STUDIES ON EDUCATION, SCIENCE, AND TECHNOLOGY 2021

Editors
Dr. Mack Shelley
Dr. Ismail Sahin

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PREFACE

Education, science, and technology disciplines at all levels have never been more important, more exciting, or more crucial for its broader impacts on human society. The need for advanced technical skills is increasingly pressing to address climate change, combat COVID and other diseases, enhance the infrastructural built environment, grow food sources to feed an expanding planetary population, make new scientific discoveries, and interface synergistic ally with the arts, humanities, and social sciences. Teachers/instructors/mentors/professors need to be proficient in the best ways to convey knowledge and motivate the next generations of productive and engaged citizens of an increasingly diverse planet on which its human inhabitants must learn to confront and surmount increasingly difficult challenges to survival and prosperity. Students need to be focused on honing their learning skills and adapting to an ever-evolving global economy demanding always higher levels of technical proficiency. Students also need to be free to pursue any and all areas of interest without interference from cultural, political, ideological, or faith-imposed limitations. Policymakers need to provide the financial and human resources to fuel the engine of education, and they must create the maximum possible latitude for both those who teach and those who learn to pursue science, technology, engineering, and mathematics to their limits. This book contributes to addressing these needs and to suggesting potential solutions from multiple global perspectives. Adaptability of instructional methods, relevance of instructional content to students' lived experiences, and sensitivity to the mental and physical demands imposed on students must be hallmarks of education.

The book is divided into three sections related to studies on education, science, and technology. Each section includes three chapters. The chapter's contributors are from the following countries: the United States, Germany, Greece, Indonesia, the United Kingdom, Russia, and Malaysia. This diversity brings an international perspective to the book.

The first section starts with the chapter titled "Access to Learning: Reality or Mirage in an Increasingly Virtual World?" by Beth Godett from the United States. This chapter examines inequities of opportunity, the problems of adapting education's brick-and-mortar digital resources to home-based Zoom and asynchronous classrooms, and possibilities for reform. The second chapter titled "Portfolios as Formative Assessment in Applied Mathematics: Influences of Portfolios on the Teaching-learning Process" is written by Edeltraud Gehrig, Annika Kanzinger, and Joerg Zender from Germany. The chapter highlights the role and potential of portfolios in the examination process and the motivation by individual coaching, consideration of the learning level, and the (self-selected) individual goals of the students.

The last chapter of the first section includes a chapter titled “Integration of Digital Technology and Educational Planning for Teaching and Learning Religion in Higher Education Institutions” by Ioanna Komninou and Christos Papakostas from Greece. This chapter describes the fulfillment of learning theories in distance learning, emphasizing in applications in the field of religion and discusses the available technological tools, their selection criteria, and the required skills to properly use them.

The second section involves chapters on science. The first chapter of this section is titled “Athlete Students' Anxiety Levels on Physical Activity and Performance during the COVID-19 Pandemic” by Syamsul Gultom, Baharuddin, Dina Ampera, and Dewi Endriani from Indonesia. This work focuses on attribution theory to determine how athletes attribute their success and failure Performance during the COVID-19 Pandemic. Another study titled “A Study of Present-day Women’s Family Status in China: Intimate Relationships among Chinese Post-90s Couples” by Anran Li from the United Kingdom explores Chinese post-90s women’s family status in contemporary society in China and the gender role ideologies of post-90s generation changes on the premise of a rich material and broad knowledge. The chapter titled “Recurring Emotions and Coping Mechanisms of Parents with Children having Autism” by Nicole Marie C. Pascua and Cherry Amor Dizon from Phillipines looks at Filipino parents’ recurring emotions and grieving experiences that trigger it while raising a child with Autism Spectrum Disorder (ASD).

The last section involves chapters on techology. The chapter titled “The Role of Educational Technology in the COVID-19 Pandemic” by Eva Faridah, Indra Kasih, and Rudi Hartono from Indonesia shows and discusses the importance of educational technology and information systems for educators and learners in conducting online lectures during the COVID-19 pandemic. While the chapter titled “On a Novel Approach to Undergraduate IT Education” by Mikhail Lavrentiev and Marina Derzho from Russia and Alex Shafarenkofrom UK introduces a new collaborative programme in Computer Science developed by academic staff of the universities of Novosibirsk, Russia, and Hertfordshire, UK who formed an initiative group for this development, the last chapter titled “Locating Visual Arts Instruction in Malaysian Higher Education: COVID-19 Epoch” by Lilian Lee Shiau Gee from Malaysia explores art students' acceptance of online learning during Malaysia's COVID-19 pandemic.

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SECTION I - STUDIES ON EDUCATION

Chapter 1 - Access to Learning: Reality or Mirage in an Increasingly Virtual World?

Beth Godett

Chapter Highlights

- COVID-inspired shifts to virtual learning have facilitated education in extraordinary times. However, changes in the delivery of and access to learning have revealed systemic flaws in education as an institution.
- This study examines inequities of opportunity, the problems of adapting education's brick-and-mortar digital resources to home-based Zoom and asynchronous classrooms, and possibilities for reform. This is done with a look at the risks of leaving too many unable to benefit from the true dawn of virtual learning.
- Even with the proper digital tools and learning platforms, one can still be technologically deprived and fail to access education.
- Vital conversations must take place reflecting communities' needs and capacities, as well as expectations and goals for education going forward.
- Without such dialogue and the planning that results we risk compromising access to education now and into the future.

Introduction

There is no question that COVID's derailing brick-and-mortar education has upended many assumptions school stakeholders have had about teaching and learning. The current state of education should prompt questions about what to keep and what to change for our young scholars and their mentors moving forward. An outpouring of research and strategies from education theorists and practitioners would suggest that transformation in education as an institution is occurring with everything being brokered from "quick fix" virtual, hybrid, and in-person return-to-school models to proposals for rebuilding a long-outmoded education infrastructure.

Despite these efforts, along with technology's potential benefits as a conduit to and tool for learning, even if all students had the necessary hardware, Internet access, bandwidth, and reliable connectivity, unrelenting legal action demanding education believed denied suggests otherwise. Opportunities built into laws designed to protect students and address disparities or denials of education prompt the question why we are still not getting it. Why does education, an institution so vital to our country and its future, lack the resilience to adapt and provide access for all students, irrespective of individual circumstances or society's evolving modes of communication and work?

In that spirit, the first part of this study examines whether the courts are an obstacle to progress in ensuring access to learning in a virtual world. The Supreme Court has made it clear on numerous occasions that there is no *fundamental right* to an education under the United States Constitution, despite a history of inconsistent judgments and failure to follow its own rules and precedent that has brought the Court close to saying there is such a right. This part seeks to explore the role of the judiciary in establishing a legal basis for providing, or denying, that right to an education and addresses the question, "Does the fact that education is not a federal right give the Court permission to control who receives formal instruction and how?"

The second part of this study looks at common themes in key court cases and how these decisions exposed deficiencies limiting education's reach. Challenges to learning access over the years will be examined, and history's enduring impact will be shown as reflecting on

access to learning today. Virtual learning will be proposed as a new frontier shedding a different light on the meaning of equity and access.

The third part of this study brings access to learning closer to home with a look at what is happening in present time in case law and community controversies. District and state courts will be seen as filling gaps left by the Supreme Court. Issues posed by litigation will suggest the potential for virtual learning to transform marginalization, defining newly-compromised communities.

Paths forward will be explored as a look at what is revealed in the third part of this study begs the question "What do we do now?" The final part of this study addresses challenges to perceptions regarding resources, accountability, curriculum and pedagogy, and training. In so doing, the possibilities will reveal how access to learning in a virtual world is impacting school stakeholders.

The Constitution and a Legal Right to Education: So What?

> "This is my quest. To follow that star. No matter how hopeless, no matter how far. To fight for the right, without question or pause . . ."
> Don Quixote, *Man of LaMancha* (Darion, n.d.)

The U.S. Constitution does not assign a legal right to education, nor does it mention education at all. It is by virtue of this Constitution's 10th Amendment which says, "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people" (U.S. Const. amend. X), that the highest Court has vacillated in assuming responsibility for learning. It is under this Constitution that the Supreme Court passes judgment, and some Supreme Court Justices, in their opinions and dissents, have been forthright in saying it is not the job of the Court to weigh in on education, even though some Court decisions have shown otherwise.

Justice Felix Frankfurter, writing for the Court in *Minersville School District v. Gobitis* ("*Gobitis"*), cautioned against the Supreme Court's interfering with schools noting what he felt was a danger in making the Court "the school board for the country" (*Minersville School District v. Gobitis*, 1940, p. 598). Some 30 years later, Chief Justice Warren Burger, in

Milliken v. Bradley (1974) ("*Milliken"*), advised the federal judiciary not to step into the role of school superintendent. Chief Justice Burger's dissent in *Plyler v. Doe* (1982) ("*Plyler"*) speaks to a Court decision supportive of educating undocumented students saying it was not an issue for the Court to decide: "We trespass on the assigned function of the political branches under our structure of limited and separated powers when we assume a policymaking role as the Court does today" (*Plyler* v. Doe, 1982, p. 242).

So, How Can Access to Learning Be Granted and Assured?

Responsibility for providing access to learning and, indeed, for controlling how learning should be delivered, has been influenced by power struggles, inherent biases such as those regarding wealth and immigration, and systemic racism, among other things. Failure of the Court to designate a "fundamental right" has left education a political pawn, unprotected and fragile, subject to the whims of government control and under the direct influence of economics and competing personal agendas. That being said, even while the Supreme Court has no mandated authority over education, it has interfered with school policy when it has seen fit to do so and, as such, has found legal justification for denying access to learning.

A perfect example of the Court's quandary over whether to separate from or insert itself into education can be shown by contrasting *Minersville School District v. Gobitis* (1940) ("*Gobitis*") and its progeny. *Gobitis* was a case where parents, devout Jehovah's Witnesses, challenged the school district when their children were suspended after refusing to stand for the Pledge of Allegiance. The Court ruled in favor of the District saying, "the courtroom is not the arena for debating issues of educational policy" (*Minersville School District v. Gobitis*, 1940, p. 598). Just three years later the Court ruled against a school district in *West Virginia State Board of Education v. Barnette* (1943) ("*Barnette"*), also a flag salute case. Justice Robert Jackson, writing for the Court, said, "We think the action of the local authorities in compelling the flag salute and pledge transcends constitutional limitations on their power . . . " (*West Virginia State Board of Education v. Barnette*, 1943, p. 642).

As a significant side note, one must bear in mind the influence of the state of the nation and the world at the time decisions are made in the highest Court. *Barnette,* although decided on the heels of *Gobitis*, was also decided as the U.S. entered into World War II, particularly its entry into the European Theatre. In *Barnette* protection of the right to adhere to one's own

beliefs without denying the rights of others stood in direct contrast to the dangers of blind adherence to a government—and a school board—that threatened liberty and justice. This was seen both in the war against fascism and in what the Court saw as the State's assertion of power "to condition access to public education on making a prescribed sign and profession" (*West Virginia State Board of Education v. Barnette*, 1943, p. 630) by participating in the flag salute.

To that end Justice Jackson defended his position in opposition to Justice Frankfurter's admonition in *Gobitis* and, in so doing, assigned school boards responsibility for acting within the constraints of the Bill of Rights, thus subject to judicial control without fear of the Court's overstepping. Jackson noted,

> That they are educating the young for citizenship is reason for scrupulous protection of Constitutional freedoms of the individual, if we are not to strangle the free mind at its source and teach youth to discount important principles of our government as mere platitudes. Such Boards are numerous, and their territorial jurisdiction often small. (*West Virginia State Board of Education v. Barnette*, 1943, p. 638)

Justice Felix Frankfurter, dissenting in this case, cautioned about the Court's maintaining its proper place and the danger of flip-flopping with regard to that role. He said,

> The uncontrollable power wielded by this Court brings it very close to the most sensitive areas of public affairs. As appeal from legislation to adjudication becomes more frequent, and its consequences more far-reaching, judicial self-restraint becomes more, and not less, important, lest we unwarrantably enter social and political domains wholly outside our concern . . . . Let [the courts] consider how narrow is the function which the constitutions have conferred on them . . . how large . . . is the duty intrusted to others, and above all to the legislature. (*West Virginia State Board of Education v. Barnette*, 1943, pp. 666-669)

While points can be argued in favor of the decisions in both *Gobitis* and *Barnette*, Jackson's logic illustrates how access to education can be vulnerable to the Court's whims. Arguments that may be influential at one point in time may not be universally just. This underscores the importance of the Court's maintaining its objectivity and its consistency, especially as concerns an institution lacking the protection and clarity afforded by otherwise granting it status as a "right."

The push and pull of judicial influence, while at times affirming Constitutional rights such as freedom of expression and belief in *Barnette*, has, on other occasions, wrought dire, even unforeseen consequences for education. One such example can be seen in *Milliken,* where the Court took it upon itself to invalidate the decision of a district court implementing a Detroit school desegregation plan. Chief Justice Burger noted supporting that decision "would [have] deprive[d] the people of control of schools through their elected representatives" (*Milliken v. Bradley,* 1974, p. 744). The Chief Justice further opined, "[L]ocal control over the educational process affords citizens an opportunity to participate in decision-making, permits the structuring of school programs to fit local needs, and encourages 'experimentation, innovation, and a healthy competition for educational excellence'" (*Milliken v. Bradley,* 1974, pp. 741-742).

At a different time, this sentiment may have borne a better result. In the midst of the struggle for civil rights and white flight from cities, this case backfired as an attempt at desegregation. It calcified differences between neighborhoods at the expense of poor students and students of color who would have benefitted from a Constitutional right to an education guaranteeing a level of access equitable to their wealthier white peers.

Is it possible to ensure access to learning for all if there is no legal right to an education? Simply establishing the foundation for that right is not enough to guarantee opportunity, and the Supreme Court has shown by its actions over the years that it is unwilling to establish the right to education for all. The Justices also have shown they need no permission to influence education by determining the scope of that incipient right, regardless of the consequences for communities of learners denied access as a result of the Court's judgments.

Access to Learning: Where Have We Been?

> "Let no one say the past is dead. The past is all about us and within."
> Oodgeroo Noonuccal, Aboriginal poet (Kline, 2020, n.p.)

A study of case law suggests that, from *Roberts v. City of Boston* in 1849 ("*Roberts"*) to at least 2007 with *Parents Involved in Community Schools v. Seattle School District No. 1* (*"Parents Involved"*), there has been a rather deliberate and significant effort to deny access to education. Key benchmarks along the way are noteworthy in revealing the extent of the

disenfranchised populations, and judgments in recurring patterns that show consistencies in the denied opportunities. Attempts to mitigate the damages through legislation, other case law, and resistance efforts attempting to effectuate change have had an impact. The final two parts of this study will show that access to learning in a virtual world, while built upon these precedents, also holds the potential for substantial change should we choose to embrace it.

In 1849 *Roberts* challenged the idea that a state could control attendance at a neighborhood school on the basis of color. Justification for this was alleged to be protection from racial prejudice and the provision of equal compensation for and qualifications of teachers (*Roberts v. City of Boston*, 1849). While, initially, the Commonwealth prevailed in Massachusetts Supreme Judicial Court, the Plaintiffs' efforts ultimately succeeded in making Massachusetts the first state in the nation to outlaw access to education on the basis of "separate but equal" standards and enshrine this in their constitution (Separate Is Not Equal, n.d.).

Despite that victory, however, the practice of providing separate schools for different races with assurances of equality remained an acceptable practice, especially after the Civil War and with the advent of Jim Crow laws stoking racial division in the South by the end of the 1800s. The seminal case justifying "separate but equal" access to education in many districts and states across the nation was *Plessy v. Ferguson* in 1896 ("*Plessy"*). *Plessy's* ultimate demise came when *Brown v. Board of Education of Topeka* (1954) outlawed "separate but equal" in education ("*Brown 1")*. Court challenges erupted after *Brown 1*, many showing how difficult a time the Supreme Court had absenting itself from issues involving education.

Reaching its hand into school district busing desegregation plans, enrollment lotteries, and the redrawing of neighborhood boundaries, the Court found itself operating on a messy platform. With a nation in the throes of the Civil Rights Movement, intentions did not always reflect the spirit of equity or an unbiased judiciary. Judgments were challenged and either overturned or qualified, rendering them ineffective.

Examples of this abound, starting with the need for *Brown 1* to be immediately followed by *Brown 2* in an effort to add teeth and a timeline to *Brown 1's* mandate to abolish "separate but equal" schools *(Brown v. Board of Education of Topeka,* 1955). The decision in *Milliken* overturned a lower court school desegregation plan only to be heralded for encouraging white flight and increasing segregation (Belsha & Levin, 2019). *Swann v. Charlotte-Mecklenberg*

Board of Education (1971) established the use of busing to achieve school integration, but its impact was neither definitive nor lasting. This decision ultimately led to an appeal in the Fourth Circuit with *Capacchione v. United States* (2001), a case that essentially sidestepped the Court's landmark decision on the basis that a unitary system of education had already been achieved, and there was no further need for remediation. Reality was, however, that no unitary system had, in fact, been achieved.

A significant bookend to case law that effectively put a period on a century of litigation addressing equity of access to education in terms of the ever-present "separate but equal" doctrine, was the 2007 *Parents Involved* case. It is here we see the uncomfortable juxtaposition of Justice Harlan's words from his 1896 *Plessy* dissent referring to a "color blind Constitution" that regards "all citizens . . . equal before the law" (*Plessy v. Ferguson*, 1896, p. 559) against those of Justice Roberts, who used "color blind Constitution" to imply that if we decide not to see race as an issue in delivering access to education, then it won't be an issue. "[T]he way to achieve a system of determining admission to the public schools on a nonracial basis," he said, "is to stop assigning students on a racial basis" (*Parents Involved in Community Schools v. Seattle School District No. 1,* 2007, n.p.).

There were many additional, though no less significant, cases during the very tumultuous years after *Brown 1*. One that dealt with state taxation schemes, *San Antonio v. Rodriguez* (1973) (*"Rodriguez"*), left an indelible mark on access to education. In *Rodriguez,* the Supreme Court inserted itself into school funding, limiting opportunities for poor, marginalized student populations living in urban and rural parts of Texas and establishing that unequal funding of school districts was not discriminatory on the basis of wealth. While Justice Powell exposed inadequacies in the arguments for more equitable distribution of tax dollars throughout the state, his opinion begs the question whether he also left the door open for differentiated funding schemes pending more specific articulation of ways an existing scheme compromises access to learning (*San Antonio Independent School District v. Rodriguez*, 1973). Almost 50 years later, no one has stepped up to convince the Court otherwise. Will virtual learning prompt a different perspective?

In addition to denials of opportunity based on wealth and systemic racism directed against African-Americans, students have also suffered by virtue of their identification with other marginalized populations. The persistence of such segregation has emboldened the Court to

issue judgments spilling over into discrimination on the basis of ethnicity and alienage. In 1974, students of Chinese ancestry, denied supplemental English instruction in the San Francisco district where English-speaking was a graduation requirement and all instruction was delivered in English, found support for access to learning in the case *Lau v. Nichols* (1974). *Plyler v. Doe* (1982) involved denial of access to learning for Mexicans unable to confirm legal entry into our country and enabled access to a basic education for undocumented students.

Challenges to denial of access to a public school education on the basis of race, ethnicity, and alienage have continued for a long time. Their legacy reveals Justices' struggles to come to terms with the Court's role in providing an entitlement not established as a "fundamental right." Taken as a whole, the impact of legal challenges from the mid-20th century to the present day portrays access to learning as an enduring mirage for many.

A somewhat inside-out look at the denial of access to learning is emerging under the influence of a more conservative current-day Supreme Court and can be found by examining the impact of religion on school funding. The recent decision in *Espinoza v. Montana Department of Revenue* (2020) gives insight into how Court decisions involving taxation have begun to chip away at the dividing line between church and state. Where past church-state cases have resulted in the use of public funds for transportation, teaching supplies, and even playground materials in religious-affiliated institutions, *Espinoza* was decided in favor of parents seeking to use public funds for tuition assistance at religious schools in opposition to the Montana Constitution's "no-aid" provision prohibiting the use of public tax dollars to fund personal choices for private education alternatives (*Espinoza v. Montana Department of Revenue*, 2020, Section IA). This decision enhanced access to learning for some; however, the consequence of directing public tax dollars to support private choices, even beyond those at religious institutions, means fewer dollars for public education and, hence, diminished access for public school students.

The roadblocks generated by these cases and the themes that developed around them are both interesting and significant. They can be juxtaposed against federal legislation that has sprung up almost simultaneously as a "workaround" to the Court decisions and delivered federal entitlements for access to learning. These pieces of legislation, including, but by no means limited to, the Individuals with Disabilities Education Act (1975) ("IDEA"), Section 504 of

the Rehabilitation Act of 1973 ("Section 504"), the Americans with Disabilities Amendments Act (2008) ("ADAA"), the Patsy Mink Equal Opportunity in Education Act (1972), and Civil Rights Act (1964), represent efforts to fill the empty shoes left by the Supreme Court.

In providing entitlements, however, these acts have spawned much litigation prompted by the denial of access to learning by the marginalized groups they were designed to protect. The enacted laws, along with the decisions of the Court, represent how vital education is to the building of American society and its workforce. There is no denying concern regarding the challenges of delivering education virtually to those protected under these entitlements. A developing platform for digital learning has the potential to neutralize the themes of denial coming from Supreme Court decisions should educators and school stakeholders find new paths to school reform. This will become more obvious when examining how state courts have picked up where the Supreme Court left off in fighting for access to learning.

Access To Learning: Where Are We Now?

> "'Would you tell me, please, which way I ought to go from here?'
> 'That depends a good deal on where you want to get to,' said the Cat."
> Lewis Carroll, Alice in Wonderland (Carroll, 1960, p. 88)

In a recent Truthout op-ed, it was alleged that our educational system has responded to the pandemic's "cataclysmic challenges" in ways it always has operated, honoring, as it were, the same inequities perpetuated by discrimination according to race, gender, and wealth (McKinney de Royston & Vossoughi, 2021). Accountability for education has always fallen to the government for funding and to districts for delivery. Doing anything differently than what's always been done would not have been expected—not, at least, at the outset.

Spring 2020 demanded that institutions make dramatic midstream changes in the direction their ships had been set to sail. The problem is that education's ships had been set to sail a course established well over 150 years ago, and education as an institution is, and always has been, bound by its own inertia. A disaster the scope of COVID-19 shook to the very core an institution in no way prepared to set a new path and revealed with such clarity the cracks in that institution's foundation as to question its integrity moving forward.

