for this Unit are not only authentic in more than one way for each understanding, but they also adhere to the UbD outline for what Unit understandings should consist of. However, there is room for improvement as far as identifying what misunderstandings could arise, as noted in the UbD Design Template.

Essential Questions

The purpose of the essential questions are to foster inquiry, understanding, and transfer of learning. The essential questions for the Parade Float Unit are: how can anything be engineered to solve an authentic problem? And how can the iterative process be used to create a sequence of movements for the float to accomplish the parade route? These essential questions were written in a way to support the Unit understandings. These essential questions also promote understanding about how to sequence behaviors in order to solve a particular problem. In the context of the parade route, the problem is, what is the correct sequence of behaviors in order to code the robot to complete the route? I wrote these essential questions in order to foster inquiry and transfer the learning from the skill of sequencing, to the applied context of sequencing code blocks to drive and turn the Code Base to travel a specific parade route.

Based on this explanation, the essential questions for this Unit adhere to the UbD outline for what Unit essential questions should consist of.

Assessment Evidence

The purpose of the assessment evidence is to identify what authentic performance tasks will students use to demonstrate the desired understandings, as well as identify what criteria the performances of understanding will be judged on. The assessment evidence for Lab 4 is: students will discuss how they used their measurements to calculate the number of wheel turns necessary for their robot to complete the parade route. They will also explain how they used their measurements to calculate the number of wheel turns necessary to drive the exact length of the parade route. Then, they will utilize their solutions in the parameters of their project to have their robot drive the length of the parade route. After, students will be able to explain why they calculated distances in wheel turns and how they applied their solution in their VEXcode GO projects.

For these performance tasks, students not only have to discuss and reflect on their work, but they also have to demonstrate that they understood how to solve an authentic problem and could sequence behaviors in order to code the Code Base to travel a specific predetermined distance. This demonstration is done by actively coding the robot and viewing if the robot traveled the route correctly or not.

Based on this explanation, the assessment evidence for this Unit adheres to the UbD outline for what Unit assessment evidence should consist of. One element of the assessment evidence that could be more explicit is the criteria that the performances of understanding will be evaluated. For example, what the expectations are while discussing verbally could be better outlined.

Conclusions

This robotics curriculum was designed in order to solve an authentic problem and teach mathematical concepts via robotics. The math concepts covered in these activities were not only understanding place value, rounding decimals, calculating circumference and diameter, but also skills that relate to solving authentic problems. These include breaking down a task into smaller parts, sequencing behaviors, and being able to explain the reasoning behind problem solving methods. Using robotics allows students to round and measure using the

number line authentically to obtain parameters, as well as solve for the circumference of each wheel of the robot, and the robot's footprint while turning. This is teaching and applying these mathematical concepts in an authentic and scaffolded way using the UbD framework.

As educational robotics becomes increasingly integrated into classrooms, it is necessary to evaluate the curriculum that is created to apply said robotics, and how pedagogical frameworks serve the goal of integrated STEM learning. This analysis can then be used to help guide further research and development of STEM curriculum, particularly curriculum that focuses on teaching mathematical concepts using robotics.

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