Recognizing a critical need for education reform is not new, well-preceding the advent of COVID, especially after the decisions in *Milliken* and *Rodriguez* and with the resuscitation of a push for desegregation and equity many presumed as dead 50 years post-*Brown. Milliken* still casts its shadow over Detroit, where, today, the vast majority of students are persons of color, marginalized by underfunded schools (Belsha & Levin, 2019). In 2019 Michigan's Governor Whitmer proposed a state budget increasing school funding allotments through weighted- or student-centered funding, in an effort to address unique student needs and provide better support and access to opportunities (Chambers, 2021). The Governor's plan reportedly became a political hot potato in the state legislature (Belsha & Levin, 2019); however, a 2020 challenge brought momentum for change that has reverberated country-wide.

On May 14, 2020, Governor Whitmer announced an agreement to settle a Sixth Circuit case filed by Detroit Plaintiffs claiming deprivation of access to literacy (Michigan. Gov, 2020). *Gary B. v. Whitmer* (2020) (*"Gary B."*), originally filed against Whitmer's predecessor, Governor Rick Snyder, was settled out of court and created a high bar for access to learning. In Governor Whitmer's words,

> [E]very student, no matter where they come from, has a birthright to a quality public education. Students in Detroit faced obstacles to their education that inhibited their ability to read—obstacles they never should have faced. . . . [T]here's more work to do to create paths to opportunity for our children." (Michigan.gov, 2020)

The settlement recognized a right to literacy, even though not formally established in the U.S. Supreme Court, and made a commitment to provide enhanced funding for access to learning that meets students' needs (Testani, 2020). As a "settlement," it is not precedent-setting; however, courts across the country will likely see efforts to incorporate its essence into newly-filed complaints.

The filing of a lawsuit and a judgment or settlement doesn't always effectuate the relief sought, or at least not to the extent desired. *Brown 1* and years of ensuing legislation vainly attempting school desegregation show us that legal pathways for access to learning can be long and arduous. In this regard, *Rodriguez's* divorcing funding equity from wealth discrimination in access to education resonates decades later with the need for continuing advocacy for students in poor urban districts.

Abbott v. Burke (1981) (*"Abbott"*), initiated to bring about school funding reform in New Jersey, reached its 21st iteration in 2017. The initial action resulted in the designation of poor, urban New Jersey school districts as "Abbott districts" to be funded "at the foundation level 'substantially equivalent' to that in the successful suburban districts" (*The history of Abbott v. Burke,* n.d.). Years of court directives aimed at achieving parity between poor urban and wealthy suburban districts resulted in what has been described as "the most important equal education rulings since Brown v. Board of Education" (*Abbott v. Burke overview,* n.d.). However, as recently as April 2020, the New Jersey State Supreme Court denied funding for school buildings in urban districts under *Abbott* (Mooney, 2020).

A similar situation exists today in *Leandro v. State* (1997)*, (Leandro)*—which began as a 1994 lawsuit on behalf of poor school systems in North Carolina alleging denial of a "sound, basic education for all children" in violation of the state's constitutional mandate (McColl, 2020). Most interestingly, the suit also initially joined plaintiffs from larger and wealthier state districts. The results of the litigation, in favor of the plaintiffs, focused on three pillars: "qualified principals, qualified teachers and adequate resources" (McColl, 2020).

Due, in large part, to the North Carolina court's diligence, the impact of this case is far-reaching with its primary focus on the need for adequate school funding. Noting insubstantial progress on the initial 2002 ruling, the court appointed a non-profit agency to make specific implementation recommendations to be put into place starting in 2020 (*The Facts on Leandro*, 2020). As a state case, the *Leandro* decision is not precedential in other courts beyond North Carolina. However, a key take-away is the affirmation by the North Carolina court that "inequitable and inadequate school funding bars access to a sound, basic public education, particularly for students of color and those from families with low incomes" (*The Facts on Leandro*, 2020). Time will tell as to how this action, as it inspires future litigation, has the potential to ultimately challenge *Rodriguez*.

Yet another suit initiated in 2014, which is still on-going in 2021, *William Penn School District v. Pennsylvania Department of Education,* echoes the same theme: inadequate funding to provide support for the "thorough and efficient system of public education" outlined in state standards. The Education Law Center involved in this case explains "children in low-wealth districts are being denied the opportunity to receive an adequate education, while their peers in high-wealth districts are receiving a high-quality education"

(Pennsylvania School Funding Litigation FAQs, n.d.). Specific reference is made to students as being denied access to "functioning school libraries, up-to-date textbooks and curriculum materials, reasonable class sizes, guidance counselors, nurses, career and technical education, college prep classes, academic tutoring programs, and more" (Pennsylvania School Funding Litigation FAQs, n.d.). The idea of adequacy, along with this itemized listing of what, functionally, could be deemed denials of access to and resources for learning, will be an essential part of examining paths forward in the last part of this study.

"Where are we now" considerations only begin with inadequate school funding leading to denials of access to learning. One major area of concern involves how changes to the delivery of learning during the pandemic have affected students identified with special needs. The initial move to virtual learning prompted fast, albeit knee-jerk, responses from parents with legitimate concerns that programs and services providing access to learning for their children were indiscriminately upended.

A class action suit was filed in July 2020 in the United States District Court for the Southern District of New York on behalf of students classified as disabled and against over 13,800 school districts and state departments of education across the country (*J.T. v. De Blasio*, 2020). It sought to ensure compliance with the Individuals with Disabilities Education Act in delivering a FAPE, a Free Appropriate Public Education, to their children, despite guidance from the United States Department of Education permitting distance learning in acknowledgement that "' . . . exceptional circumstances may affect how all educational and related services and supports are provided'" (*J.T. v. De Blasio,* 2020, p. 7). While this suit was quickly dismissed in November 2020 for, among other reasons, lack of standing, especially for students beyond the reach of the New York courts, it was among the first to challenge the authority of state and local leaders, including district administrators, to close schools and institute remote learning on the basis of concerns for public health.

Students with special needs and certain other eligible students do receive unique protections that others do not under IDEA, ADAA, and Section 504. These pieces of legislation provide pathways to litigation when districts have not assumed their due diligence in following protocols. A unique "Where are we now?" that has arisen in many states with regard to special education is "COVID Compensatory Education" or CCE. This is not an extension of normal compensatory education but, rather, consideration for additional services that may be

required for students to access learning and services identified in individualized education plans that may have been compromised during complete or partial pandemic school shut-downs.

Difficulties anticipating the pandemic's end and districts' abilities to provide and enforce proper safety precautions for a complete return to in-person learning are, at least one year in, increasing angst among school stakeholders. Late in December 2020, several New Jersey parents charged the Superintendent of the affluent Scotch Plains-Fanwood Regional School District with "the unconstitutional, random and arbitrary continued shutdown of *in-school learning* in their public-school system" (*Dembiec v. Scotch Plains-Fanwood Regional School District*, 2020, para. 1). Claiming their children were subjected to "isolating and ineffective remote learning" and "at risk for further academic stagnation or loss of skills" including "mental health risks," as well as deprived "of the opportunity for a meaningful education, including appropriate academic instruction and social/emotional growth and support (*Dembiec v. Scotch Plains-Fanwood Regional School District*, 2020, paras. 14-15), parents also voiced concerns about finding childcare and needing to make "impromptu arrangements with their employers" (*Dembiec v. Scotch Plains-Fanwood Regional School District*, 2020, para. 43).

Changes exacerbated by the pandemic prompted several California families to articulate, in a 2020 suit, specific challenges disadvantaging low-income and minority families in supporting access to education for their children. Claiming the state's "fail[ure] to provide 'basic educational equality' for children of color from low-income backgrounds during the pandemic," parents seek for the state to provide "students [and] teachers with the devices, internet connection, training and support needed for remote learning" (Yancey-Bragg, 2020). A recent Columbia University study involving more than 100,000 schools appears to support the parents' sought-after remedy revealing that "[d]isadvantaged students are much more likely than others to be engaged in remote schooling during the coronavirus pandemic" with other experts warning "that disadvantaged students often lack the support that remote learning requires, such as computer access, quiet study space and help from parents or tutors" (DeParle, 2020).

Marginalized populations are not always defined by wealth or race. Surprisingly, disenfranchisement can include all students in a particular school or district should it be

determined that they have been deprived of access to learning—even a very specific type of learning. In the *Northwest Ordinance* of 1787, our country's founders first expressed that "Religion, morality, and knowledge, being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged" (Zeiger, n.d.).

Echoing the importance of accessing education to good government, perhaps the most sweeping suit of late was filed as *A.C. v. Raimondo* (2020) (*"A.C."*), alleging failure of the state of Rhode Island to provide students with "an education that is adequate to prepare then to function productively as civic participants capable of voting, serving on a jury, understanding economic, social, and political systems sufficiently to make informed choices, and to participate effectively in civic activities" (*A.C. v. Raimondo*, 2020, p. 2). Plaintiffs cited lack of or limited access to higher level learning opportunities beyond basic math and reading, particularly in civics. District deficiencies, according to the plaintiffs, included the need for improved professional development for teachers in that curricular area, and greater access for students to curricular and co-curricular activities giving them more exposure to and experience in governance by way of, among other things, improved instruction, field trips, school publications, moot court, and debate (*A.C. v. Raimondo*, 2020, pp. 2-3).

Recognizing that the Supreme Court has not said that education is a fundamental right, district and state courts are taking the matter into their own hands. The remedy sought in *A.C.* called for the Rhode Island court, as the Sixth Circuit had declared in *Gary B.*, to make education a "fundamental right." The students asked the court to declare a constitutional right "'to a meaningful educational opportunity' that will adequately prepare [students nationwide] to be 'capable' voters and jurors, as well as to exercise all of their constitutional rights and function as 'civic participants in a democratic society'" (*A.C. v. Raimondo*, 2020, p. 3).

The need to ensure access to learning for all doesn't always need to play out in the courts, however. Sometimes the most persuasive examples come from merely living in the world one has been given. While the pandemic has made it quite clear that industrial age learning simply doesn't fit our world today, in some cases, it has provided what, on the surface at least, is an impetus for change.

The system of assigning students to schools in New York City, a district with a history of access disproportionalities, particularly on the basis of race, has been long criticized. New

efforts on the part of Mayor de Blasio give the appearance of blurring geographic boundaries and encouraging the creation and implementation of new integration plans. Much criticism has arisen, however, about the need for the Mayor to take steps that would affirm the sincerity of his efforts, especially in that his actions do not apply to all of the City's schools or address access to highly segregated programs such as those for gifted and talented students (Shapiro, E., 2020).

For many marginalized populations, access to learning has not changed. In 1991, when Jonathan Kozol studied schools across the country, he referred to the education of children of color in poor urban settings, as "the survival of the children of the fittest—or of the most favored" (Kozol, 1991, pp. 73-74). In the time Kozol conducted his study, he saw access to learning as dependent upon the parents' level of education, the poorest communities being no exception. "[E]ven in poor black neighborhoods," Kozol writes, "it tends to be children of the less poor and the better educated who are likely to break through the obstacles . . . " (Kozol, 1991, p. 73). Today, with access to learning including, in large part, access to technology and the Internet, Kozol's initial observations are no less relevant, and access to learning remains very much conditional on a number of factors.

While some may stress a desire for returning to in-person instruction, the conditions described in *Gary B.* make it clear that little has changed for poor urban youth of color. Kozol's observations resonate with the experience of the students in Detroit. We hear Kozol's words "[T]o ask an individual to break down doors that we have chained and bolted in advance of his arrival is unfair" (Kozol, 1991, p. 76), echoing in Governor Whitmer's sentiments about Detroit students' facing obstacles to learning they never should have faced. With the Plaintiffs in *Gary B.* alleging an inexperienced and often absent teaching staff, substitutes lacking; inadequate curricula and appropriate learning materials; overcrowded classrooms unheated in the winter and stifling in the warmer months; omnipresent cockroaches, vermin, bedbugs, and mold; failing infrastructure including cardboard-covered windows, leaks, and falling ceiling tiles and plaster (*Gary B. v. Whitmer*, 2020, pp. 8-11), it is difficult to imagine that the district would be in any better position to equip all learners with computers, Internet access, and bandwidth.

Consider the plight of the many homeless children across our country. How consistent and adequate is their access to learning? In an article detailing the enormity of this population and

the scope of challenges faced in New York City alone, Samantha Shapiro writes that the number of New York City homeless students exceeds

> the entire school populations of Boston, Indianapolis and Rochester combined. . . . Many homeless children have a hard time simply getting to school, because they are exhausted from sleeping in an apartment with more people than beds, or aren't able to clean their clothes, or have slept somewhere far from their school, or have to miss school to attend mandatory appointments with their parents. (Shapiro, S., 2020)

Research on this population across the country, she continues, is scarce, with "their transcience hinder[ing] access to treatment [of health needs] and early intervention" (Shapiro, S., 2020) where the percentage of students with special needs far exceeds what is typical in many states. Shapiro quotes Barbara Duffield, director of SchoolHouse Connection, a national nonprofit focusing on the impact of homelessness on education. "Not having access to an education," Duffield is quoted as saying, "condemns these kids to a life of poverty, homelessness and hardship" (Shapiro, S., 2020). The challenges of providing remote learning to homeless students during the pandemic have been monumental as, for among other reasons, shelters provide little privacy and lots of rules that make it difficult for parents to supervise children when they go off to work. Simply leaving older children to learn remotely by themselves, given that there is even access to the Internet, is often, if not always, prohibited in shelters (Shapiro, S., 2020).

Quite at the other end of the economic spectrum, the pandemic and remote learning has affected students in the town of Brookline, Massachusetts, as well—but for very different reasons. A district fraught with hostilities between the union and the school committee, on-going for years, has now been faced with planning for instruction in a model where teachers have not received sufficient training in engaging students virtually on such a huge scale, are extremely concerned about health and safety with a return to the classroom, and are torn between union contract demands, administrative curricular mandates, and doing what they believe is the right thing for children (Malone, 2020). Additionally, teachers are dealing with a highly-invested, well-educated and positioned parent population. Brookline "is the second-most-educated place in the country, behind only Bethesda, Maryland" (Malone, 2020), and includes the president of Moderna, among many with Ph.D.s. Add to this "a group of privileged white parents who are extremely skilled at promoting their position," and school committee meetings that have "quickly become must-see TV" (Malone, 2020).

Were the teachers and the school committee "using the COVID crisis as a bargaining tactic" (Malone, 2020)? And, if so, what is the impact of doing that on access to learning for students? Any indication of instability in this regard, Malone points out, has significant ramifications. He notes, "[t]he Brookline schools have been bleeding enrollment" with 11 percent of students leaving the district by November 2020 as compared with only four percent across the state (Malone, 2020). Fewer children means fewer dollars and the need for fewer teachers to staff fewer of the programs high-powered parents value. Have children of wealth become marginalized populations not only in Brookline, but across the country?

It appears they have by virtue of power struggles between educators, administrators and parents unable to be present to support their virtual learners. It is an interesting consideration, especially when looking more deeply into the motivation behind issues presented in wealthy communities, such as with the Scotch Plains-Fanwood suit where parents challenged the administration for not returning students to schools but provided no support based upon the district's efforts to address learning during the pandemic. The plaintiffs in that suit aver that "Remote learning puts Plaintiffs' children at a complete disadvantage as compared to other like students in the state of New Jersey and throughout the country" (*Dembiec v. Scotch Plains-Fanwood Regional School District*, 2020, para. 29), a sweeping generalization, difficult to substantiate.

Accusations have been made that, by virtue of being forced to access learning digitally, children are not receiving an adequate education. Even though the *Leandro* case was initiated almost two decades ago, allegations that children are not receiving a "sound, basic education" still very much apply to virtual learning today with the court's remedial plan in that case identifying the need for, among other things, funding for "adequate resources," learning opportunities to ensure workforce readiness, and "access to high-quality pre-kindergarten and other early childhood learning opportunities" (McColl, 2020). In early fall 2020 parents in the Charlotte-Mecklenburg School District alleged their children, as a result of the District's "move to fully online instruction," were being denied "the provision of a full public school education" (Mecia, 2020). A pattern of uncertainty regarding access to education and incomplete information about the implications for virtual delivery of that education has clearly evolved.

What Do We Do Now?

> "So many things are possible just as long as you don't know they're impossible." Norton Juster, The Phantom Tollbooth (Juster, 1961)

In the first three parts of this study, the enactment of case law and legislation dominated an unsettled assurance of access to learning predicated by the reality that a law is a law only until it isn't. This final part is different in that it examines unfolding challenges and possibilities giving tacit permissions that would, otherwise, be unimaginable or unrealistic. "What do we do now?" involves ensuring that students are accessing learning into the future.

As students remain in what amounts to a virtual holding pattern, the enormity of that charge is resulting in an expressed urgency to restore face-to-face schooling, an archaic model that, at best, should only be brought back with funding for proper mitigation measures to ensure safety. CDC Director Rochelle Walensky, in a recent interview, spoke of specific mitigation measures including masking, proper distancing, "dedensification" of the classroom, contact tracing, ventilation, and handwashing, noting that, *with funding to implement all these mitigation measures well*, the data and the science suggests it would be safe to return to in-person learning, even if all teachers are not vaccinated (Walensky, 2021). Funding is a big "if." Realistically, social distancing in classrooms, lunchrooms, and hallways will be an issue for the foreseeable future. Those even imagining that there could be enough money to accommodate the logistical changes needed to ensure safety and properly implement mitigation measures, especially in hallways and lunchrooms, where students must unmask to eat, likely may not have taught in or managed a public school at any level. While undertaking this challenge is not impossible, the scope of doing it successfully is enormous.

The push to return to brick-and-mortar school classrooms also fails to take into consideration that having teachers and students in the same physical space does not guarantee learning takes place. A teacher's tweet best expresses that many other factors play into whether or not learning is accessible and accessed: "I've been teaching face to face all school year, and I'm here to tell you: face to face instruction doesn't = better mental health for students. They're all still struggling. Because it's a pandemic" (Hannaford, 2021).

This study does not attempt to solve the return to school problem. Neither can we pretend that virtual learning is a totally new concept, as many charter schools have been teaching this way for some time. However, what is new is the need to think differently about virtual learning and the doors it can open for *all* students, not just those more inclined to digital learning in the past or fortunate to have experienced it prior to COVID. The final part of this study seeks to posit that schools, at *this* point in time and by virtue of what McKinney de Royston & Vossoughi (2021) termed the pandemic's "cataclysmic challenges," have been given a unique opportunity to examine access to learning using virtual spaces to exceed traditional limitations.

Traditional limitations return us to schools segregated by race, ethnicity, and wealth and to schools that have failed students through inequities in qualified and quality teaching staff and administration, resources and funding, and opportunities for learning. Transition to full virtual and hybrid learning models has uncovered systemic cracks in our system of education that have deepened over time. Niccolls & Midles cite as one example the idea that being a successful learner means being able to compete for merit on a level playing field with everyone else. They note,

> Students have been prohibited from accessing meaningful content and learning experiences well before pandemic schooling circumstances. Students are not failing more now than they were before. The *system* is failing more now than it did in the past. The controls of location and delusional thinking that students at school, in buildings, sitting in classrooms means that they are learning has been unable to translate to remote instruction. (2021)

We need to revisit what success looks like.

Transition to virtual learning has also revealed new and unexpected student groups who now join previously marginalized populations experiencing limited access to learning. These new groups include, but are hardly limited to:

1) Children lacking computers and consistent Internet access and bandwidth.
2) Children with no private space in which to learn.
3) Children with no parent support either because their parents are physically absent or because they lack tech-knowledg-y.
4) Homeless children.
5) Children who have lost in-person services and socialization opportunities.

6) Children who suffer because virtual barriers separate them from teachers and counselors who may identify mental health and/or learning needs.
7) Children trapped in unstable family and home environments now unable to be afforded the privacy that in-school counseling allows.
8) Populations of students affected by the devastating loss of family members to COVID, some of whom may be newly-orphaned or suffering from PTSD. (Chatterjee, 2021).

As the list grows, one is led to wonder why is this so, and who is ultimately responsible for helping these students access learning, resources, and services so that access becomes a reality rather than a mirage?

No case law or legal entitlements carve out a path forward—only conjecture based upon talk of lawsuits, public opinion, and research using metrics ill-suited for virtual and hybrid learning models currently in place. Conversations are taking place in "thinktanks" with K-12 and university educators across the country that inspire hope for change. Topics from these conversations address access to learning and include, among other issues, "learning loss" during the pandemic; changes to expectations for what education should look like; the future of virtual learning; and how access to learning may look very different in years to come.

The issue of learning loss, hotly debated in the press, is one that is particularly troubling. Notable and respected research institutions are quick to share data magically revealing how many years of learning loss will result from each month of virtual access. Data accuracy is an important consideration. NWEA, a group that describes itself as "a pioneer in educational research and assessment methodology with a focus on improving learning outcomes for every student" (Kuhfeld et al., 2020, back cover), recently released a report on achievement and growth in reading and math during COVID. As a disclaimer to their findings, authors of the study note, "Student groups especially vulnerable to the impacts of the pandemic were more likely to be missing from our data. Thus, we have an incomplete understanding of how achievement this fall may differ across student groups . . ." (Kuhfeld et al., 2020, p. 2). That many will overlook disclaimers such as this contributes to the distortion of even well-intentioned data.

But what should we measure? It is difficult to imagine a parent who would *not* want their child to learn, but with our goal-driven society expecting that everything must be quantified, measuring to affirm that learning is taking place is no different. While reaching preordained

standards may be acceptable where products need to be made available and safe for general public consumption, this is not what works for people, especially if we appreciate that everyone has their own unique strengths. With an increased focus on measuring learning since the advent of No Child Left Behind in 2001, parents and educators have, unfortunately, lost the intuitive ability to pick up on the descriptive, unquantifiable data revealed in children's responses to the world around them, as well as the ways in which children tell us what they need.

The times they are a-changing as it has been said. Even the College Board has begun looking at its products and how virtual learning amid the pandemic has changed the value of SAT and other standardized testing in the college application process (Nierenberg, 2021). As Niccolls and Midles so aptly state,

> The pandemic is a portal for the opportunity and not a setback. Our children are experiencing continuous learning. They aren't necessarily learning what we measured in the schooling of the past. They aren't predetermined content, formulaic, rote, memorized, or skilled question analysis and multiple-choice selections types of learning. It is *agile time* learning . . . They are learning in relationship with digital resources. (2021)

The simple answer to whether learning has been lost during the pandemic from the perspective of Niccolls and Midles and others, is that students have not experienced learning loss during the pandemic. What they have experienced is "school loss and peer interaction loss" (Niccolls & Midles, 2021) as the universe in which they interact with others has changed exponentially. Expecting that goals for learning will be the same with virtual access to learning, and that we can measure achievement in virtual space using the same metrics as for face-to-face learning, is like the proverbial comparing of apples to oranges—and it also begs the question what types of measurement best suit children now and into the future. Cotter & Seymour, in their 1993 book *Kidgets,* suggest

> What if the aim . . . is to have all kids master important skills? And the measure is that they learn—and can demonstrate—all the skills? If that is the aim, then what useful purpose do marking and grading serve in an educational environment? (p. 12)

Goals change. Skills needed to thrive and achieve a sense of accomplishment in life change. "We are all changed. We must let go of standardizing and turn towards personalization and

actualization. Our ability to do this well will be a turning point as the entire world shifts into a new way of being, post-pandemic" (Niccolls & Midles, 2021). Arguing that learning has been lost during the pandemic has the potential to force access back to a uniform model for learning built upon segregation by wealth, by privilege, by race and ethnicity, by language—each of which, in its own way, historically permitted schools to standardize instruction, to mass produce, track, and indoctrinate learners.

In contrast, consider how learning virtually has the potential to erase boundaries. If a guaranteed level of funding existed in every district across the country to provide every student with a computer and a commitment to *equitable* Internet access and sufficient bandwidth—the need for which will vary depending upon where the student lives, that would be a start. Imagine how, if everyone could connect, what doors would open. High school students could create their own programs focused on their interests and passions, drawing from courses offered across the country. If they learned virtually, school hours would look different. Each student could be assigned a teacher mentor from their home district who would work with them to create their program and monitor their progress according to customized learning objectives consistent with goals for their transition from school to learning and life beyond K-12. Segregation could all but disappear. Bullying that interferes with the ability of so many to learn will greatly diminish. The community will assume more of an "it takes a village" mentality where school isn't just someplace to which children are sent, and education truly becomes the "fabric of society."

Of course, there are many underlying logistical implications in implementing this model, one of the more important being equitable pay for teachers. There is no question that this framework should be considered—in fact, Jeff Bezos is banking on it. He has recently made a $2 billion investment in Montessori-type preschools in an effort learn more about in-person school operation, and all indicators point to Amazon's outreach into education as one of its most important next frontiers (Dresel, 2021).

Why is this important? As Dominik Dresel shares in his *EdSurge* opinion piece*, Jeff Bezos wants to go to the moon. Then, public education*, brick-and-mortar schools will still be around 20 years from now. However, the value of maintaining them may not be worth the expense as virtual learning continues on its post-pandemic course. Amazon is banking on parents choosing between crumbling infrastructure reflecting "an industrialization-era widget

factory," and learning models reflecting "the rapidly changing work environment [a] child will actually graduate into" (Dresel, 2021). Looking very similar to the model outlined above, in the model of which Dresel writes, remote and asynchronous learning would be provided by well-paid master teachers "who leverage adaptive learning technologies that build an individualized learning path for [their children]" (Dresel, 2021). Learning in Amazon's world will take place in "centers [that] look less like classrooms and more like co-working spaces, with lounges, group meeting rooms, individual study spaces, playgrounds, and makerspaces" (Dresel, 2021).

Dresel points out that schools have been advantaged by contributions from tech giants such as Apple, Google, and Microsoft. He notes that despite push-back likely to come from teachers' unions and communities unwilling to relinquish control, funding realities and the abilities of corporations to partner with schools can help public education remain relevant and compete with a tech-savvy charter niche (Dresel, 2021). Bezos attributes his success to being about "build[ing] a business strategy around the things that are stable in time" (Dresel, 2021). Dresel sees Amazon's involvement in education not as an "if," but as a "when," and encourages "public education to take inventory, and understand its continued value proposition to our society, and the economy" (Dresel, 2021).

The idea of business-education partnerships is not new; however, if one thinks about schools in their community currently, they may be hard-pressed to come up with partnerships extending beyond programs in certain curricular areas or a nominal sharing of resources. In some places corporations have adopted schools as can be seen by the school names. However, by-and-large, education fears being taken over by those who do not have the training to run this very specialized "business." We have all seen what happens when those unfamiliar with public schools are placed in positions to make decisions directly affecting education. It's certainly a risk going into the future, and Dresel notes that a danger of involving corporations in education may be that those corporations become a "Trojan horse" that can "rob public education of its soul, its identity as a public institution" (Dresel, 2021).

An important first step in Dresel's "taking inventory," is to look and listen to the children. We need to carefully consider whether data provides an accurate or complete picture of learning or whether it describes a reality that no longer exists. We need to dedicate ourselves

to listening to the voices of students describing what they've learned virtually and what help they need to learn better.

Perhaps districts employ a school-within-a-school model to create confidence and investment in change. Different types of virtual learning experiences can be piloted for some or all students in a way that changes attendance patterns with the primary aim of enhancing learning while accommodating COVID spread as a by-product. An extension program in Cambridge, Massachusetts, distributed laptops and Wi-Fi hotspots to all students, as well as changed the start time for classes to mid-morning. That, plus weekly individual meetings with each of their teachers, resulted in soaring attendance and honor roll rates (Vaznis, 2021). The strategy this school embraced was to

> take advantage of the ever-changing world to enliven classes, strengthen relationships with students, and tend to their social-emotional well-being. Teachers taught the science behind the virus and how it spreads. They gave history lessons on past pandemics, and in the wake of George Floyd's death at the hands of police, they increased the focus on social justice and racial equality. (Vaznis, 2021)

Teachers and students speak of the program's rewards in terms of the relationships they have been able to build and the commitment to education that has developed among students who, previously, had been attendance concerns (Vaznis, 2021).

Even students with special needs, about whom many have concerns regarding potentially changed programs and pared back supports, have found a silver lining in virtual space. Students who have thrived include those who experienced anxiety when learning in traditional classrooms, those who faced bullying, who were introverted or uncomfortable in social situations, who were easily distracted, or who yearned for freedom to move at their own pace—more quickly with things they know and more slowly with things they didn't, including the opportunity for individual help from teachers. Alyson Klein in Education Week notes, "It's important to look at why the kids who are thriving are thriving" (Klein, 2021, p. 9)—and many are.

We did not get to where we are with access to learning by chance; it will take more than that for us to grow into a model where access to learning in a virtual world is a reality and not a mirage. By virtue of the pandemic, our world has evolved to where what we used to do in person we now more naturally do virtually—not just in schools. Where, without question,

there is concern for businesses that have failed and people with greatly changed economic circumstances, there are also huge numbers of industries and new employers that have evolved and blossomed to meet the needs of a more virtual and isolated world. In order for access to learning to be a reality in a virtual world, we must be resilient and embrace the challenge of thinking and doing differently. The world for which we have traditionally prepared our children no longer exists.

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Chapter 2 - Portfolios as Formative Assessment in Applied Mathematics: Influences of Portfolios on the Teaching-learning Process

Edeltraud Gehrig, Annika Kanzinger, Joerg Zender

Chapter Highlights

- Inclusion of portfolios using iterative process and coupling elements of a review process with elements of sports training in education is possible.
- The chapter highlights the demonstration of the importance of creativity in STEM lectures.
- In this chapter, the role and potential of portfolios in the examination process is discussed.
- The paper argues the learning success on different levels with one method: Catching weak students and individual support for strong students (heterogeneous groups).
- Motivating students by individual coaching, taking the learning level into account and the (self-selected) individual goals of the students are emphasized in the present work.

Introduction

The portfolio is often a buzzword in education. In the school and university context, portfolio work has become part of daily business. A closer look at the literature and practice, however, reveals a conceptual diversity. The diversity results in a lack of clarity about what a portfolio is and how it can be used in a meaningful way. Nevertheless, the portfolio is based on a pedagogical idea of dealing with learning achievements: integrating the evaluation and teaching function for individual learning support. The portfolio combines the traditionally isolated teaching, learning, and assessment functions with each other, which enable an interplay between external and self-management (Häcker, 2005; Jahncke et al. 2018; Egloffstein et al. 2010; Farrell, 2020).

A portfolio is a focused collection of work showing students' effort, progress, and performance in a specific area (Paulson & Meyer, 1991). Arranged suitably, the collection will reflect the learning process and overall progress in a studying person's behavior (Yang et al., 2016). From a didactical point of view, one of a portfolio's primary functions is to encourage students to reflect on their learning process critically. The teacher supports this learning process (Yang et al., 2016; Qvortrup & Keiding, 2015). In addition to evaluating student learning products, a presentation portfolio also enables teachers to guide the learning process continuously. Several small tasks can already be worked on during the course and accompanied by feedback (Kreuzer 2018). Portfolio work demonstrates how learners think, analyze, design, and interact with the teacher linguistically, socially and emotionally (Grace 1992). This makes it an essential source of information for teachers and students and, thus, a valuable basis for feedback during the course (Kreuzer 2018).

Portfolios influence all areas of competence. For example, portfolio strengthens the ability to link new knowledge with existing knowledge (Peet et al. 2011, Haave 2016, Hosseini & Ghabanchi, 2014). It thus leads to deeper learning and a more solid knowledge structure (Ambrose et al. 2010). In this chapter, we want to concentrate on the motivational and learning-outcome effects of portfolios.

Theoretical Framework

In today's professional world, not only expert knowledge but also interdisciplinary skills gain

significance. Therefore, acquiring these competencies is an attractive goal that should be kept in mind when developing a study program. In STEM, these skills must not be treated separately, i.e., restricted to specific soft skill subjects without reference to technical knowledge. Instead, they should be closely linked to and embedded in the teaching of subject-related topics. In mathematical-scientific courses of study, a successful transition into professional life needs to develop the ability to reflect on problems, independently develop ideas and work out solutions to unknown situations based on previously acquired knowledge. It is also necessary to recognize structural similarities in different contexts and to effectively develop problem-solving strategies. Finally, evaluation and critical reflection are crucial for developing a solution for the working environment and society. Although they are currently an untypical form of examination, portfolios are an effective way to prepare for professional life in mathematics and science. One aim of the portfolio modules is to promote the technical, methodological, personal and communicative competencies required for self-directed learning (Arnold 2007). Students should use the portfolio to design, document, reflect on and evaluate their learning path in terms of the qualification goals.

Another point is the often-lamented heterogeneity, especially in mathematics (Müller et al., 2018). The flexible design and concept of the portfolio examination allow for individual support with a high degree of learning progress. Our portfolio addresses technical competencies and methodical expertise, both combined with elements for a critical reflection of the own learning process. Using portfolio as an examination method thus not only allows teachers to test students in regards to the competence fields (in accordance to the respective module description) but also to adjust in a very flexible way (depending on the subject, student heterogeneity and previous knowledge) the composition of the examination. Furthermore, the possibility of using individual deadlines for selected parts of a portfolio over course length intensifies an optimum alignment of methods, goals and expected results ('constructive alignment'; Kreuzer 2018), thereby thoroughly balancing knowledge transfer and competence development.

Portfolio as an Instrument for Coaching and Feedback

Portfolios in the educational field are not created ‘in one go’ but the process of multiple revisions. Several cyclical phases models have been established to describe self-regulated learning processes based on the control loop models of cybernetics (Landmann et al., 2009;

Schmitz & Wiese, 2006; Zimmerman & Moylan, 2009). In these models, accomplishing a learning task due to individual feedback loops is considered a process of iterative-recurring stages. The first phase (preparation phase) is analyzing the learning task elements and the learning context. The analysis leads to a specification of learning objectives, taking into account emotional-motivational requirements (is there a personal interest in the learning content?). In the second phase (performance phase), the initially concrete plans and strategies are implemented, i.e., the student initiates concrete learning actions. Monitoring one's learning progress is relevant to the regulation of learning actions to achieve the learning goal. In the third phase (self-reflection phase), the individual learning actions and learning outcomes are evaluated. What has been achieved is compared with the learning goals that were specified in the preparation phase. Products from these phases flow into the preparation phase, and the cycle begins again. Low or insufficient performance, therefore, rarely occurs when working with portfolios. However, where they do exist, they often contain indications of a failed portfolio process, e.g., where no adequate support could be provided. The collection is subject to constant change, development and feedback (Häcker 2005, Zartmann 2014).

The way we used portfolios in our lecture they are strongly linked to feedback as defined in sports. In sports, feedback should effectively support the following three steps: Awareness raising of action-guiding prototype structures (1st step), action-reflection with the inclusion of expert knowledge (2nd step), the renewed initiation of action-guiding prototype structures (3th step). The reflection of all three steps concludes the feedback in sport. These three steps can also be interpreted as parts of a portfolio (Brouër, 2007). Furthermore, in sports, the method of augmented feedback represents a core idea (Magill & Anderson 2007): If a specific score is achieved, the athlete gets feedback through that scoring called knowledge of result/performance. However, for an inexperienced athlete, this knowledge of result/performance does not help to improve. On the other hand, a coach can give augmented feedback addressing the whole process of moving (knowledge of process). This kind of feedback helps the athlete change things and gets a better outcome. Augmented feedback should not be given too often. The athlete can struggle with too much information and become dependent on the coach's advice. So, the rules for feedback in sports are that it should be given:

- if specific goals are not met or exceeded
- if the athlete requests it

- if several attempts are made, and the feedback summarises these attempts (ibid.).

In his meta-analyses of successful teaching, John Hattie (2012) states that it is essential for learning success to empower students in self and social skills: self-responsibility, self-control, self-confidence, self-reflection, realistic assessment of self-efficacy and self-confidence need feedback from teachers and peers to develop. Feedback from teachers is based on evaluating teaching and learning processes; it recognizes learners' achievements and makes mistakes in learning fields for learners and teachers (Zartmann 2014).

Portfolio as an Instrument for Motivation

The Bologna Process called for teaching to become more student-centered. This means to provide learning that enables and, at the same time, demands more personal responsibility, independence, cooperation and communication from the students (Mayrberger 2013). A portfolio allows for a more open form of engagement with learning content than traditional performance assessments such as essays or exams. Giving free rein to one's ideas, deciding for oneself to divide up the work, is seen as positive. The teacher gains insight into the work and can comment on ideas as an enrichment (Brucker 2011).

Due to a high self-control potential, portfolios can reach students with different subjective learning concepts if favorable emotional access can be established. Therefore, portfolios should be perceived as meaningful in the study context, open up creative space, and be fun (Häcker 2005, Zartmann 2014). If students can work on their questions, a higher level of intrinsic motivation is present (Fink 2011).

According to Hattie (2012), motivation is exceptionally high when learners feel competent, have sufficient autonomy, set worthwhile goals, receive feedback and validation from others. This refers to the self-determination theory of Ryan and Deci (2000). The authors claim that intrinsic motivation is based on three pillars: autonomy, competence and relatedness. These aspects are reflected in the portfolio performance as it was used in our context. Like in a journal, students handed in manuscripts of their tasks, which they created autonomously. The students then got individual expert feedback to present the course later a reviewed and (in most cases) a better version of their work. They perceive competence by presenting a good task and social relatedness doing so in small groups (for further details, see below).

Very closely related to motivation is the idea of creativity. Characteristics of creativity are flexible thinking, being open, critically questioning the existing, exposing problems and finding solutions, developing innovative products and processes. Universities play an essential role here. They should educate people who drive creative and innovative ideas further. Universities are faced with the challenge of developing or increasing their students' creative potential and teaching specialist knowledge. First empirical results show that universities have failed to focus on a learning culture that promotes creativity. A framework concept was developed in a study with dedicated professors that enables increased learning motivation (flow) through different levels. The levels in Table 1 promote creativity in university teaching (Jahnke & Haertel 2010).

Table 1. Six Levels to Promote Creativity in Higher Education (based on Jahnke & Haertel 2010)

Level	Description
6 Original, completely new ideas	Cannot be forced, if necessary, promotion of many ideas through creativity techniques and suitable environments, allow/promote mistakes
5 Promoting a new culture of thinking	Change of perspective, breaking through habitual patterns and routines, adopting a different attitude, reflection on one's own creativity and thinking structure, knowledge about how the brain works
4 Promotion of creative learning	"Creating" - providing ideas, theses, networking, texts, transfer
3 Increase the motivation to learn: promote flow	promote flow, e.g. with metaphors, humour, variety, enthusiasm, develop interesting questions/problems, establish practical relevance
2 Promotion of independent working	Acquiring knowledge yourself, controlling learning processes independently, making your own decisions
1 Promotion of independent, reflective learning	Acquire knowledge yourself instead of just taking it over, engage in inner dialogue, think outside the box, encourage to question the familiar

One way to reach the levels is to change the teaching-learning process design. The authors state that this can occur at different process points, e.g., the topic is explained, the problem definition, the solution and the procedure for problem-solving are to be contested creatively (Jahnke & Haertel 2010). This idea was used as the basis for the implementation of portfolio work presented here (see Figure 1).

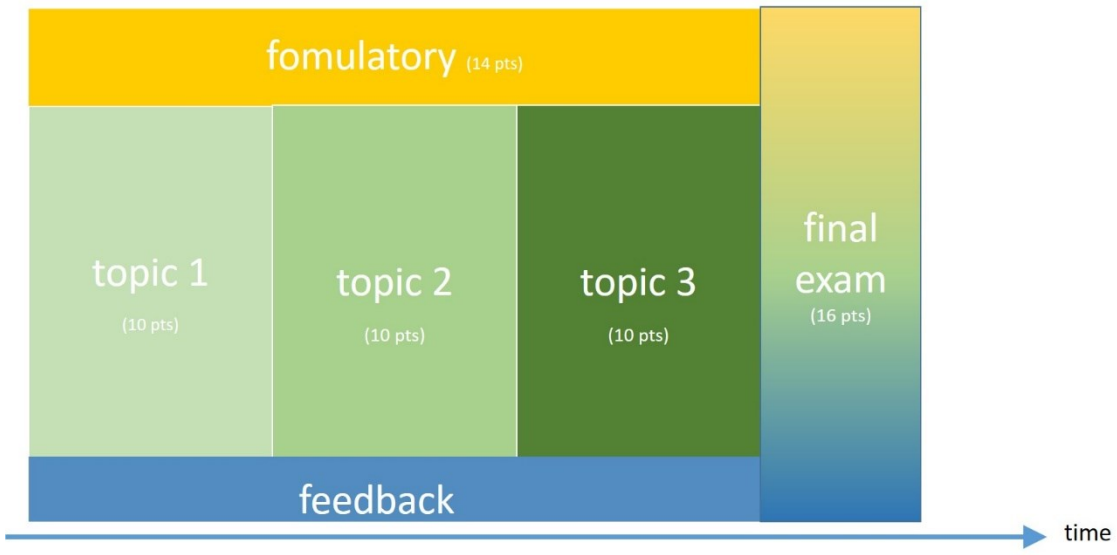

Figure 1. Composition of Portfolio

Portfolios in Applied Mathematics at the University of Applied Science RheinMain

In the following, we present the results of our case study of a portfolio for two lectures in a study program (applied mathematics). We considered the lecture Point Mechanics and Rigid Body Motion. The two are somehow related in content since the students need to apply mathematical methods to describe a mechanical application. The students of the considered courses had no previous knowledge of physics.

The students (Bachelor Applied Mathematics, first and second year) had to complete five tasks during a semester course, composing the portfolio. First, they had to develop sample tasks with sample solutions. This had to be done for three technical subtopics (addressing the course contents of the previous weeks) along with a given scheme (i.e., which type of system should – roughly – be addressed, which types of questions are of interest, which mathematical terms should be used). The three subtopics deadlines were deliberately set and spread over the study term, i.e., the submission deadline for the first task after four weeks, for

the second task after seven weeks and for the third task after ten weeks. Second, they had to summarise the lecture and submit a self-written formulary with explanations by the end of the course. The portfolio examinations ended with an electronic test (single choice test, including upload of detailed calculation leading to the student's choice).

The focus of this work is on task development. For the three self-written problems and solutions, the students were allowed to submit a pre-version, which was then discussed via email or feedback interviews. As mentioned above, there are several similarities to the augmented feedback in sports: The first point in this comparability is that we have relatively inexperienced learners (first- and second-year Bachelor students). As a next point, we can state that the pre-version of the self-written exercise and solution handed in by the students represents their current level of learning and knowledge. When they ask for feedback, this leads to the part action-reflection with the inclusion of an expert. The detailed and individual feedback about the score and the task itself provided by the teacher is a kind of knowledge of the process.

Furthermore, the students get feedback only when requested and once per task. Consequently, feedback occurs selectively and not very often. All these requirements meet the criteria for effective augmented feedback in sports. Developing their assignments also encourages student creativity, as described above. This leads us to the following research question.

Research Question

What are the effects of a portfolio of tasks in a lecture on motivation and learning-outcome? Since this is not a quantitative but rather qualitative analysis of the process, we discuss the motivation and learning-outcome in terms of creativity, improvement and attitude towards the subject.

Method

In the following, we summarise the general rules for developing and assessing the sample tasks and give examples visualizing the students' progress.

In the course "point mechanics", these three parts for the three subtopics were (1) kinematics,

(2) forces/dynamics and (3) work/energy. In the course "rigid body motion", the three subtopics were (1) position description, (2) rigid body kinematics, (3) inertia tensor/energies. For each part, the students were given guidelines to develop their exercises. The three tasks were presented in week 1 (first task), week 4 (second task) and week 7 (third task), and the respective deadlines for the official submission were week 4 (first task), week 7 (second task) and week 10 (third task). In this way, the questions matched the material covered in the lectures so far. Besides, the workload was well distributed over the semester. Through the descriptions, it became clear which the students should process elements of the currently treated topics and how this could be done—knowing the deadlines, the students could set up their time plan to perform the given task in the corresponding time interval.

General rules were the following: The students were given work assignments presenting the idea and content of the task and the learning objectives. The written task descriptions included a list of elements that should be addressed in the self-written examples and solutions. Furthermore, the worksheet listed ideas and examples for questions that could be further developed or changed. The students thus had a clear plan of what had to be done. They could decide whether they prefer to change the given examples to develop an own example (with a solution) or to derive something completely new (depending on their interests), thereby considering the elements that needed to be addressed.

In the following, we select only a few task descriptions to explain the idea for both lectures. In the lecture point mechanics (where masses are in good approximation assigned to geometrical points), the three areas behind the three tasks were 'kinematics', 'forces/dynamics' and 'work/energy'. In the worksheet for 'kinematics', it was explained that the self-written example and solution should refer to a situation where different types of motion and start conditions are combined. This could be, for example, the motion of two vehicles (e.g. one moving with constant velocity and the other with a given acceleration) starting at different times and conditions.

Similarly, the motion of various projectiles could be addressed. The worksheet suggested typical questions and situations that can be addressed in the self-written task: 'When and where do the two vehicles meet?' or 'Describe the maneuver when one vehicle overtakes the other (considering safety distance, required time for the maneuver, speed limits'). Typical quantities ('elements') that can be calculated in these situations were listed. The students

were given information on how many of these elements should be addressed in their self-written example and solution. They could combine the elements following the line given in the examples or derive entirely new situations. Similarly, clear instructions were given in the areas of 'forces/dynamics' (where students were trained to use forces to describe static and dynamic processes in everyday life or applications) and in the area of 'work/energy' (where various energy forms and energy transformations were used and typical examples of transformations between, for example, kinetic energy, potential energy and deformation energy were addressed).

In the lecture on rigid body motion (where the spatial structure of the mass distribution is explicitly taken into account), the three areas covered by the worksheets were 'position description', 'description of motion sequences of rigid bodies' and 'inertia tensors and energies'. The content thereby ranged from a mathematical description of rigid bodies' positions and movements up to the optimization of complex coupled (translational and rotational) motion sequences.

Students were offered feedback on the completed assignments via email or/and conversation before the official submission. Afterward, they could revise their solution again and submit it for evaluation by the lecturer. One of the three tasks had to be submitted in a formatted and typed form. The student could decide which of the three tasks he/she submits in such an article form.

A maximum of 10 points (out of a total of 60 points for the entire portfolio) could be obtained for each sample (i.e., in sum, 30 points for all three areas). The assessment of the work was done along with the following scheme:

- complete and correct (7 points)
- well-designed including illustrations and thoroughly structured – optimally solved the example could so to speak be incorporated in a real textbook (2 points)
- creative and unique (combining elements in a new way to explore and describe either unknown situations or problems (1 point)

The students received the final marks for the self-developed questions and solutions a few days after the submission to ensure augmented feedback in time and support the overall process's continuity. These three parts covered approximately two-third of the semester,

beginning from the first week. The remaining 30 points could be obtained by creating a formulary (14 points) and writing a test (16 points) at the end of the semester.

The task "write a formulary" supported the students' preparation for the exam. It also helped the students structure their thoughts, bring the actual contents to the point, and write them down clearly. The final test allowed for testing of knowledge and the competence to solve given tasks. It consisted of eight questions that had to be answered. One point was given for the correct solution and one point for an explanation to value any effort to derive solutions (see Figure 2).

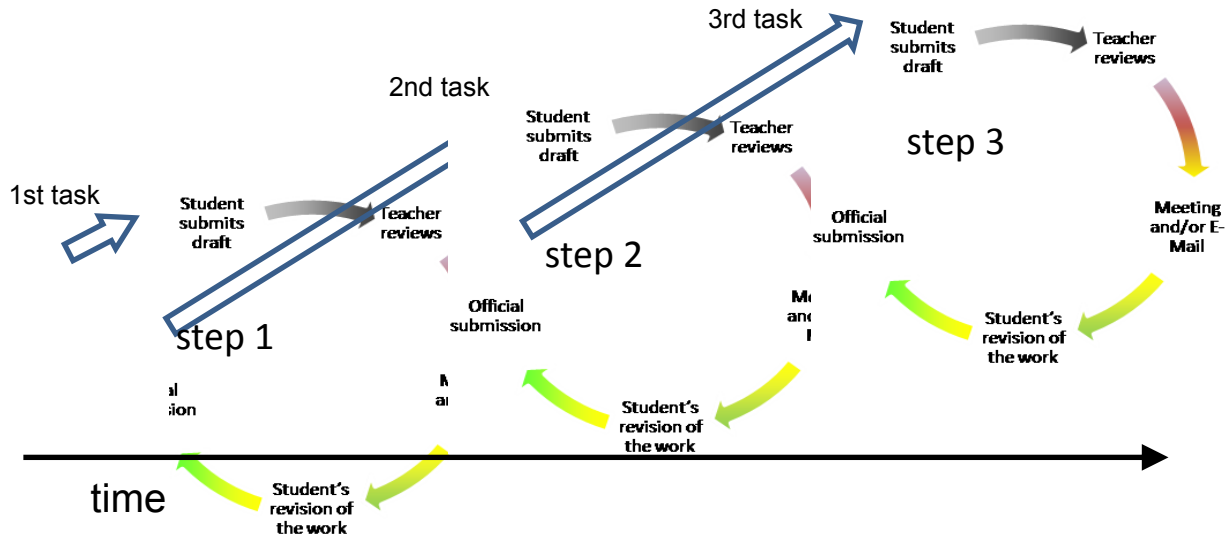

Figure 2. Stepwise and Reinforced Learning: Combining Review and Training

In the following, we present some results of the three graded assignments during the semester.

Results

This chapter contains empirical explorations of the data collected in connection with "point mechanics". The empirical evidence starts with investigations of three students' portfolios with improves learning outcomes and a detailed description of the examples. A look at an example of portfolios with increased motivation and transfer to real-life completes the explorations group.

Examples of Portfolios with Improved Learning Outcome

In the following, we reveal the role of review and feedback in the self-written exercises with solutions in the learning progress. All students improved their work after taking into account the suggestions arising in the feedback process. For better readability, we skip the self-written solutions.

Example student 1 working on point mechanics, part "kinematics"

Exercise: We consider two people. The first one is 1.30 m tall and throws a ball from a height of 1.00 m. The other is 2.00 m tall and throws a ball from a height of 1.80 m. The first person throws with a 91 km/h; the second person throws with 88 km/h.

a) When are the balls at the same height?

b) When do the balls arrive at the bottom?

c) What is the maximum height of the balls?

d) Both persons play a game: The second person throws the balls into the air (with a given velocity), and the first person tries to adjust the speed so that the balls are of equal height after 2 seconds.

Solution]

Feedback: Point d) was added by the student only after the feedback discussion. In this conversation, it was suggested to think about how the two movements could be brought together mathematically by following the game's idea. The student liked the proposal and tried to implement it. This added part of the task is considerably more complicated than the questions in a) -- c). Thus, the student improved considerably during the development (i.e. after the feedback conversation), found the solution, and then checked the plausibility task.

While checking for the calculated values' reasonability, the student realized that the calculated values were unrealistically high for nonprofessional players. The student looked up a reasonable velocity interval and estimated which similar start situation and choice of affecting parameters (from a reasonable range) could fit. The student tried various mathematical methods to reach this goal, thereby going voluntarily far beyond the original question.

Example student 2 working on point mechanics, part "forces/dynamics"

Exercise: A lamp is to be integrated into a room. Two different configurations are considered: In the first configuration (a+b), a lamp (weight force 60 N) is attached with two struts to one wall. One rod is fixed perpendicular to the wall, and the other one forms a 50° angle with the first rod (see Figure 3).

(a) How can the rods be arranged?

(b) Which design is possible when the dowel placed in the wall is designed for a tensile force of 50N?

In a second configuration (c), a floor lamp is chosen. The lampshade is balanced with a weight.

(c) How heavy must the weight be so that the lamp is balanced?

(* to a) Convert the construction from (a) now in a configuration as follows: the long rod stays fixed at the top at its original position, in such a way that, with the upper dowel remaining, the lower dowel is moved 0.2m downwards.

At what height measured from the floor is the lampshade then when the original height is 1,5m above the ground, the upper rod (l1) is 0,5m long, and the lower rod (l2) has a length of 0.4m?

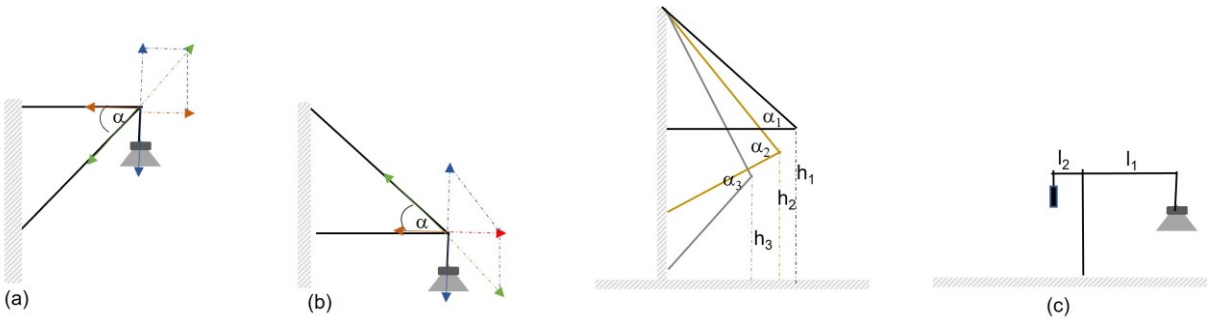

Figure 3. Portfolio Work of Student 2

Feedback: The extension to part a, i.e., the attempt to arrange the rods differently and see to what changes this would lead, was inspired by the feedback loop. The student tried various configurations and realized that only some of them make sense and that further trigonometric calculations are required. Again, the part of the example added after the feedback conversation has a much higher degree of difficulty.

Example Student 3 working on Rigid Body Motion, "Inertia Tensor / Energy" Exercise

Consider a cuboid and a coin of equal mass and calculate the inertia tensor concerning the bodies' symmetry axes. In a next step compare with the inertia tensor of the combined system when the axis of rotation is such that it touches the rim of the coin and a corner of the cuboid. Thereby, various inclinations and corresponding angles can be considered in the configurations. Finally, the coin is thrown in a hyperbolic sinkhole. Analyze the motion and the energy contributions (potential energy, motion energy) during the spiral movement down to the bottom in the middle of the sinkhole in dependence on start conditions.

Feedback: The idea to do something real with the coin came during the feedback. The analysis of the motion and the various energy contributions (translational energy of the mass center, rotational energy, potential energy) during the movement are much more complicated than the calculation of the inertia tensor of the symmetric bodies.

In all cases, the feedback led to an improvement of the self-written examples. We would like to note that the teacher only indicated in what direction one could improve the work in order to describe a more realistic case or how a configuration could be changed so that dependencies on typical or critical parameters can be derived. The idea of how to do this was found by the student without further help. Although this meant a bit more work for the students, it was worth doing.

The grades significantly improved, and the students reported feeling much more satisfied with their new "special" and "own" ideas. Feeling somehow responsible for "their" individual work leads to a strong connection between new work and existing knowledge. This is a stable basis for a durable consolidation of knowledge. Even more, the students reported how much fun (!) they had while turning their ideas into "real" and "possible" tasks.

Examples of Portfolios with Increased Motivation and Transfer to Real-life Applications

Excellent students generally do not need pushing to get good grades. However, even these students had a substantial benefit from the applied methods. The flexibility and the possibility to discuss their ideas lead to a real boost in motivation and enthusiasm. This will be discussed in the following.

From a didactical point of view, connecting to existing knowledge and one's own life (real situations from everyday life) to things one likes or even just transferring it to a fantasy story is an essential source for the generation of knowledge. To give room for this, the descriptions of the tasks left (on purpose) a sufficiently large open space for the development of own examples. Even students who need no help thus readjusted their view in both technical expertise and motivation when they derived their examples and solutions.

For example, students succeeded in optimizing various boat types crossing a river to reach a given destination (including maneuvers, engine failure, drifts – to name a few). They also succeeded in organizing the best strategy to meet as a group in a beer garden, including the different ways with a variable level of fatigue (which influences arrival time). Other examples dealt with the development of, e.g. a tennis ball machine, a skateboard park, the optimum vehicle design for a soap crate running, the analysis of a baseball game or the analysis of work and energy during the delivery of a pizza (including different load and weather conditions) and many more.

It was overwhelming to see the creativity the students developed while trying to master an imposing work. The examples started from questions from everyday life (where one has to be aware that even posing a well-written and resolvable question is far from being trivial) to creative ideas and beautiful stories. This was particularly surprising as the reward was relatively moderate: only one point was achievable as a bonus for creativity – at a maximum of ten points for the entire example. The students simply enjoyed developing the task. They reported being enthusiastic and motivated to do more. As a consequence, the submitted work was characterized by immense quality and creativity.

Example Student 4 working on Rigid Body Kinematics

Exercise: In ice skating, one of the most challenging elements among couples is the so-called death spiral. Thereby the figure is just as dangerous as it sounds and requires a lot of body tension. The partner glides almost horizontally over the ice on one leg and is only held by the partner's outstretched arm, who rotates around his body's axis. For a good transfer of rigid body rotation, we describe the motion with roller skates (see Figure 4).

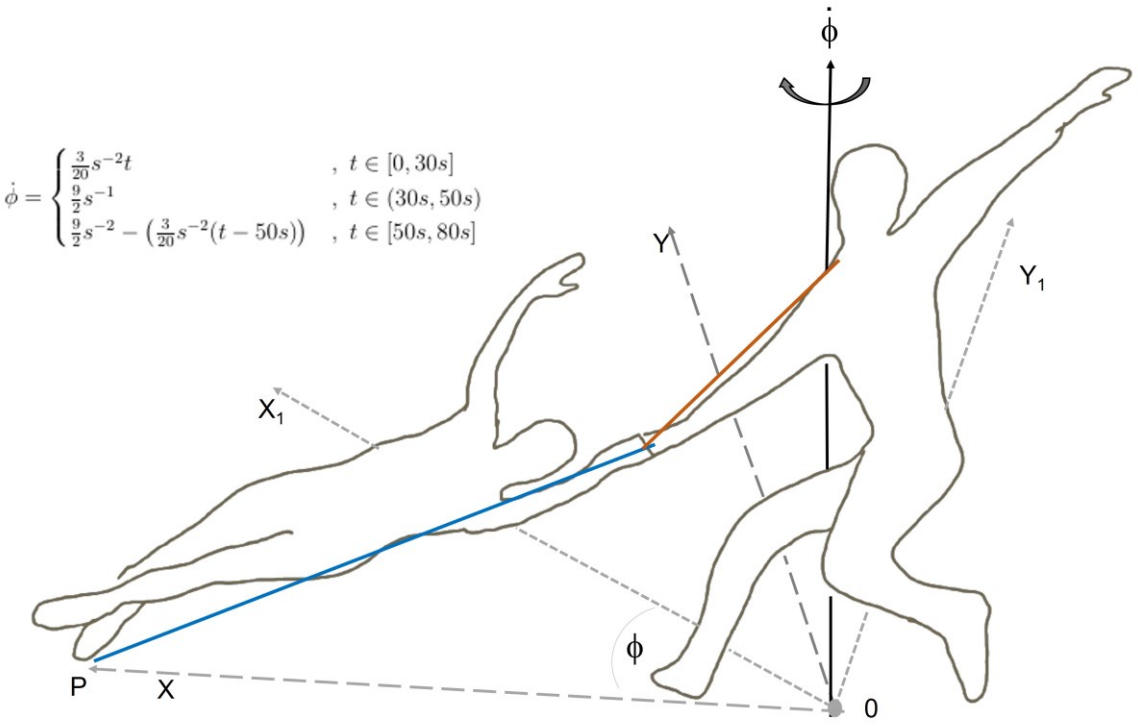

Figure 4. Portfolio Work of Student 4

The choreography was chosen so that the rotation around the own axis is driven during the first 30 seconds with a constant angular acceleration. In the next 20 seconds, the angular velocity remains constant. Afterward, it falls steadily back to 0.

The holding hand's length is 1m, and the height of the partner is 1.65m. (angle of the partner with respect to the ice surface $\theta = 35^\circ$, radius of the rolls = 0.025m). The angular veloicity of the rollers of the skates is $d(\psi)/dt$ with $\psi(t = 0) = 0$. From the second 30 onwards, the speed around the own axis is so high that the skater leaves the floor and, within the next 20 seconds, without any friction, floats free in the air. The take-off process is continuous so that at the second 40, it is at the supporting arm's height, and at the second 50 arrives back on the ground. The Point P marks the center of a roll on the shoe.

(a) Determine the rollers' position while experiencing the constant acceleration $\ddot{\varphi}$ up to second 30.

(b) Determine the corresponding speed and acceleration of the roll.

(c) How does the position, speed and acceleration change (as a function of time) up to the second 40, using the result from (b).

(d) What is highly unrealistic in the case of sub-task (c), and how can this be corrected?

(e) Assuming the partner is not standing at an angle of 90◦ but 120◦ to the ice surface. How would this affect the calculation?

Solution]

It is probably easy to guess that the solution filled many pages with large formulas and calculations – and convincing results.

Another unique point is that some students connected the three tasks to a complete story. In the following, we mention a few examples. One continuation story in the lecture 'point mechanics' covered the topic' mechanics around an amusement park' and dealt with the various attractions' mathematical analysis, optimization and finally, very realistic and essential safety questions. In the freefall tower, the cabins were calculated, and the chains pulling the cabins up were adjusted to given boundary conditions (i.e., accelerations of cabins and passengers). Resulting restrictions to the maximum number of passengers could be determined. In a chain carousel, limits in the operation conditions (i.e., speed limit) were derived for a given geometry and weight distribution.

Finally, the forces acting on adults and children, depending on their weight, were calculated. In the roller coaster, the forces acting on a car on the ramp were calculated for different numbers of passengers, and two loops of the ride were analyzed in detail. The story continued with a consideration of work and energies in a circus tent, looking at a group of acrobats' performances. Another combination of the three tasks was a tragic love story beginning with a marriage proposal with a bouquet dropped from an airplane (example 'throwing motion' of part 'kinematics') continued with a jump into a river as a result of heartbreak; subsequent rescue operation ('forces and dynamics') and finally a sports training to get back into shape ('work and energy').

Another equally impressive and funny example was a story about superheroes in 'point mechanics': The story started ('kinematics') with a meeting of a group of heroes whose paths were calculated for different boundary conditions. Realizing that he forgot his mask, Superman flies back in the middle of his journey, and the remaining participants wonder – and calculate - whether the coffee they brought with them will still be warm enough when Superman arrives. Spiderman rescues a child by shooting a spider thread along a slanted roof ('forces and dynamics') in the following episode. In the exciting battle to save the earth ('work and energy' – third and final part) from the evil, the work done along different paths is

calculated and compared (e.g., across the already devastated landscape, trajectories of the superheroes, and so on).

A similar exciting trilogy was submitted in lecture 'rigid body mechanics' (parts are displayed in Figure 5): In the first part ('position description'), coordinate transformations were used in the context of teleportation through the multiverse, recording the calculation of changes in positions using rotation matrices and quaternions. At the end of this "moving" story, the heroes eat ice cream and calculate the stick's optimum orientation so that the dripping ice cream can be licked off just in time. The second part ('rigid body kinematics') reported on Iron Man's affinity to technology as a small boy, including a detailed analysis of the coupled dynamics within a Stirling engine and a derivation of angular velocity vectors and corresponding rotational matrices. Finally, the third part showed Captain America succeeding in optimizing the stability in his shield's motion ('inertial tensor/energies") by deliberately varying the geometry and analyzing the corresponding inertia tensor.

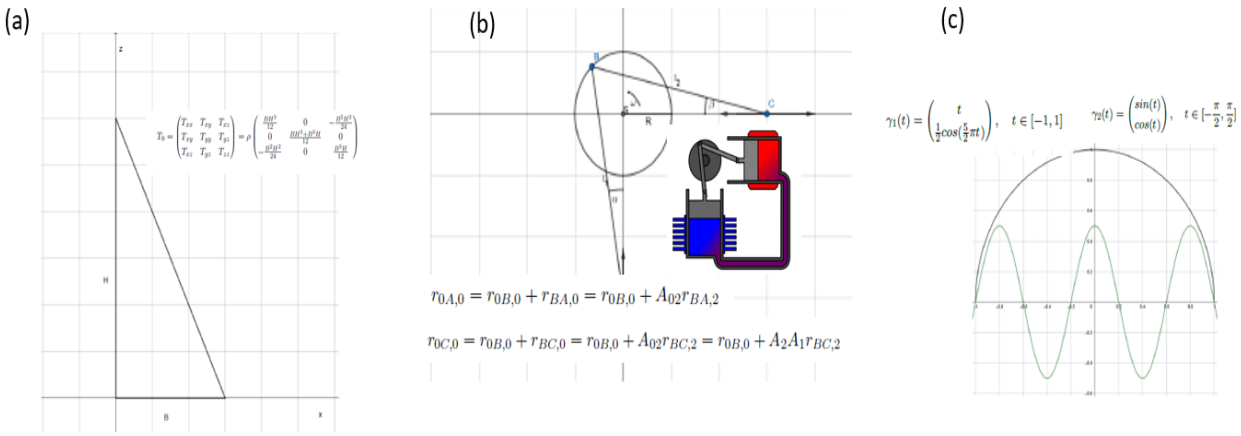

Figure 5. Portfolio Work in Episodes: (a) inertia tensor of the hero's broken shield, (b) flashback: Hero's thoughts on how engines work, (c) optimization of work and energy in a battle using different paths over the devastated earth.

Discussion

A portfolio examination was carried out for (first and second year) bachelor students. The portfolio included, in particular, three successive tasks with the possibility to discuss the draft of the self-written examples and solutions with the teacher. It could be demonstrated that the portfolio was organized like sports coaching (see Figure 6).

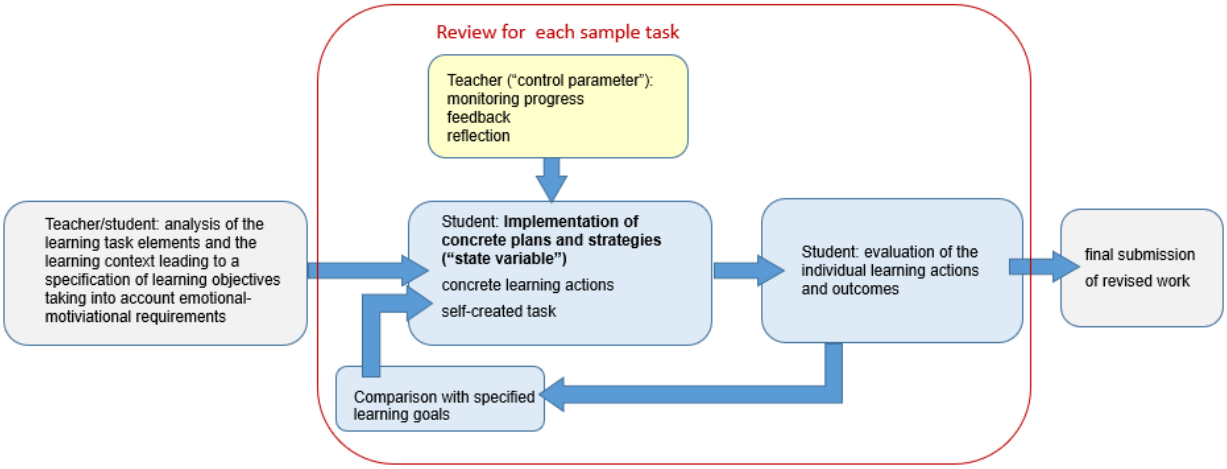

Figure 6. A Control-theoretic Approach to Formative Assessment

For each sample task, the learning objectives were specified, thereby considering both mathematical requirements and the students' learning context. This was the input to a review loop organized as a control loop model, including the student and the teacher as actors and leading to the final submission of the revised work as output quantity. In general, such a system's dynamics can be interpreted based on control theory, as discussed in Wiener (1948). A current status quo is compared to the desired target value. In the context of control theory, the state variable is in our case study represented by the state of the work, including the plans and strategies to achieve the goal. A feedback loop reports the results.

In our case study, this loop contains the teacher's review (including monitoring progress, feedback and reflection) and the student's evaluation of the feedback and the individual learning actions and outcomes. In this model, the teacher's feedback represents a kind of external and state-dependent control parameter coupling to the system. In case of a discrepancy between the target and the actual value ('comparison with specified learning goals'), the regulation process gets involved. If the two values show a good fit for each other, there is no regulation. When combining the review with the coaching process, the idea was to offer just one review (and only on demand) for each task. It turned out that the review and selective augmented feedback lead to a significant improvement in the results and additionally to a high satisfaction since the goals were at every time self-chosen (i.e. the decision whether it is worth trying to reach the final point given for creativity in the developed example and solution).

Thus, the review and coaching provided a check for content (quality and quantity, plausibility), thereby suggesting the next level to improve. It enabled a reflection between learning goals and presented learning outcomes. This possible next goal was set individually for each student, thereby coupling to the students' knowledge. As a consequence, this aim was always close enough to be reachable for the student. The student could reflect on these suggestions knowing (from feedback) the actual performance and realizing ways to improve. Based on this information, the student could decide to stay on the level (if the outcome was sufficient to pass) or proceed to a higher level. In doing so, the student could potentially reset the specified learning goals accordingly.

In this process, the students took responsibility for their learning. Additionally, the self-regulation and the process itself were controlled by the teacher acting as a coach. This supports the idea that self-regulated learning generally is, on the one hand, known to improve the learning process but carries the risks that students may not fully recognize a deficit in expertise (Landmann 2009). The teacher's suitably chosen support bridges that gap and helps to adjust the plan for the next steps following the actual goals identified by both teacher and student in the feedback loop. In combination, the consecutive tasks and the redefinition of goals and ways to reach them (via a coaching process) in between enabled support of the students' evaluation of the learning process and the decision on how to proceed.

The feedback after selective points helped to increase the task quality and performance. Weaker students learned to cope with initially unsatisfactory results and were inspired to improve their work by considering the teacher's feedback before the official submission. Precisely this step leads to a convincing increase in both learning performance and learning outcome.

As typical reactions to suggestions for improvement, we realized curiosity and ambition, leading not only to improved results but particularly to an increase in motivation. By getting the chance to learn from the situation or realize what exactly went wrong, the typically observed frustration that sometimes inhibits learning in subsequent exams could be avoided leading to high motivation and better scores. Students in the mid-range performance experienced a similar behavior: After receiving the feedbacks, the initially average performance improved, leading to better results than expected. This method turned out to be a real 'motivation boost'.

The students reported that they had much fun in the creation of their self-made examples. They developed a kind of experimental approach and courageously invented creative scenes (in most cases either linked to a direct reference to their own private lives or ideas for excellent inventive stories) using reasonably mathematical terms and relations with creativity. We believe that this connects to personal experiences and ideas that deeply anchor learning to neuronal brain activities and help to memorize knowledge on long-time scales. Finally, the excellent students went far beyond the given task. By doing so, they encountered obstacles and limits, very similar to real-life working situations, thus preparing them for future work life. Developing own tasks strongly promoted the students' creativity. This was found in a small survey of the students. The students subsequently participated in a short evaluation based on the questionnaire by Jahnke & Haertel (2010).

The results confirm the promotion of the six levels of creativity promotion:

- Through the portfolio work, the students estimate their learning level to be greater compared to learning for an exam
- Promotion of independent, reflective learning: especially the feedback helped the students (100% of the students)
- Promotion of independent working: 85% of students said that their self-organized learning was encouraged, in which they sought their ideas and acquired things independently
- Increase the motivation to learn: promote flow: 85% of students enjoyed developing assignments and implementing them practically
- Promotion of creative learning and a new culture of thinking: 85% of students were encouraged to apply their knowledge to real-world situations
- Original, completely new ideas: 70% of the students were able to develop entirely new, original ideas that did not yet exist by developing their tasks and making mistakes in the process.

It thus can be said that the portfolio work encouraged students' creativity at all six levels. Furthermore, they reported that they had much fun and felt motivated to prepare much more than the required results.

For them, the experience was, on the one hand, an optimal preparation for their future professional life. On the other hand, it turned out to be an excellent motivation for learning for life during their study. Considering motivation theory, the three requirements for intrinsic

motivation, autonomy, competence and relatedness (Ryan & Deci, 2000) are all met within the portfolio work. The autonomy was given by the free choice of what task the group would like to create. Also, they were free to organize the work as they wanted to.

Moreover, competencies were part of the coaching. They got feedback on their task, and most of them were okay but needed some adjustment. When handing in a second time after revision, the tasks became better, and the students got just that feedback.

We observed that a thorough distribution of testing within course duration combined with a feedback interview offers much potential to both teachers and students. It allows students to check knowledge in various fields of competences, and it strongly supports self-directed learning. In particular, the portfolio is convinced in reaching a sustainable link of new to existing knowledge.

Conclusion

We used portfolios to generate learning success through continuous feedback. The learning support through individual tasks, which were distributed over the semester, and individual feedback on each processing enabled a significant reinforcement of the learning outcome and the motivation. The stepwise inclusion of exercises with corresponding feedback demonstrated training effects similar to sports training.

Furthermore, the detailed and iterative feedback process played a crucial role in the overall learning outcome. Constructive suggestions for improvement in the development of meaningful and realistic tasks and hints for the derivation of the corresponding solutions turned out to be an essential element for creativity and motivation. This is of particular importance since these elements, in turn, are relevant for the student's future role in their professional environment. The outcome could be interpreted with levels of the creative process.

Recommendations

The overwhelming variety of tasks and positive feedback can only encourage us to design teaching and examinations using portfolios. Due to the increased workload required to

supervise and feedback, we recommend group sizes not larger than approximately 30 persons. This is because the teacher's effort with the feedback loops, the definition of the evaluation criteria, and the portfolios' corrections are to be classified as high.

Portfolio work at the RheinMain University will continue to be evaluated continuously and optimized concerning its effectiveness to ensure that its coherence-building and integrative effect on the program and the students' learning processes strengthen.

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Chapter 3 - Integration of Digital Technology and Educational Planning for Teaching and Learning Religion in Higher Education Institutions

Ioanna Komninou, Christos Papakostas

Chapter Highlights

- The prior research has examined the integration of not only the mature digital technologies in education, but also the arising technologies dynamically inserted in the field of education. However, research on the technology integration in religious education is yet limited.
- The motivation of this study was the impact of the COVID-19 pandemic on education and the transition to distance-learning courses in all institutions of higher learning.
- The main objective of this study is to describe the fulfillment of learning theories in distance learning, emphasizing in applications in the field of Religion.
- The contribution of this chapter is the exploration of the available technological tools, their selection criteria, and the required skills to properly use them.
- The sample is 200 students, who attended classes and took the final examination of the course, exclusively online.
- The evaluation of the course, which embedded technological features, was made through a questionnaire delivered to the students at the end of the semester.
- The findings show that it is very important to evaluate application of new approaches and utilize new teaching and learning tools in Religious Education.

Introduction

The coronavirus disease 2019 (COVID-19) has spread rapidly around the world, since it first emerged in China at the end of 2019. The year of 2020, Europe became the new epicenter of the coronavirus pandemic, with more reported cases and deaths than the rest of the world combined, apart from China (Sahu, 2020). Greece decided measures to protect its population, and lockdown restrictions took effect on March 2020. An ongoing measure is the closure of educational institutions nationwide, in an attempt to contain the spread of the COVID-19 virus. Although preliminary, primary and secondary schools have temporarily closed; the country's higher education system has canceled all the in-person classes and shifted to online courses instead (Batmang et al., 2021; ElSaheli-Elhage, 2021; Gultom et al., 2022; Hebebci, Bertiz, & Alan, 2020; Hu & Huang, 2022; Maksum & Purwanto, 2022; Marpa, 2021; Nnebedum, Obuegbe, & Nwafor, 2021; Paramitha et al., 2022a, 2022b; Paudel, 2021; Restuati et al., 2021; Xhelili et al., 2021). In Greece, although concerns began to be recorded since the start of the COVID-19 pandemic, there have not been registered any coherent developments regarding eLearning in Higher Education. The launch of a national eLearning strategy in Greece started very recently, including teachers training courses and advanced eLearning technologies. By the end of the academic year 2019-2020, all universities across the country integrated online education into their courses.

National and Kapodistrian University of Athens delivers online courses to the students by synchronous and asynchronous learning platforms. Recorded lectures are delivered to students in the Delos open platform (https://delos.uoa.gr/opendelos/, accessed on 7 April 2021). Open eClass e-learning platform (https://www.openeclass.org/en/platform, accessed on 7 April 2021) is an open-source Course Management System, offered by the Greek Academic Network GUnet (https://www.gunet.gr/en/, accessed on 7 April 2021) to support the distance-learning services, using either a web browser or a mobile application. Open eClass supports the electronic management, storage and presentation of teaching materials, transcending the limitations of conventional teaching in space and time, and creating the necessary conditions for a dynamic learning environment.

In addition to the asynchronous platform, due to the pandemic, a synchronous tool is used for meeting, sharing and collaborating, namely Cisco WebEx (https://www.webex.com/, accessed on 7 April 2021). WebEx is used as a virtual meeting platform allowing teachers

and students to communicate and collaborate through the use of audio, video and content sharing. Each faculty member uses his/her own personal meeting room, and the classroom is actually taken out of the classroom. Online sessions allow the teachers to:

a) present live in an online classroom;

b) host office hours; and

c) create break-out sessions and meeting spaces.

While the transition to distance-learning for all University courses was a one-way street, moving all programs online is challenging, as face-to-face and online teaching have differences between them in terms of learning theories, instructional strategies employed by the lecturers and interaction among lecturers and students (Ananga & Biney, 2017). The existing popular learning theories of behaviorism (Watson, 1913), cognitivism (Bruner, 1966) and constructivism (Bruner, 1990; Piaget, 1972; Vygotsky, 1978) have been used in physical classrooms for years, and their application is also considered in online education.

We introduced an educational model named Synthesis, aimed to develop a pertinent reference framework for designing and implementing eLearning courses for higher education students, and implicitly improve the level of qualification and development of skills, with significant impact on the quality of higher education. The implementation of this model aimed to stimulate the academic development of students, to motivate them towards their professional career in education, to familiarize them with current issues in the field of education, pedagogy, digital technologies, and scientific research in general. This approach in teaching is also a response to the offer of universities for competitive advantage in the international educational market.

This project was based on a series of studies, best practices and projects, already developed by the trainers (Professor and Laboratory Teaching Staff). Each contributor shared from his/her experience in systematic instructional design process, creating a flexible model involved in many instructional design activities. The total number of University students participated in the Synthesis educational project was 326 in all three semesters. The duration of the educational project was 16 months, from March 2020 to May 2021. The proposed educational courses in the project was structured in 3 training modules. Module 1: Creative thinking; Module 2: Learning Strategies; and Module 3: evaluation of educational practice. The instructional design was due to beneficiaries identified in the students' needs analysis,

carried out in an earlier time period of the project. Each course had in view 75 hours.

The educational approach involved a combination of online synchronous meetings with online asynchronous activities. Blended learning courses included: videoconferencing, interactive multimedia sequences, individual and group projects, online discussions forums, self-assessment activities, and feedback. The innovations proposed in the Synthesis Project were aimed at three main directions: a) Product innovation; b) Methodological innovation; and c) Innovation in the field of educational services.

Related Work

Analyzing the related literature (see Table 1), Zagano (2016) studied massive online open courses (MOOCs) in the field of humanities and social sciences. More specific, the author designed a noncredit online course in a 30-day format, restricted to a specific topic within religious studies. The research revealed several challenges, when transferring a classroom course to distance learning; however, given the diverse educational and cultural backgrounds of the participants, some of them eventually drop out the course.

Table 1. Integration of Digital Technology in Religious Studies

Study	Context	Learning theory	Software	Sample	Method
Carrow_Boyd, 2013	Unitarian Universalist	Not specified	Social media	Educators	Qualitative
Zagano, 2016	Islamic	-	MOOC	292 students	-
Lester, 2018	-	-	Social media		-
Baiyeri, 2019	Christian	Not specified	-	147 students	Qualitative
Al-Gumaei et al., 2019	Islamic	Not specified	-	62 teachers	Qualitative and quantitative
Syarif, 2020	Islamic	Not specified	-	30 students	Quasi experimental

Lester (2018) considered the value of social media for the transformative and social aspects of learning in religious and theological higher education studies. The author provided examples of the use of the most known social media platforms, in face-to-face and online environments. As far as the pedagogical approach is concerned, the learning theory of constructivism is applied in an online, decentralized course, as learners construct their knowledge on social networks.

Carrow_Boyd (2013) examined the experiences of religious educators learning to use social media for religious education purposes. The author's purpose was to discover how educators' learning of social media, may impact learning and teaching in religious education programs. The participants attended a weeklong workshop and according to the qualitative analysis of the interviews, they were positively affected towards utilizing social media for religious purposes.

Al-Gumaei et al. (2019) investigated Islamic studies teachers' perceptions in integrating information and communication technologies (ICT) in education. The study used a mixed method research, as the participants who were teachers, responded to a questionnaire and to semi structured interviews, so that quantitative and qualitative data were collected. The results indicated several challenges in the integration of technology in teaching.

Syarif (2020) evaluated the effectiveness of an e-learning platform, measuring the learners' performance before and after the introduction of a particular intervention. The author employed quasi-experimental research design and the participants were 30 students. The results showed that the integration of Islamic values into an e-learning platform, can promote the development of these values in students.

Baiyeri (2019) explored the problems associated with the adoption of e-learning among students in the field of Christian religious studies. The findings revealed financial factors as main militating problems, and lack of adequate technical support. Furthermore, regular training should be considered in terms of integration of synchronous and asynchronous mode of elearning among students of Christian religious studies in Nigeria.

While a great deal of prior research has focused on the integration of technology in Religious studies, few studies focused on Christian Orthodox context in University students. Moreover,

there is no proposed learning theory, which explains how we perceive, process, store, retrieve, reuse, and transform information. In view of the above, this paper tackles the need for further research to collect and analyze data on this topic. To fill the gap in the literature, we conduct this research with the aim of presenting a model, used in practice.

Method

Model Application

The application of the Synthesis model took place for a period of three semesters of undergraduate courses of the Department of Social Theology and the Study of Religion of the National and Kapodistrian University of Athens. The courses regarded both Pedagogy and Didactics, in terms of Religious education, which are part of the Teacher Qualification courses offered to the Department students. Some of the sections investigated teaching and learning theories, instructional design and strategies, and teching aids and techniques. A critical factor was the digital skills of the 21st century, and their importance in educational settings. We embedded in the courses the term of Art (cinema, photofraphy, theater), and we practiced audiovisual, technological, and critical thinking skills. Teaching was about a synthesis of different teaching and pedagogical learning styles, teaching models, and techniques. Due to COVID-19, all lessons were deployed exclusively from distance, using digital technolgy.

The synchronous part of the courses used the WebEx learning platform. Apart from teachers' online sessions, we also involved the students in hands on workshops through WebEx breakout sessions, annotation, chat, and polling. Visiting professors were also invited in online sessions, so that the students could benefit from their spcialization, and ask them questions. The online sessions lasted 13 weeks, while each session was three teaching hours.

The asynchronous part of the courses was based on Open eClass and Moodle. Open eClass was mainly the Content Management System (CMS) environment, while Moodle was the Learning Maagement System (LMS) environment. Open eClass served the purpose of backing up the online sessions, as it hosted the session presentations, and video sessions. Moreover, Open eClass had all the necessary course information, and also was the platform for the assignements, and the semester exams. Lastly, all the teachers' announcemets were uploaded in Open eClass, and a course forum helped the students communicate each other

and solve their questions, regarding the content of the course. On the other hand, Moodle was the platform, where we tested all the different teaching and learning theories. Every semester involved a 25-days project, aiming to deepen in a specific section of the course's content. The specific sections were a) the project method, and b) the creativity, in a school classroom. Every student had the opportunity to work independently, creating content both, working individually, and in a group amongst others. The aforementioned projects were student-centered, involving hands on workshops. More advanced students were supportive towards the less experienced students.

The social development was the first priority of the course designers, due to the special conditions of the pandemic spread. In that terms, we created a network of people, involved in the learning procedure, having interchangeable roles and transferring redeveloped knowledge. The evolution of collaboration was based on a vertical Y-axis, starting from individual assignments of specific social interactions (breaking the ice, peer review feedback), ending to more advanced ways of collaboration, such as team work assignments (digital stories of creative writing, full research project). The teaching material was created firstly in multimedia Shareable Content Object Reference Mode (SCORM) packages, and secondly in external software tool products, such as Articulate (https://articulate.com/, accessed on 7 April 2021) and Camtasia (https://www.techsmith.com/video-editor.html, accessed on 7 April 2021). The course is structured in four modules, each of which contained activities of gradual feedback, and finally, an overall reflection.

Model Evaluation

Learners' Perceptions

The evaluation of the course was based on a) students' written answers to the post-questions; b) the interviews of the students; and c) students comments on each other. Essential data for the effective application of Synthesis model were extracted from anonymous questionnaire, observations, and typical semester course/instructor evaluation online form (see Table 2). The questionnaire concerned the following main sectors: course material, learning activities, collaboration with instructors and other students, time management, digital environment, general benefit arisen for students' academic development.

Participants rated their satisfaction, of taking part at these courses in a 5-point Likert scale,

expressing their level of satisfaction to very much enjoyable (72.5%), very enjoyable (24%), and neutral (3.5%), while no answers were given in negative choices. When they were asked about the importance of this course for their academic development, 79% answered that they can effectively integrate digital technology in their learning process.

Table 2. Descriptive Statistics of the Evaluation Questionnaire

Evaluation questions	Mean	SD
A. Evaluation of content, organization and teaching		
Clarity of aims and objectives	4.85	0.10
Achievement of aims and objectives	4.77	0.12
General organization of the course	4.79	0.11
Usefulness of handouts or other instructional material offered by the instructor	4.85	0.10
Usefulness of assignments (projects, term papers, weekly tests, research papers, etc.)	4.18	0.65
Usefulness of extra lectures or seminars	3.33	0.89
The course met my expectations	4.75	0.11
Overall satisfaction with the quality of the course	4.00	0.53
B. Evaluation of instructor		
Clarity of explanations provided by the instructor	4.87	0.09
Help offered by the instructor in assignments/project, etc.	4.85	0.08
Encouragement to participate in discussions	4.87	0.09
The instructor was consistent in meeting his/her obligations	4.92	0.05
Overall evaluation of the instructor	4.92	0.05
C. Self-evaluation		
Your commitment to the course	4.41	0.43
Your participation in the course	4.62	0.28
Consistency in meeting the demands of the course	4.52	0.34
Overall personal evaluation	4.53	0.41

The learning material was considered very enough and attractive (72%), while group hands on activities were considered as the strongest point of the program (96%). 87% would like

very much to be involved in similar procedures in other courses of the Curriculum, while 94% stated that they would suggest to other students to choose these specific courses (see Table 3). From the reflection of the implementation of the Synthesis model, students submitted their views in a forum considering the benefits they had, which are in a nutshell: essential learning, cooperation and mutual assistance, learning skills, higher order thinking leads to effective study, remembering and recalling information and move deeper into application.

Table 3. Results of the Online Evaluation Form

Evaluation questions	Percentage
The teaching material was very attractive and useful	72.5%
The assignments were a good combination of theory and practice	96.0%
Instructor-to-students and students-to-students relationships were enhanced	86.0%
Time management issues arise	65.0%
Students would register in similar courses	87.0%
Students would recommend others to choose similar courses	94.0%

In addition to the responses of the participants to written open-ended and closed-ended questions, the students also expressed themselves, as one student quoted;

> Student 1: “A big thank you to all of you for giving me one more reason not to give so much importance to the "mandatory" curriculum from now on, but simply to the curriculum.”

Furthermore, some students particularly enjoyed the heterogeneity of the groups, and took advantage of their teammates strong points;

> Student 2: “I have the certainty that in "Spring" (name of a team), the older ones learned and enjoyed the imaginative ingenuity and creativity of our younger classmates, and at the same time the younger ones had the opportunity through this collaboration, to experience the fruits that can bring the right coordination and disciplined work, as part of a team effort”.
>
> Student 3: “My dear Dimitris (response to a classmate), this is indeed a true

MIRACLE!! I think this is the word that can be attributed to our team, despite the diversity and the unique character of each one, we put aside our ego, and worked as a strong team".

Student 4: "One of the few excellent collaborations and learning lessons worth continuing ..."

So far, most applications and tools that are available in the teaching community neglect the need for cooperation between the participants, focusing solely on individuality. It is crucial for eLearning designers to add meaningful activities that promote communication and teamwork, as another student quoted;

Student 5: "I sincerely hope that in the future the same cooperation, the same interesting teaching approach and the same passion for knowledge and teaching will be maintained, both on the part of the teachers and on the part of the students."

Results and Discussion

If blended learning is only seen as the integration of system applications, then this is not enough to create a successful learning environment (Schober and Keller, 2012). In order to create a positive learning environment, teachers need to be able to encourage students to participate more (Donnelly, 2010) in learning activities, and find a way to make more social interaction cooperative (Liu, 2010; Delialioğlu, 2012). Thus, there is a need for a learning plan, that can balance the face-to-face activities in the classroom and the online learning environments (Akkoyunlu and Soylu, 2008; Donnelly, 2010) implementing innovations used by teachers across the academic and professional spectrum (Weimer, 2002). The proposed learning model was based on the major concepts and theories of learning, such as behaviorism, cognitive psychology, constructivism, social constructivism, while the deployment of networking learning was based on connectivism.

The combination of the most important learning theories and the different digital technologies and environments led us designing a Learning Model, which suggests a holistic approach, named SYNTHESIS. SYNTHESIS as a Greek word, is defined as the combination of components or elements to form a connected whole. SYNTHESIS as an abbreviation stands for: 1) Student centered learning; 2) Y-axis; 3) Networking; 4) Transfer; 5) Hands on; 6) Experiential; 7) Scaffolding; 8) Intrinsic; and 9) Social (see Figure 1).

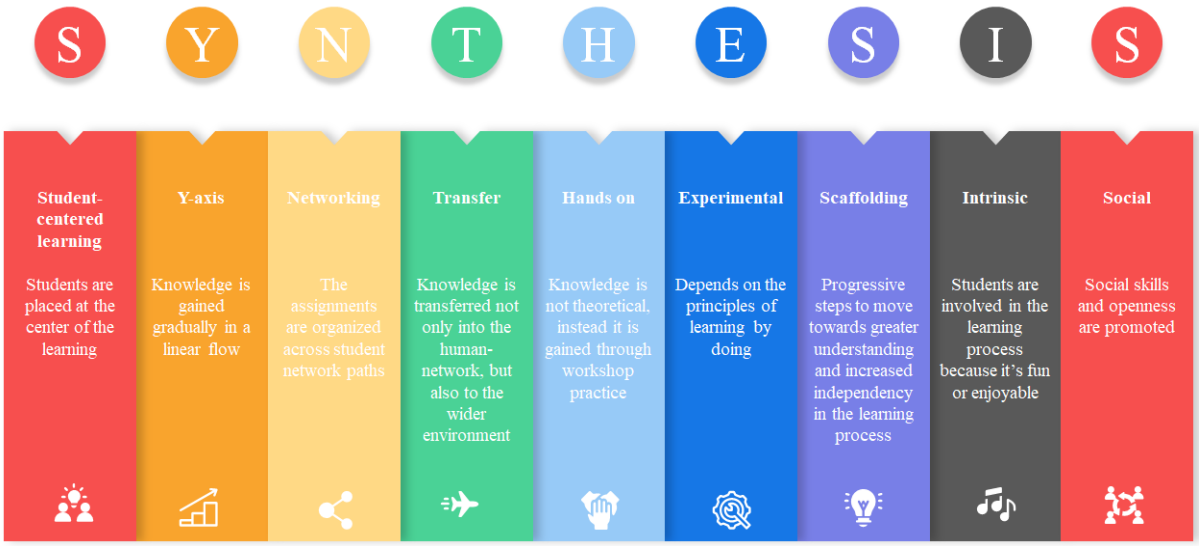

Figure 1. Synthesis Proposed Model

Student Centered Learning

Student centered learning is center stage on the European higher education policy agenda to enhance the quality of teaching and learning in European Higher Education (Klemenčič, 2017). In the student-centered classroom, which we developed in Moodle platform, the students speak, the teacher listens, interjects and facilitates conversation when necessary. By involving students directly in the instructional process, and allowing them to interact with each other, students develop a sense of community (Hannafin & Hannafin, 2010). Student-centered learning encourages active student participation and requires students to monitor their own thinking. Students are also expected not only to be aware of their learning, but also to intervene in and influence their learning environments and learning pathways (Klemenčič, 2017). Student motivation generally increases with student-centered learning, as does student achievement and overall satisfaction with the school experience.

Indeed, we specifically encouraged student collaboration by assigning them group projects. When students work with each other, they learn much more than just the lesson content. They gain an understanding of the diversity that exists in our communities and be able to benefit from the wide variety of perspectives present (Mahendra et al., 2005). Finally, they can share their ideas with each other, which provides a much greater opportunity to develop those ideas into something great (Agouti, Walters, & Wills, 2014).

Y-axis

A straightforward definition of a learning progression is to examine it as a "sequenced set of building blocks that students must master en route to mastering a more distant curricular aim." (Popham, 2007). Thinking about learning progressions, they rely on sequencing and acquiring certain skills, at certain points, so that students can gain knowledge or a skill at some distant point. Teachers do not just drive an educational car, instead, they show their students how to drive, and gradually relinquish control of learning to them. Indeed, in our research, we planned enriched activities and opportunities, so that everyone learns, from the students who conquer concepts quickly to the students who need to meander a bit.

Networking

The main purpose of using asynchronous learning platforms to our courses is to distribute and manage learning content to students, emphasizing in the social aspect of learning. This extends the limited social tools within an asynchronous E-learning tool, which are limited to emails, messages and discussion forums (Downes, 2005). It was more than just "going online" to formal education (Anderson, 2019). Indeed, we focused on social interactions among students, and we aimed to provide a platform and a meaningful way to collaborate and multiple ways of being knowing and communicating (Abao et al., 2015). Networking increases the opportunities to take advantage of views exchanged and their integration, but also helps in the formation of a solid foundation for knowledge purpose of (Zaidieh, 2012).

Learning is a process based on group activities and connections between group members. These connections form a network and, accordingly, learning resides in the network connections (Downes, 2006; Siemens, 2006). Network has gained a lot of importance, and increases the potential value by enabling personalization of students learning experiences, (Gruzd, Paulin, & Haythornthwaite, 2016).

Transfer

Knowledge must be transferred between the individuals, groups, and teams, and the whole University society, as well as to external interested parties. Knowledge transfer as "the process by which one unit (e.g., group, department, or field) is influenced by the experience

of another." (Argote & Ingram, 2000). On the other hand, the following explanation is possible: "Knowledge transfer is seen as a process by which an organization recreates and maintains a complex, causally ambiguous set of routines in a new environment" (Szulanski, 2000). Kalling states, "Knowledge transfer within an organization can be viewed as the process by which an organization makes knowledge about routines available to its members and is a widespread phenomenon that can be an effective way for organizations to expand the knowledge base and leverage unique capabilities in a relatively inexpensive manner" (Kalling, 2003). External knowledge transfer refers to processes of information exchange with groups other than those belonging to one's own organization. Internal knowledge transfer refers to intra-organizational processes and means units belonging to the organization.

It is very important the distinction between information, data, and knowledge. Knowledge, in a sense, cannot be transferred but redeveloped and changed by sensemaking. Student's mind responds to learning process by actively arranging and rearranging mental structures (Pfaff & Weinberg, 2009). A fundamental part in knowledge management is to make knowledge accessible and usable turn down any knowledge barrier. Adopting Synthesis Model is more than giving access or educate students in standardized courses. It means a consistence effort to overcome any knowledge barrier considering several additional factors (Paulin & Suneson, 2011).

Hands On

Many researches (Pfaff, 2017) recommend laboratory-based courses, in-class activities and projects cite examples of students who actively involved developing a better understanding of concepts by making new connections with their previous one. Hands on approach proposed as a means to increase students' academic achievement and understanding of scientific concepts (Ekwueme, Ekon, Ezenwa-Nebife, 2015). Implementing Synthesis, we used concrete activities that didn't reflect reality, but they were unarguably real. Our carefully designed project complement classroom lectures with hands-on learning activities to develop students' critical thinking and group work skills (Jazwa, 2017).

We designed the lesson activity by creating individual and group assignments, where students are presented with content and then, depending on their responses, are directed to specific

pages. The content may be text or multimedia. At this stage, the type of assignment we chose, was the "Upload a single file" assignment. As the name implies, it basically allows students to upload one file, which is just the thing for handing in homework assignments. Our aim was to create a fun learning environment, while still promoting deeper thinking (Cloutier, Dwyer & Sherrod, 2016). In that way, knowledge is not theoretical; instead it is gained through workshop practice, increased engagement in learning.

Experiential

Experiential Learning is an essential part of Synthesis Model. Experiential learning is a method promotes interaction and focused reflection to increase knowledge and develop skills. Experiential Learning is a way to reach knowledge by experience, or discovery (Dickinson, 2017). Kolb (1984) indicates four key aspects of experiential learning: firstly, concrete experience, secondly reflective observation, thirdly abstract conceptualization and fourthly active experimentation. Experiential Learning (EL) is one of the strategies recommended by Bates (2015) for online courses. The strategy's robust learning cycle, which may be employed as syntax in a learning unit, is one of its benefits. Experiential learning is defined as learning from one's own experiences, or through doing, so in order to gain new knowledge, skills, attitudes, or ways of thinking. The integration of networked technology within higher education new learning styles have evolved and the tools are changing as well (Dogoriti & Pange, 2014). Research also indicates that computer technology support learning developing the higher-order skills of critical thinking, analysis, and scientific inquiry (Roschelle, 2000). Implementing Synthesis, we developed learning techniques such as a rich variety of interactive practices whereby the students had opportunities to learn from their own and each other's experiences. In addition, students were actively and personally engaged in the learning process by reflective personal essays, storytelling, discussions with others and reflection.

Scaffolding

Scaffolding is an important concept of learning process although much discussion exists about its conceptualizations, appearances, and effectiveness (van de Pol, Volman & Beishuizen, 2010). Researchers (Yelland & Masters, 2007) suggest that in computer contexts conceptualizations of scaffolding are needed to gain greater insights into teaching and

learning processes. It is also suggested that scaffolding is effective intervention across levels of different characteristics and can largely be designed in many ways. Especially computer-based scaffolding assists students to complex problems, or tasks, helping increase and integrates their higher order skills (Belland et al., 2017). Instructional scaffolding as a key element of Synthesis Model defined as support provided by teacher, peer, and computer-based tools that allows students to meaningfully participate in tasks that they would be unable to complete unaided (Belland, 2014).

In our courses developed in moodle we used different types of activities, such as forums, wikis, assignments, quizzes, and SCORM players. The main power of this activity-based model comes in combining the activities into sequences and groups, which can help teachers guide students through learning paths. Thus, each activity can build on the outcomes of previous ones. This educational technique uses progressive steps to move students towards greater understanding and increased independence in the learning process. Results indicate that the project management methodology and project scaffolding tools facilitated team communication and collaboration.

Intrinsic

Our study examines the intrinsic properties of the moodle learning management system, and how these properties motivate students to use an e-learning portal, which subsequently influences their perceived learning effectiveness and academic performance. Indeed, through discussion boards and live chat sessions, the Communication Module facilitates communication amongst students or between students and teachers. Regular communication helps to preserve a social and educational connection. This aids in the production of knowledge and encourages students to learn and explore the system more thoroughly. The flow of information about educational material and daily learning activities between students and teachers is critical for learning (Chang and Tung, 2008; Johnson et al., 2008; Paechter and Schweizer, 2006; Richardson and Swan, 2003).

Social

Research into social learning has expanded in recent years, with a new emphasis on learning strategies focus on how and why individuals learn from others (Rendell, et al., 2011).

Considerations how to enable social learning aim to create a framework that enabling starting conditions and features for social learning situations. This framework embrace learning situations as focus projects, multi-organisational peer groups, facilitation, adaptability and flexibility (Bos, Brown & Farrelly, 2013). While social learning is widespread, social learning strategies should focus on what, when, and whom individuals copy (Kendal et al., 2018).

Implementing Synthesis policy studies, pedagogy and systems science are discussed, identified rules that focus social learning. Considering there is an essential difference between individual and social we designed a course in Moodle to facilitate the teacher's simultaneous collaboration with the training group at the level of synergy and group development. Students' individual professional practical skills are converted to group practical skills in interdisciplinary learning activities.

Conclusion and Future Work

The main aim of this study is to examine undergraduate students' perceptions, who are preparing to be teachers, towards digital technology for collaborative learning, and its implementation into a school classroom. Following, we describe the Synthesis model we employed, the participants and our data collection process. The data collected is analyzed both qualitatively and quantitatively. Our proposed model provides a holistic approach to planning and implementing e-Learning, both synchronously and asynchronously, within Religious Studies University students.

The future work of our research involves the introduction of a new course in the curriculum of our Faculty, named Religious Education and Distance Learning. The new course will be taken by the students, by the start of the new academic semester, 2021-2022. Moreover, we are planning to start the development of a network, consisted from researchers, sharing similar interests, for setting up more experimental applications in order to create a Good Practice database.

Regarding the limitations of our research, the Moodle platform is currently not supported as a digital service from our University Network Operations Center (NOC). The University has academic licenses for WebEx platform, and Open eClass, however there is no support for

Moodle platform, so the authors have to setup the Moodle courses on external servers, bearing the cost of hosting.

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SECTION II - STUDIES ON SCIENCE

Chapter 4 - Athlete Students' Anxiety Levels on Physical Activity and Performance during the COVID-19 Pandemic

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Chapter Highlights

- The COVID-19 pandemic period made all activities unable to be carried out optimally, work activities, educational activities, social activities, and sports activities.
- This research is a qualitative descriptive study used to translate data that is closely related to social conditions, the interrelationships between variables that occur and the presence of existing facts and their consequences.
- Every athlete must feel mental turmoil; the mental that usually appears is anxiety, either during practice or during competition, and during the COVID-19 pandemic.
- This study focuses on attribution theory to determine how athletes attribute their success and failure.
- This study focused on the student-athlete perspective, but there is a lack of evidence on how coaches manage stressors and support students.

Introduction

The COVID-19 pandemic period made all activities unable to be carried out optimally, work activities, educational activities, social activities and sports activities. As the COVID-19 pandemic continues to expand in almost all regions, various protective measures have been introduced by the authorities, including school and university closures, travel bans, cultural and sporting events, and social gatherings (Abdul Razzak, 2022; Abed, 2021; Altawalbeh & Al-Ajlouni, 2022; Atabey, 2021; Atilgan & Tukel, 2021; Canese, Mereles, & Amarilla, 2022; Dankers, Stoltenkamp, & Donson, 2022; Giri & Rana, 2022; Hebebci, 2021; Kara, 2021; Kibici & Sarıkaya, 2021; Kibici, 2021; Kilincer, 2021; Parnell, 2020; Sarikaya, 2021). The COVID-19 pandemic has prompted the government to issue Government Regulation of the Republic of Indonesia number 21 of 2020 regarding large-scale social restrictions in the context of accelerating the handling of the corona virus disease 2019 (COVID 19) and policies regarding the prevention of COVID-19 in the form of Working Meeting Decision point number 2. As a result of the COVID-19 pandemic this forces all activities to be restricted and do Work from Home (WFH).

Evidence-based planning and budgeting in accelerating the handling of COVID-19 will increase Indonesia's readiness to face disease pandemics in the future. Indonesia must continue to increase efforts to prevent, detect and respond to the COVID-19 pandemic across sectors. One thing that is very crucial is the availability and completeness of evidence as a navigational tool for policy making. To that end, the Ministry of National Development Planning/Bappenas has conducted a Learning Study on COVID-19 Handling in various key areas, such as health, response management, technological innovation, economy, education, religion, socio-culture, protection of women and children and social protection. The focus of this study is to identify gaps and challenges, and present relevant recommendations for handling COVID-19 in Indonesia.

Sports activities in educational institutions support the mental and physical well-being of students and help them grow in a healthy way (Miller et al., 2020). Accordingly, Universities and other higher education institutions promote sports competitions between students within institutions and across borders to develop higher levels of physical activity, a sense of achievement, enforce discipline, and build teamwork (Fox et al., 2010). Perceived performance in sports activities is based on students having higher achievements through

stronger physical activity and sports (Simms et al., 2021). In addition, sports activities encourage students to achieve achievement goals, and students evaluate their performance on how well they meet the physical and cognitive demands of those goals (Johnston et al., 2020).In the development of sports achievements there are several factors to achieve maximum performance such as anxiety factors. Achievement is a factor that determines the success of the development of achievement sports, here athletes are seen as weapons in increasing the good name of the country and region.

An athlete must have good qualities physically and psychologically, an athlete's achievement will also increase with several interrelated factors, namely technical, physical, tactical, and mental. In achievement sports many mental problems occur, and the problem depends on the athlete himself because every different sport has its own problems. Therefore, coaches must familiarize their athletes with mental training, high-achieving athletes are not only based on physical, but the athlete must have mental (psychological) skills that can balance the athlete's own skills. Mental training itself must be balanced with physical exercise (continuously) and from each different sport.

Physical activity is also an important part of sports for student-athletes (Choi et al., 2020). This requires body movement that leads to energy expenditure to achieve the physical fitness necessary to maintain physical health and performance goals (Osipov et al., 2020). Athletes must have the physical strength, speed, and endurance to represent a higher intensity of physical activity. Furthermore, to meet the demands of the institute and their coaches/instructors, students face physical and psychological stress related to performance anxiety, stress, injury, and eating disorders.One of the important factors that influence the perception of students' performance and physical activity is the perception of students' psychological health which is a state of mental function that results in productive activities, fulfilling relationships with others, and adapting to change (Simms et al., 2021). Perceived psychological health is an important determinant of athlete involvement in sport(Johnston et al., 2020); whereas, excessive mental stress has an impact on the level of performance of athletes as a standard in sports and maintaining academic performance creates a lot of mental stress for student-athletes. Many universities require a minimum level of CGPA, body weight, and physical activity from their athletes (Johnston et al., 2020), leading to depression, anxiety, and substance use that affect overall physical performance and activity.

Because athletics is a running, jumping, throwing and swimming competition; therefore, they need the participants' physical health to qualify for the competition (Parker et al., 2018). Most studies have focused on mental health, but investigations focused on the role of student-athletes in physical health are felt to be scarce in the literature. This relates to the physical perception of sports competence, physical strength, physical condition, body attractiveness and overall physical self-esteem (Piko, 2000). Therefore, the current research intends to advance by exploring the impact of perceived physical health on athletes' perceived physical performance and activity.

The perceived physical self-concept is related to the perception of the individual's physical abilities and appearance (Sánchez-Miguel et al., 2020). Previous research on self-concept has focused on a general and global view of the self(Klomsten, Skaalvik, & Espnes, 2004). While the physical dimension, which is a contributor to self-concept, was neglected for decades; recently introduced to formulate a fundamental part of the perceived self-concept in sports(Kim, Jang, & Cho, 2020). There is a dearth of studies focusing on the impact of student-athlete's perceived physical self-concept on physical activity and perceived performance. Moreover, to the best of the authors' knowledge, no research to date has investigated the mediating role of student-athlete's perceived physical self-concepts between their psychological and physical health relationship with perceived performance and physical activity. Thus, based on the literature gap and the fact that physically active students are said to have higher levels of physical and emotional self-concept.(Kim et al., 2020), and that competitiveness increases due to an increase in perceived self-concept(Murray et al., 2021). Therefore, making progress, this study focuses on investigating the role of perceived psychological health, perceived physical health, and perceived physical self-concept in determining student-athlete perceived performance and physical activity.

Most previous research analyzing student participation in athletics has focused on motivation and goal orientation theory, but very few have investigated the role of attribution theory in determining student-athlete perceptions of their performance and physical activity. Attribution theory is concerned with how individuals explain the causes of success and failure based on behavior caused by situational or dispositional events, physical and psychological attributes (Antblad, 2020). There are several studies that have provided an explanation of how important the role of psychology is when developing and improving athlete performance when facing matches or competitions. (Soleh & Hakim, 2019) argues

"that there are psychological changes during the match in the athlete's ability to accept pressure or psychological changes, concentration remains, mental toughness increases, so that they are able to face tough challenges". During the COVID-19 pandemic, it has changed all the orders of life, changing activities that have become routine in daily life so that it is required to keep a distance, study and work from home. Meanwhile, restrictions on human movement are being voiced by the minister of health, and the government to be aware of the spread of COVID-19 in Indonesia. To avoid being infected, people are advised to avoid crowds, follow health protocols, stay calm and don't panic during this pandemic. During the pandemic period, it had a lot of impact on the community, the psychological impact was anxiety because the virus could be transmitted from someone who was not in a good or unhealthy condition and transmitted to people who were in good health (Fitria & Ifdil, 2020). The presence of this virus makes it easier for people to panic, worry, worry and even cause excessive anxiety. psychological impact, namely anxiety because the virus can be transmitted from a person who is not in a good or unhealthy condition and is transmitted to people who are healthy and healthy (Fitria & Ifdil, 2020). The presence of this virus makes it easier for people to panic, worry, worry and even cause excessive anxiety. Psychological impact, namely anxiety because the virus can be transmitted from a person who is not in a good or unhealthy condition and is transmitted to people who are healthy and healthy (Fitria & Ifdil, 2020). The presence of this virus makes it easier for people to panic, worry, worry and even cause excessive anxiety.

Anxiety is a condition that occurs when the physiological condition of the athlete's body seems to feel depressed; as a result, the heart rate increases excessively (Hardiyati et al., 2020). Anxiety is a psychological problem that arises in every individual. The situation is often unclear but anxiety itself is often felt (Annisa & Ifdil, 2016). (Hardiyati et al., 2020) generally think that athletes who have good skills generally have low scores in the degree of anxiety, tension, depression, anger, and confusion. They on the contrary have a tendency to get high scores in aspects of self-confidence, self-concept, self-esteem, courage, need for achievement, tendency to dominate, aggression, intelligence, independence, mental tension, independence or autonomy, social ability, personal stability, and extraversion tendencies. Anxiety or anxiety can be experienced by anyone in the form of feelings of tension, insecurity, and worry. (Soleh & Hakim, 2019) describes the process of anxiety in which a person feels uncontrollable emotions, which occurs when a person is experiencing frustration and inner conflict or pressure. According to Fauzul Iman (Mahfud & Gumantan, 2020)

argues that athletes often face anxiety, especially in individual sports with fairly high difficulties. As a human, there must be positive and negative feelings. Positive feelings like happy, happy, excited. Negative feelings such as disappointment, confusion, worry, and so on (Mahfud & Gumantan, 2020) states that the anxiety reaction has three components, namely emotional, cognitive and physiological: a) The emotional component, namely the anxiety component is related to the individual's perception of the psychological effects of anxiety. b) Cognitive component, namely the existence of individual concerns about the consequences that may be experienced or negative expectations and assumptions about oneself. If anxiety increases, it will interfere with the individual's ability to think clearly, solve problems and meet environmental demands. c) Physiological components, namely the body's reaction to the presence of anxiety that arises can encourage the emergence of movements in certain body parts. The movements that occur are largely the result of the work of the autonomic nervous system, which controls the various muscles and glands of the body. The big impact of excessive anxiety can affect physical condition. Because when a person experiences anxiety, it will indirectly increase his heart rate. As a result of anxiety, besides having an impact on psychology, it also has an impact on a person's physical condition (Kusuma, 2018). This impact will cause dizziness, headaches, and others (Annisa & Ifdil, 2016)). With a physical impact that will affect a person's performance, this impact will also affect a person's immunity because anxiety will stimulate an increase in the production of the hormone cortisol in the body. This hormone will further suppress the body's immunity (Mahfud & Gumantan, 2020) Types of anxiety can be classified from approaches, as explained by Wiramiharja (Wisnu Haruman, 2013) there are several types of anxiety disorders, namely: a) Panic disorder is a disorder that is triggered by things that other people think are not extraordinary events. b) Agyrophobia is a condition in which a person feels unable or difficult to be both physically and psychologically to escape. c) Other phobias are statements of feelings of anxiety or fear of something that is unclear, irrational, and unrealistic. d) Obsessive-cumulsive is a thought that pathologically continuously arises from within a person, while compulsive is an action driven by impulses that is repeatedly performed. e) Generalized anxiety disorder characterized by excessive and chronic worry in the old term is called Free Floating Anxiety.

What is Coronavirus and COVID 19? According to LINE Siaga, COVID-19 is a type of disease that can be transmitted and is caused by SARS-CoV2, while SARS-CoV-2 is a type of virus that originates from the Corona Virus (CoV). Coronavirus is a virus that can cause

illness, such as flu to acute respiratory disease. Coronavirus is a zoonotic, infectious disease through animals, investigations have found cases of SARS-CoV through animals and transmitted to humans (2002) and MERS-CoV from camels to humans (2012). According to the Indonesian Ministry of Health, information from several cases initiated by the World Health Organization (WHO) on December 31, 2019 stated that there were pneumonia clusters with unclear etiology in Wuhan City, Hubei Province, China. According to WHO (2020),

Sport is a direct physical contact sport; some people already don't like this sport because according to some people this sport is a cruel sport. This sport has several categories that are competed in the Olympics. College students at Medan State University during the COVID-19 pandemic experienced difficult times of the pandemic because they could not do regular exercises and even the training facilities were closed due to this pandemic, as a result, many athletes experienced anxiety about training for fear of being exposed to this very deadly virus. There have been several studies on anxiety about COVID-19 in various fields. Research from (Fitria & Ifdil, 2020) discusses the role of cognitive behavior therapy counseling in how to overcome anxiety during a pandemic. Research from the literature (Fitria & Ifdil, 2020) discusses the factors that influence anxiety in health workers in an effort to handle the transmission of the COVID-19 virus. It (Fitria & Ifdil, 2020) also discusses the anxiety experienced by adolescents during a pandemic.

Furthermore, research from (Mahfud & Gumantan, 2020) on a survey of student athlete anxiety levels during the COVID-19 pandemic. In this case, because there are no studies that discuss the level of anxiety of athletes while practicing, the researchers will conduct an analysis of the level of anxiety of athletes during the COVID-19 pandemic. Based on the explanation above, this study aims to obtain information related to student athlete anxiety during the pandemic. With this research, it is hoped that in addition to getting information about the athlete's anxiety level,

Sports education in Indonesia is handled by the Youth and Sports Office (DISPORA) in coordination with the Education and Culture Office (DISDIKBUD) (Mamun, 2019). Many internationally renowned school games such as the 2019 Sea Games, 2018 Asian Games and 2018 Asian Para Games were held in recent years where students from various colleges and universities participated in various sports activities and won prestigious awards (Triwiyanto & Prasojo, 2020). Therefore, it is appropriate and prudent to investigate the underlying

factors and mechanisms that influence the performance and physical activity of Indonesian student-athletes.Therefore, the context of the current Indonesian study to investigate the level of student anxiety about physical activity and Perceived Performance, which has not been studied before, is expected to advance the literature by providing empirical evidence in this context, thus, the current study is very significant with the following objectives.

1. To investigate the direct impact of the psychological and physical health of student-athletes on their performance and physical activity during the COVID-19 pandemic.
2. To investigate the direct impact of the psychological and physical health of student-athletes on the physical self-concept they feel during the COVID-19 pandemic.
3. To investigate the direct impact of perceived physical self-concept on their perceived physical performance and activity during the COVID-19 pandemic.
4. To investigate the indirect impact of student-athlete's psychological and physical health on perceived performance and physical activity through perceived physical self-concept as an underlying mechanism.

Basis of Attribution Theory in Psychology

Attribution theory in sports psychology advocates that people attribute their failures or successes to favorable causes, determination, physical and mental strength (Antblad, 2020). The three main characteristics of this theory are control, locus of control and stability (Graham & Folkes, 2014). Control refers to the psychological concept in which individuals believe that they are in control of situations and experiences; in this study, it is called the perceived physical self-concept (Murray et al., 2021). In addition, the internal locus of control describes an athlete's feeling that he has control over the situation (Barry et al., 2018). At the same time, stability refers to whether an attribution or cause is considered immutable (Tamborini et al., 2018). In this context, a high internal locus of control illustrates that psychological and physical health leads to a stable situation in the form of performance and physical activity.

While there are no definitive epidemiological data regarding the psychological effects of COVID-19 on individuals and its effects on public health at this time, the results from the limited number of studies are remarkable. For example, studies have reported that “one-third of interviewees in China and Japan experienced severe anxiety, and about half experienced moderate anxiety” (Wang, Pan, Wan, Tan, Xu, Ho, & Ho. 2020; Shigemura, Ursano,

Morganstein, Kurosawa, & Benedek. 2020). Similarly, studies have found that "fear of contracting COVID-19 leads to intense emotional and behavioral consequences such as boredom, loneliness, anxiety, sleep problems and anger" (Brooks, Webster, Smith, Woodland, Wessely, Greenberg, & Rubin. 2020).

It has been reported that "depression, anxiety disorders, post-traumatic stress disorder (PTSD), paranoid and psychotic disorders, and even suicide may be emotional and behavioral consequences of fear caused by COVID 19" (Wang et al. 2020). Research has shown that "this type of reaction, which can be developed based on a state of fear, may be more common in individuals who have previously experienced a psychological disorder and experience quarantine or prolonged curfew" (Brooks et al. 2020). As a result of the COVID-19 Situation, individuals may show negative emotions as a result of an event they have witnessed and fear develops as a result of the information obtained. Therefore, a coach must know the state of his athletes in the psychological aspect. Due to the COVID-19 pandemic, the habits of athletes have changed indirectly.

Athletes in isolation during training or staying at home for long periods of time may have a negative impact on the athlete's mental health status as well. Isolation can cause psychological effects such as depression and anxiety by causing changes in people's living conditions, decreased social and physical contact, and separation from their loved ones (Şenışık, Denerel, Köyağasıoğlu & Tunç, 2020).

Perceived Psychological Health, Perceived Physical Health, and Perceived Performance during the COVID-19 Pandemic

During this pandemic to new normal, everyone experiences very sudden changes in all aspects of life. This change makes many individuals experience stress, including students. Stress is a body reaction caused by the human mind that appears when individuals experience pressure, sudden changes and threats that make a person feel depressed. The use of the term stress for conditions ranging from the mildest challenging stimulation to the most unpleasant conditions, stress is a response to appetite, beneficial stimuli that are often not considered stressful can be as large as a response to negative stimuli (Koolhaas et al., 2011). Stress is often caused by pressure caused by personal, family, school and social problems. This problem needs to be identified so that it can be resolved immediately. One of the stresses

most often felt by students is academic stress, this academic pressure increases due to exams, assignments and many activities that students have to do (Jain & Singhai, 2018). During this pandemic and new normal, academic pressure has increased due to changes in learning that is usually done face-to-face to online learning (Kusnayat et al., 2020; Sanjaya, 2020; Sumantyo, 2020).

Stress has many impacts on an individual's life, for example, experiencing anxiety. Anxiety itself is the impact of stress experienced by individuals (Fitria, 2018; Mutianingsih & Mustikasari, 2019; Thoyibah et al., 2020). When individuals experience continuous anxiety, it will interfere with their activities in daily activities. Therefore, the individual must have control over himself so that the anxiety does not increase. Some important things that can affect individual anxiety are the way individuals manage stress. Someone who has good stress management is able to use resources effectively to overcome mental and emotional disturbances and disorders that arise due to pressure and conditions that are beyond prediction (Burla et al., 2019). The purpose of stress management is to improve the individual's quality of life for the better.

In addition, how to minimize anxiety is to regulate emotions. Emotional regulation is one alternative to be a solution so that individuals survive and regulate their emotional responses in order to deal with the anxiety they experience (Putri & Handayani, 2020). Based on the description above, the authors are interested in seeing the effect of stress management, managing emotions and students' anxiety levels in the new normal period. Emotional regulation is one alternative to be a solution so that individuals survive and regulate their emotional responses in order to deal with the anxiety they experience (Putri & Handayani, 2020). Based on the description above, the authors are interested in seeing the effect of stress management, managing emotions and students' anxiety levels in the new normal period. Emotional regulation is one alternative to be a solution so that individuals survive and regulate their emotional responses in order to deal with the anxiety they experience (Putri & Handayani, 2020). Based on the description above, the authors are interested in seeing the effect of stress management, managing emotions and students' anxiety levels in the new normal period.

A peaceful mind can help an athlete focus his energies on achieving the set goals. Whereas stress and anxiety can do the opposite by leading to depression and other mental illnesses to

lower the athlete's overall performance (Simms et al., 2021). Sports participation includes several cognitive-affective experiences with implications for athlete well-being and psychological health (Wan, 2006). In addition, perceived psychological health is important in predicting positive influences that enhance an athlete's development and performance (Barry et al., 2018). It has been associated with supportive social interactions and cooperative behavior (Nedal & Alcoriza, 2018). In contrast, psychological stress and anxiety can affect an athlete's immune response, which affects his overall performance (Wan, 2006). Meanwhile, attribution theory suggests that appropriate coping mechanisms can lead to positive perceptions of an athlete's overall psychological health, which can lead to better performance levels.

The overall abilities and capabilities of a student athlete in terms of physical strength and competence enable him to face sporting challenges positively (Piko, 2000). In addition, increased well-being leads to increased motivation for best performance. Research shows that athletes face enormous pressure to stay in shape by maintaining a healthy weight, endurance level and body(Parker et al., 2018). moreover,Trudeau and Shephard (2008) revealed that doing sports protects the body from various diseases such as diabetes, cholesterol, and heart problems and helps maintain blood sugar levels, resulting in good performance for athletes. Also, perceived physical health has been associated with physical, mental, and social well-being (Zobova et al., 2019). The literature shows that sports injuries and training stiffness are associated with failure to perform, but learning to overcome these weaknesses through proper training and fitness measurement can help athletes link success and improve performance (Yamamori, 2019). This illustrates that when athletes are physically fit, they perform well.

Perceived Psychological Health, Perceived Physical Health, and Physical Activity during the COVID-19 Pandemic

Physical activity involves the use of the body's muscles which increase energy levels and capacities (Wilson et al., 2020). Human biology requires a certain amount of physical activity to maintain good health and well-being (Fox et al., 2010). Sports activities improve mood, concentration, sleep habits, leadership skills and increase student self-confidence (Zobova et al., 2019). Several research results also show that exercise or physical activity can prevent mental disorders experienced by some people due to the implementation of quarantine and

isolation, as well as physical distancing due to the COVID-19 pandemic. Mental disorders may be depression, anxiety, fatigue and stress syndrome.

An athlete needs emotional and mental stability to function progressively. Recent years have found elite athletes experiencing drug abuse, burnout and mental illness due to an inability to cope with increasing levels of stress and pressure to meet high expectations.(Simms et al., 2021), illustrates the importance of psychological well-being in supporting physical activity. In addition, attribution theory suggests that internal locus of control is related to emotional and mental well-being, which in turn determines a person's level of supportive activity (Rejeski & Brawley, 1983). Therefore, it is expected that the perceived psychological health will directly affect the physical activity of student athletes. So the following hypothesis is suggested;

Literature is related to the physical well-being of students with their active participation (Dishman et al., 2006). It also promotes the basic behaviors and skills required to engage in sporting activities. Moreover, Fox et al. (2010) demonstrated that physical well-being is required for active involvement in physical activities such as sports, jumping, throwing, swimming, etc., all of these activities require physical strength. Students perceive their physical health as the ability to successfully exert the energy necessary to perform physical activities and sports successfully (Piko, 2000). Various activities require the use of certain muscles such as swimming using the muscles of the arms and legs; throwing requires arm muscle strength and shoulder balance etc (Osipov et al., 2020). Therefore, athletes need to have a fit physical condition to carry out these physical activities.

Furthermore, scholars link competitiveness in physical sports with the physical activity of an athlete (Yağar & Soybean, 2020). While the current study aims to examine the impact of athletes' physical health in determining physical activity based on the fact that athletes spend a lot of time getting into the right body shape through excessive exercise and developing physical strength to participate in sports activities actively. Exercising or doing physical activity can also prevent a person from heart disease, diabetes, and high blood pressure, diseases that are most likely to occur during the COVID-29 pandemic due to the lack of physical activity of people who tend to spend time at home watching television, using cellphones, and playing games, putting them at risk for heart disease, diabetes, and high blood pressure.

Perceived Psychological Health, Perceived Physical Health, and Perceived Physical Self-Concept

Emotional intelligence such as self-concept, altruism, empathy, and understanding are necessary formulations for psychological health and well-being (Isohätälä, Näykki, & Järvel, 2020). Perceived psychological health related to increased team participation, collaboration, and interaction (Leisterer & Jekauc, 2019). Psychological health protects athletes from destructive behavior and drug abuse. In addition, the athlete's physical self-concept is related to the individual's self-image, self-esteem, and ideal self (Dishman et al., 2006).

Sport is related to how well an athlete perceives his physical attractiveness and endurance to perform well (Kim et al., 2020). Moreover, the results of research conducted byLee, Jones, and Day (2017) revealed that improved mental health leads to a stronger physical self-concept, which helps increase self-confidence and motivates athletes to perform better. Thus, based on a literature review and attribution theory, which postulates that when athletes feel that they are healthy and can control existing support situations and stresses, they describe a higher level of perceived physical self-concept that is necessary for their performance.

Physical health plays an important role in the achievement motive and is often associated with increased physician involvement and overall satisfaction with aligning with one's ideal self (Osipov et al., 2020). Self-concept is highly subjective, and each person has a unique set of characteristics associated with achieving the ideal self (Sadeghi et al., 2018). Therefore, it can vary greatly, but in sports, certain physical requirements are associated with each sporting activity. Therefore, student-athletes put a lot of time and energy into achieving the ideal self-concept (Dishman et al., 2006).

There are also gender differences observed in the literature regarding male athletes focusing on endurance and female athletes focusing more on fitness (Barry et al., 2018), illustrates the importance of perceived physical health in designing perceived physical self-concepts. In addition, physical self-concept is related to the physical appearance and abilities of athletes (Sánchez-Miguel et al., 2020). Therefore, perceived physical health has a strong relationship with perceived physical self-concept.

Perceived Physical Self-Concept Relationship with Perceived Performance and Physical Activity

Physical strength and well-being help achieve a positive self-concept in athletes; they feel confident to participate, engage, and excel to achieve higher levels of performance (Van Ryzin, Gravely, & Roseth, 2009). Too, Klomsten et al. (2004) described that the perceived physical self-concept acts as a motivating force to achieve the goals set for demonstrating competitiveness and success in sports. In addition, students participate in aerobics, cardio-related exercises that build muscle and regular jogging to achieve their physical self-concept. It is also associated with establishing positive attributions and creating an internal locus of control for student-athletes to develop their physical strengths to succeed (Timo et al., 2016). Literature supports that students with strong physical self-concepts set higher standards of performance and display stronger competencies than their team members (Sawatsuk et al., 2018), which keeps them highly engaged and committed to achieving the desired performance.

Sports medical doctors encourage athletes to take certain supplements and avoid certain types of foods, in order to achieve a strong physical self-concept to further maintain desired levels of physical activity (Murray et al., 2021). Physical self-concept provides body satisfaction and enhances the athlete's physical perception (Piko, 2000). Feelings of comfort in one's body determine the configuration of self-concept, especially during adolescence (Sánchez-Miguel et al., 2020), which further motivates the athletes to actively participate in various supporting competitions. Studies show that dissatisfaction with body image increases in women during adolescence, and therefore they strive to obtain an ideal self-image that affects their physical sports activities (Luczak & Kalbag, 2018). Moreover, according to attribution theory, controllable attributions to desired outcomes may be integral to strengthening the relationship between physical self-concept and physical activity (Miller et al., 2020).

Mediating Role of Perceived Physical Self-Concept between Perceptions of Psychological and Physical Health and Perceived Performance during the COVID-19 Pandemic

In today's world, social media promotes materialism and an ideal sense of self through unrealistic body image and requirements, causing distress and anxiety among teenagers to

achieve the perfect body shape (Ambassadors, 2020). Research shows that in order to achieve a certain level of physical attractiveness or body image, the psychological health of student-athletes plays an important role (Osipov et al., 2020). In addition, students strive to maintain a perfect body image and increase their physical attractiveness by relying on sports. In addition, perceived physical self-concept is related to maintaining performance levels(Choi et al., 2020); and is affected by the psychological well-being of athletes, when they evaluate their self-esteem based on this image (Kim et al., 2020). Simultaneously, psychological well-being directly affects the performance level of athletes (Wasike, 2017). Several studies advocate the role of the perceived physical self-concept as an underlying mechanism for transmitting self-assessments, developing realistic goals, and establishing a supportive environment for improving performance (Ramirez-Granizo et al., 2020). However, there is a dearth of research to explore research gaps regarding the mediating role of perceived physical self-concept between student-athlete psychological health perceptions and perceived performance. Therefore, this study aims to advance the literature by proposing these intermediary mechanisms be tested in a comprehensive framework. Therefore, based on the arguments and attribution theory above which states that athletes' perception of health will allow them to feel a higher level of locus of control in the form of high self-concept which results in increased performance.

Exercise and sports activities have been associated with a healthy lifestyle for many years (Johnston et al., 2020). Physical health and well-being is an active lifestyle with physical activity and the exertion of energy to achieve positive physical strength (Van Ryzin et al., 2009). Moreover, a positive body image is supported by physical attractiveness, depending on physical health (Ramirez-Granizo et al., 2020), as a healthy person feels confident and satisfied with his physical self-concept. The perceived physical self-concept determines how people think, act, and view themselves (Ambassadors, 2020). Researchers attribute perceived physical self-concept to perceived competence, physical condition, physical attractiveness, and strength required to achieve perceived levels of performance (Timo et al., 2016). Whereas, the current research is intended for the purpose based on the attribution that athletes will display higher levels of perceived performance when they are physically fit, and the same will be transmitted through internal locus of control in the form of perceived physical self-concept. Thus, it can be argued that perceived self-concept is the underlying mechanism by which perceived physical health and perceived performance are related.

Mediating Role of Physical Self-Concept Perception of Perceptions between Psychological and Physical Health and Physical Activity

The literature suggests that being physically active prevents the human body from disease, but common mental health conditions such as feeling anxious can affect the mental well-being and psychological health of an athlete, (Bowyer & Kahne, 2020). On the other hand,Choi et al. (2020) also prove thatPhysical environment and psychological mechanisms associated with exercise influence the formation of physical self-concept. While the research resultsTrudeau and Shephard (2008) shows that lifestyle also has a greater impact on human physical and mental well-being, as smartphones and digital applications inhibit physical activity leading to inactivity, weight gain, and stress resulting in low physical self-concept. Other studies have also shown that the psychological well-being of athletes is related to unrealistic expectations of physical appearance (Teng & Wang, 2020). On the other hand, a study also shows that a positive self-image helps a person to have strong physical endurance and be physically active (Dishman et al., 2006).Therefore, it is important for athletes, especially students, to be provided with the necessary monitoring and support to maintain a healthy physical and psychological condition. So, based on the arguments, literature review and attribution theory above, it can be said that the perception of self-concept is the fundamental mechanism by which the perception of psychological health is related to physical activity (see Figure 1).

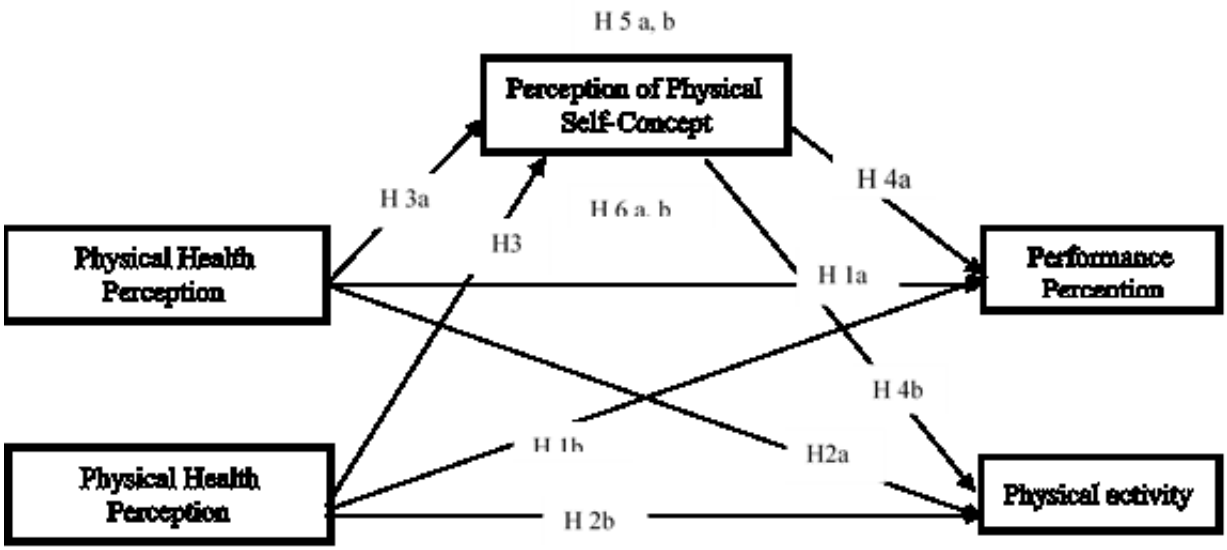

Figure 1. Theoretical Framework of the Study

Perceived physical health is related to the success of maintaining body functions that prevent disease and harm (Simms et al., 2021). In sports, physical strength and well-being play an effective role in maintaining competence and success and is demonstrated through strength, coordination and flexibility (Murray et al., 2021). Previous research has shown that engaging in physical activity helps athletes maintain a healthy self-image (Kim et al., 2020). In addition, following the attribution theory, physical health is related to the internal locus of control in maintaining the stability of the ideal self-concept; therefore, time, energy and resources are invested in maintaining it (Barry et al., 2018). In addition, the physical self-concept determines the physical activity of an athlete (Dapp & Roebers, 2019). Previous research has also linked motor skills to physical self-concept and physical activity (Simms et al., 2021). Whereas, based on the literature and theoretical support above, the current research argues that the perception of physical self-concept is the underlying mechanism by which the perception of physical health is related to physical activity.

Research Methodology

This research is a qualitative descriptive study used to translate data that is closely related to social conditions, the interrelationships between variables that occur and the presence of existing facts and their consequences (Mukhtar, 2013). According to Kusumah (2011) questionnaires are questions given to the subject to collect the required information. There are several kinds of questionnaires, namely structured and unstructured. Questionnaires are questions used by researchers where the questionnaire contains questions related to research, questionnaires are given to respondents to ask for answers. Techniques Data collection is a stage of a research, using the correct technique can produce data with high credibility and the right target of the research. The method that researchers use for data collection is using a questionnaire (questionnaire) and documentation in the form of writing or photos. The questionnaire itself consists of two types, namely open and closed questionnaires. Researchers are more directed to a semi-open questionnaire, which means the researcher has prepared several answers to be answered by the respondent and the respondent will answer with their will without coercion from the researcher. The source of the data studied is the result of a questionnaire that has been answered by student athletes. In qualitative research, the data that has been successfully obtained will be collected, recorded, and accounted for for its truth. So this method is done by collecting data with a questionnaire process, with the aim of answering the results of the questionnaire with the achievements that have been achieved

by the athletes. Data errors made include: (1) Researchers will compare the questionnaire data that has been answered by athletes with achievements that have been achieved from the results of facts in the form of writing and even photos and videos. (2) The researcher will compare the situation in the field with the opinion of the answers that have been answered by student athletes.

Using a quantitative field survey, primary data were collected from student athletes currently studying at the State University of Medan. In the first stage, Medan State University has a Faculty of Sports Science with3 Study Programs, namely: Health and Recreation Physical Education Study Program abbreviated PJKR, Sports Coaching Education Study Program abbreviated PKO, and Sports Science Study Program abbreviated IKOR. Then, in collecting data from the student athletes, they were asked to allow the researcher to contact the head of the sports department and were also asked to provide the contact details of the sports coach.

The author received contacts from 21 coaches who provide sports training to student athletes. In the second stage, after receiving the coach's contact information, the researcher explained about the purpose of doing it and after getting the coach's willingness to cooperate, they were then asked to choose student athletes. This study uses the scale adopted in the original form, which helps to avoid response and bias of the general method. In the third stage, the google survey consisted of two parts, namely, one related to the demographic characteristics of students, including questions related to age, gender, degree level, time spent on sports activities, and number of years since taking part in various sports activities.

The second part consists of 35 items related to the research variables sent to student athletes along with the first part of the survey. Students are invited by email to seek their voluntary participation, and the anonymity of their responses is also guaranteed to all potential participants. In total, survey links were sent to 73 respondents within 1 week, of which 68 surveys were received back. After careful scrutiny, it was found that 19 responses were incomplete or uninvolved, so they were excluded from the final data set, and this study left 49 usable responses reaching a final response rate of 74.79%, and the anonymity of their responses is also guaranteed to all potential participants. In total, survey links were sent to 73 respondents within 1 week, of which 68 surveys were received back. After careful scrutiny, it was found that 19 responses were incomplete or uninvolved, so they were excluded from the final data set, and this study left 49 usable responses reaching a final response rate of 74.79%

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Research Steps

Perception of physical self-concept was measured using a subscale consisting of 6 items in the Physical Self-Description Questionnaire/*Physical Self-Description Questionnaire* (PDSQ) byMarsh et al. (1994).The items included in the questionnaire describe how the student-athletes felt satisfied with their own physique which was rated on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree.*Physical activity* operationalized as moderate to vigorous physical activity (MVPA) with two items (Prochaska, Sallis, & Long, 2001; Sabiston & Crocker, 2008). Participants were asked to answer sample items such as: "Usually during the week how many days are you physically active for a total of at least 30 minutes per day?" and “Over the past seven days, on how many days were you physically active with a total of at least 30 minutes per day?” Items are rated on a scale from 0 days to 7 days. Participants' perception of performance was assessed using a sample item indicating "How well they perceive their own sports performance over the past week" on a 7-point Likert scale, ranging from zero = very poor to 7 = very good.

Participants also rated “How satisfied they were with their performance over the past week” by assigning a score between 0 = dissatisfied and 7 = very satisfied. This performance perception measure has been adapted fromArnold, Edwards, and Rees (2018). In addition, perceptions of psychological health were measured using a 21-item scale adapted from the short-form Depression, Anxiety, and Stress Scale (DASS-21) (Antony et al., 1998). It was measured on a 7-point Likert response scale ranging from 0 = not applicable to 7 = often applied to me. Finally, perceptions of physical health were assessed with a self-reported questionnaire adapted fromFricker et al. (2005)about student-athlete fitness, and specifically reported that during the past 31 days they experienced symptoms of infection in the chest (phlegm, cough, chest tightness etc.), upper respiratory tract (sore throat, runny nose, sneezing etc.), headache and flu (chills), fever, joint pain etc.). This was assessed using a 7-point Likert severity scale ranging from 1 = none to 7 = severe.

Characteristics of Respondents

The demographic characteristics of the respondents describe that student-athletesplayed a different game while participating in this survey. Of the total 49 participants, 31 were male and 18 were female. Participants' ages ranged from 18 to 29 years. They study at different degree levels, namely Bachelor's and Master's levels. Most of the participants (66.5%) described that they played different games for 5-10 hours a day. The second major class (28%) reported playing games for 3-5 hours a day, and the final class (5.5%) reported exercising for 1-3 hours daily. The majority of participants (59.6%) reported that they took part in different games for more than 10 years. In addition, 24.3% and 13.7% played different games for 7 and 5 years, respectively.

Based on the results of research conducted using a questionnaire distributed to 68 respondents consisting of the classification of gender, age to student athletes. This was done with the aim of knowing the level of anxiety in student athletes during the COVID-19 pandemic and the impact it had. Based on the results of research conducted, 36.4% felt very uneasy about the COVID-19 pandemic that occurred, 34.1% felt restless, 20.5 did not worry, and 9% felt very uneasy.

Then it was continued on student athletes who were very restless when the COVID-19 pandemic occurred because of fear and fear of being infected because this virus spread quickly and was afraid that it would be affected by the family. In addition, restlessness and worry will have an impact on disrupted practice and have an impact on the family's economy. This high level of anxiety is in accordance with research conducted by (Fitria & Ifdil, 2020), namely anxiety in adolescents during COVID-19 with anxiety results in the moderate category of 43.9% and high category of 54%. For respondents who feel uneasy, there is a statement that respondents will always believe in a healthy body condition, and feel that they will be fine.

The results of the study on fear during student athlete daily activities during the COVID-19 pandemic there were 20.5% of respondents felt very afraid of the COVID-19 pandemic that occurred, 50% felt afraid, 22.7% were not afraid, and 6.8 % feel very unafraid of the COVID-19 pandemic. Furthermore, regarding concerns when meeting other people, 25% of respondents felt very worried about the COVID-19 pandemic, 56.8% were worried, 11.4%

were not worried, and 6.8% were not very worried about the COVID-19 pandemic. For respondents who are not worried there is a statement that "We as humans need socialization with other people, so like it or not we have to always be in touch with people out there". Respondents also realized that this virus was very dangerous, but they still carry out their activities in accordance with the health protocols recommended by the government. For respondents who are worried, they assume that they are afraid and worried about contracting COVID-19 when socializing with other people. There are also respondents who feel afraid and anxious when meeting other people so they tend to be afraid to leave the house.

Results

SPSS 25 was used to identify control variables and to analyze respondents' descriptive statistics and correlation statistics between research constructs. Analysis of ANOVA (Analysis of Variance) revealed that there is no demographic variable that significantly affects the dependent variable. Therefore, no demographic construct was controlled for in further analyses. While SmartPLS3 is used to analyze the hypothesized path along with reliability, validity, factor loading, etc. To test the proposed hypothesis, the measurement and structural models were analyzed.

Measurement Model Rating

To investigate the psychometric properties of the measurements, confirmatory factor analysis was performed using SmartPLS3. "Cronbach's " and "composite reliability (CR)" were calculated to assess the reliability of measures according to the instructions provided in the literature (Henseler, Ringle, & Sinkovics, 2009; Mansoor & Noor, 2019). Table 1 describes the reliability of all reflective measures based on Cronbach values (above 0.70) and CR.on the other hand, measuring "convergent and discriminant validity" was assessed. For the athlete-student physical self-concept perception,three items, namely, PPSYH4 and PPHYH9 and PPHYH18 with a load factor of less than 0.5, were excluded from the analysis according to the instructions of Hair et al. (2012) based on its high impact on AVE and overall construction reliability (Mansur, Fatima, & Ahmed, 2020). For all other indicator variables, factor loading was => 0.60 with a significant loading of each item ($p < 0.01$) onto the underlying variable, and the "extracted mean variance" (AVE) latent variable above 0. 50 for all study constructs, therefore, “convergent validity” is considered to be well established.

Table 1. Factor Loading, Reliability, and Validity

Construction/ indicator	Factor Loading					AVE	CR	Cronbach's
	1	2	3	4	5			
Psychological Health Perception						0.539	0.903	0.828
PPSYH1	0.711							
PPSYH2	0.668							
PPSYH3	0.755							
PPSYH5	0.788							
PPSYH6	0.729							
PPSYH7	0.726							
PPSYH8	0.682							
PPSYH10	0.737							
PPSYH11	0.748							
PPSYH12	0.751							
PPSYH13	0.709							
PPSYH14	0.700							
PPSYH15	0.729							
PPSYH16	0.773							
PPSYH17	0.731							
PPSYH19	0.743							
PPSYH20	0.773							
PPSYH21	0.793							
Physical Health Perception						0.540	0.823	0.800
PPHYH1		0.655						
PPHYH2		0.781						
PPHYH3		0.719						
PPHYH4		0.776						
Perception of Physical Self-Concept						0.527	0.870	0.767
PPSC1			0.663					
PPSC2			0.716					
PPSC3			0.727					
PPSC4			0.703					
PPSC5			0.748					
PPSC6			0.794					
Performance Perception						0.506	0.672	0.716
PP1				0.715				
PP2				0.708				
Physical activity						0.542	0.703	0.737
PA1					0.729			
PPA					0.743			

Note: CR, composite reliability; AVE, the mean variance is extracted.

When using SmartPLS3, the most appropriate measure of discriminatory validity is the Heterotrait-Monotrait ratio (HTMT) (Henseler et al., 2009; Mansoor et al., 2020). The value of the HTMT ratio should be less than 0.9, as shown in Table 2 that all values are less than 0.9 for the whole model.

Table 2. Heterotrait-Monotrait Ratio

Construction	Average	STD.	1	2	3	4	5
Psychological Health Perceptio	6.12	0.89	**0.734**				
Physical Health Perception	5.96	0.97	0.413	**0.735**			
Perception of Physical Self-Concept	5.98	0.93	0.321	0.434	**0.725**		
Performance Perception	6.09	0.82	0.417	0.307	0.371	**0.711**	
Physical activity	5.87	1.01	0.323	0.319	0.427	0.519	**0.736**

Notes: *The AVE square root of the construct is shown in bold on the diagonal.*

The full measurement model is given in Figure 2.

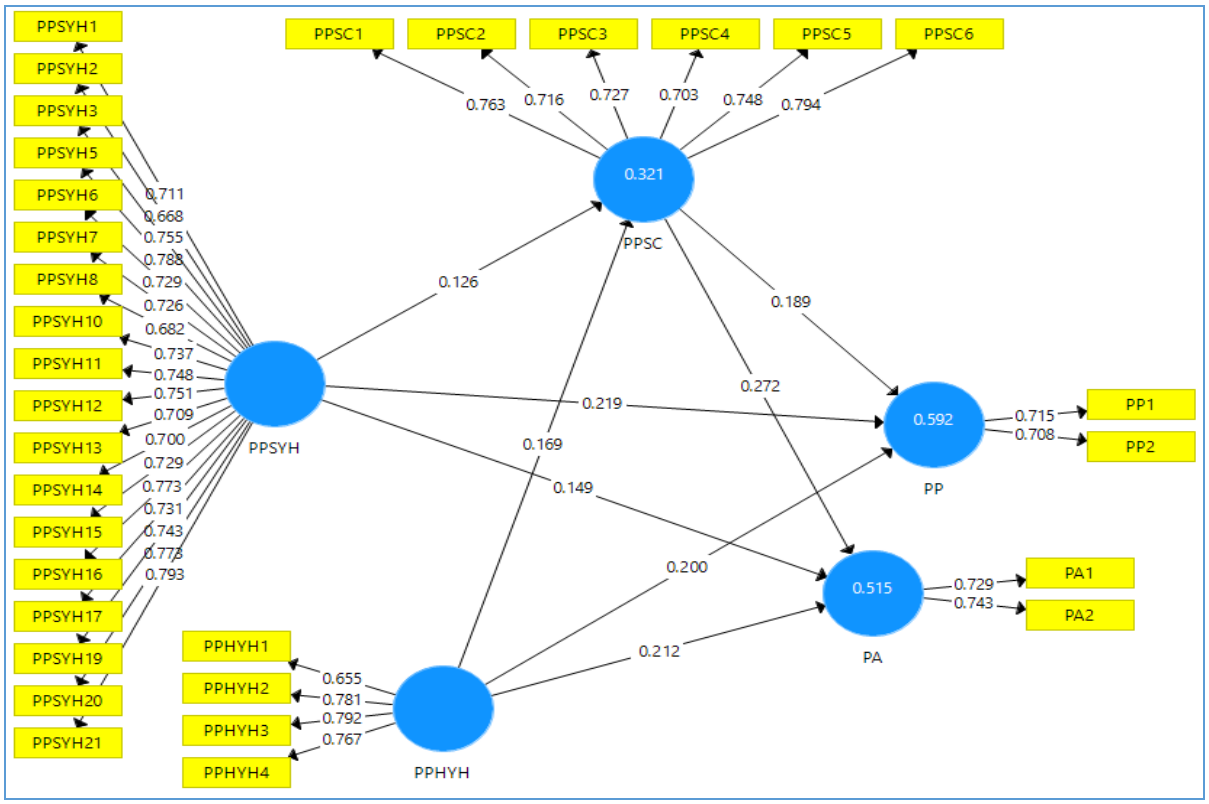

Figure 2. Full Measurement Model

Structural Model Assessment

Bootstrapping technique was performed to assess structural pathways, and 500 sub-samples were used to test the hypothesized links. B-coefficients, t-values, and p-values were recorded to confirm the hypothesized relationship. Simultaneously, the Coefficient of Determination (R2) is used to assess the suitability or change of the overall model. The results of R2 describe a 59.2% change in perceived performance and 51.5% in physical activity due to all direct and mediating variables. The value of R2 reflects a good fitness model.

Direct Hypothesis

Table 3 and Figure 3 describe the results of the direct and indirect hypotheses. The results revealed a positive and significant relationship between perceived psychological health (ß = .219***, t = 5.562) and perceived physical health (ß = .200***, t =4.737) with perceived performance. Similarly, the results also show a positive and significant relationship between perceived psychological health (ß = .149**, t = 3.043) and perceived physical health (ß = .212***, t = 5.182) with physical activity. In addition, the results also show a positive and significant relationship between perceptions of psychological health (ß = .126*, t = 2,474) and perceptions of physical health (ß = .169**, t = 3,697) with perceptions of physical self-concept. Meanwhile, the perception of physical self-concept is also positively and significantly related to the perception of performance (ß = .189***, t = 4.593) and physical activity (ß = . 272***, t = 6.786).

Mediation Hypothesis

As shown in Table 3, the mediation hypotheses H5 a, b, and H6 a, b, are also supported. The indirect and positive effect of the perception of psychological health (ß = .121*, t = 2.321) and perception of physical health (ß = .132**, t = 2.974) with the perception of performance in the presence of the perception of the physical self-concept as a mediator was proven correct. Similarly, the mediating role of perception of physical self-concept was evident between the relationship between perceived psychological health (ß = .177***, t = 3.900) and perceived physical health (ß = .145**, t = 3.012) with physical activity. Furthermore, the results show non-zero values for the lower and upper boundary confidence intervals that support the significance level of the findings.

Table 3. Hypothesis Testing Results

	Hypothesis	Std. Beta	t-value	p-value	Finding
H1a	PPSYH → PP	0.219	5.562	0.000	Supported
H1b	PPHYH → PP	0.200	4.737	0.000	Supported
H2a	PPSYH → PA	0.149	3.043	0.008	Supported
H2b	PPHYH → PA	0.212	5.182	0.000	Supported
H3a	PPSYH → PPSC	0.126	2.474	0.014	Supported
H3b	PPHYH → PPSC	0.169	3,697	0.003	Supported
H4a	PPSC → PP	0.189	4.593	0.000	Supported
H4b	PPSC → PA	0.272	6.786	0.000	Supported
H5b	PPSYH → PPSC → PP	0.121	2,321	0.019	Supported
H6a	PPHYH → PPSC → PP	0.132	2,974	0.010	Supported
H5b	PPSYH → PPSC → PA	0.177	3900	0.000	Supported
H6a	PPHYH → PPSC → PA	0.145	3.012	0.005	Supported

Where: *PPSYH=Perception of Psychological Health; PPHYH= Perception of Physical Health; PPSC= Perception of Physical Self-Concept; PP = Perception of Performance*; PA = Physical Activity

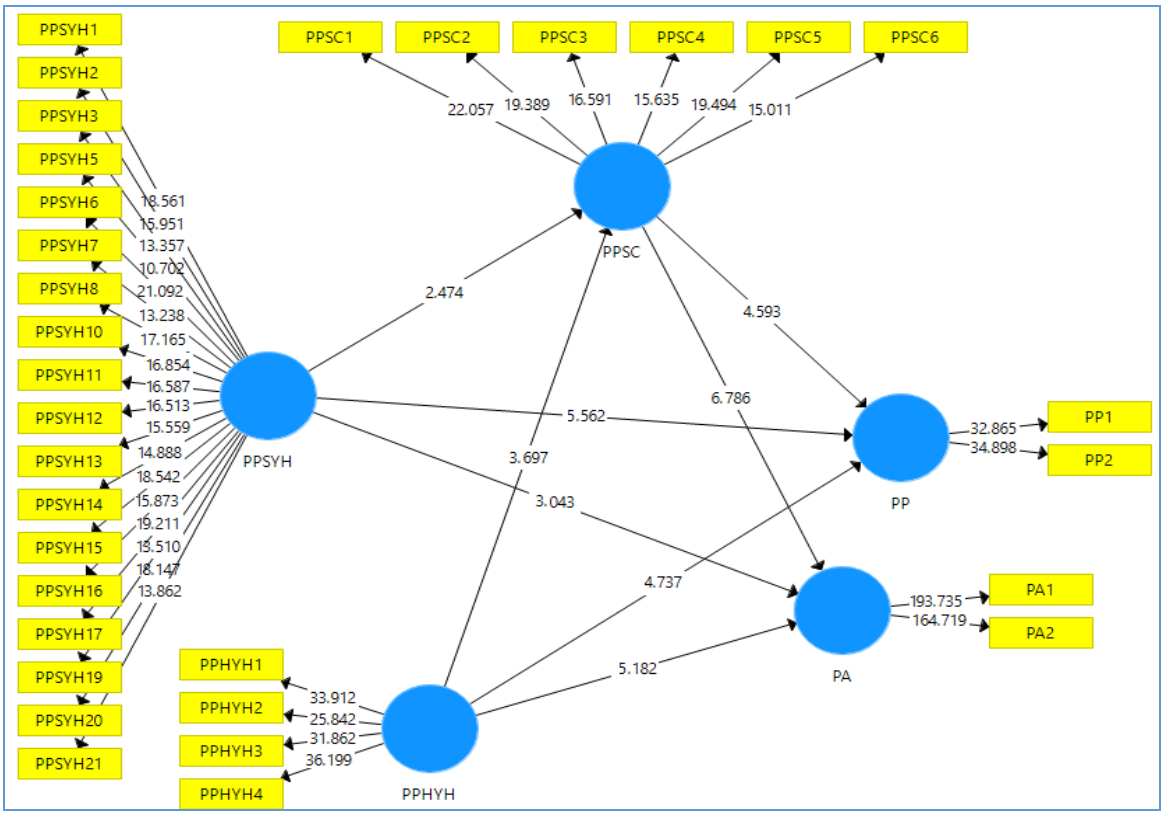

Figure 3. Structural Model

During this pandemic to new normal, everyone experiences very sudden changes in all aspects of life. These changes make many individuals experience stress, students are no exception. Stress is a body reaction caused by the human mind that appears when individuals experience pressure, sudden changes and threats that arise make someone feel depressed. The use of the term stress for conditions ranging from the mildest challenging stimulation to the most unpleasant conditions, stress is a response to appetite, a rewarding stimulus that is often not considered stressful can be as big as a response to a negative stimulus.

Based on the results that have been carried out, the anxiety level of student athletes during the COVID-19 pandemic is at 58%, 26% doubtful and 16% not anxious. However, from several previous researchers, the anxiety rate can reach up to 54% and other researchers reach 36.4%. Therefore, this happened due to lack of information and athletes' mindset about the dangers of COVID-19. Factors that cause anxiety during This pandemic consists of internal and external.

Internal factors of anxiety during a pandemic such as:

1. Genetics
2. Weak adaptation mechanisms, such as when wearing a mask, staying at home, keeping a distance, and other changes during times a pandemic like this
3. Certain personality types such as anxious type
4. Weak physical factors (comorbid disease) that aggravate the emergence of anxiety

External factors of anxiety during the COVID-19 pandemic, such as:

1. Social media information
2. Environmental stigma
3. food, clothing and finance
4. Work problems
5. Limitations of physical and social activity

Information that needs to be known is also that COVID is quite dangerous for the elderly, especially those who have a history of diseases such as chronic, diabetes, heart, hypertension and respiratory. Then things that can be done to overcome anxiety are to do stress and anxiety management, such as:

1. Stay connected and communicate with loved ones. Sharing feelings is an effective thing in managing emotions.
2. Practice a healthy lifestyle including eating a balanced diet, getting enough sleep, exercising regularly, relaxing and washing hand periodically.
3. Avoid smoking, drinking alcohol and the use of other addictive substances.
4. Get information about COVID-19 from accurate and reliable sources such as WHO or other official government information.
5. Limit time to watch or listen to news related to COVID-19 so as not to cause anxiety.
6. You can also use other methods that were previously more effective to deal with life's problems.

Therefore, athletes must have control over themselves so that anxiety does not increase. Some important things that can affect anxiety are the way students manage stress. Someone who has good stress management is able to use resources effectively to overcome mental and emotional disturbances and disorders that arise due to pressure and conditions that are beyond prediction. In addition, how to minimize anxiety is to regulate emotions. Emotion regulation is one alternative to be a solution so that athletic students survive and regulate their emotional responses in order to deal with the anxiety they experience.

Based on the results of the analysis showed that anxiety (stress) and physical activity of student athletes had a significant effect on the performance felt by students during the COVID-19 pandemic. Due to the COVID-19 pandemic, many student athletes feel anxious when doing their activities. This is natural because there is an appeal for all citizens to adapt to the new situation, where during this COVID-19 pandemic, there are many things and demands that must be obeyed by residents, in addition to the increasing number of deaths and the number of infected COVID-19 patients causing panic that does not occur. Furthermore, this frightening situation had never been experienced before, so it was certain to be hit by fear and anxiety. Therefore, managing emotions is very necessary in order to reduce student athlete anxiety. For this reason, student athletes are able to adapt themselves to the problems and demands that arise, that anxiety occurs when individuals are faced with an event or events that they experience perceive as a threat to physical or psychological health.

Furthermore, the state that results when the individual and the environment interact, real or not, demands. The situation and resources owned by individuals regarding psychological,

biological, or psychosocial conditions greatly affect individual anxiety. Anxiety also arises as a result of demands that exceed the individual's ability to fulfill them. In this case, students are faced with the demands of needs from all aspects, and if they are not able to meet the demands of these needs, they will feel a condition of tension within themselves. For this reason, it is necessary to manage emotions well from individuals so that they can manage emotions that cause anxiety.

Good emotional management can also guide thinking processes, deepen knowledge about things that cause anxiety, and support emotional and intellectual growth. The experts explained that the emotional management of a student is needed in creating high individual performance and abilities. A student athlete who is able to understand, discriminate, and use emotions or feelings well knows how to stay motivated even when he is under stress. Good anxiety management will have a positive impact on behavior that emerges during the COVID-19 pandemic, besides that, good emotional management also involves positive thoughts. Anxiety has contribution to emotional awareness and acceptance of emotions, in line with research which found that difficulties in managing emotions will increase anxiety and the use of a person's ability to manage it will reduce anxiety.

Discussion

This study was conducted to investigate student athlete perceptions of physical activity and performance using attribution theory during the COVID-19 pandemic. To analyze this, perceptions of physical health, perceptions of psychological health and perceptions of physical self-concept were explored. The results revealed that the psychological health of student athletes was positively related to perceptions of performance and physical activity. This is in line with the findings of Karimi and Sotoodeh (2019), which illustrate that various stressors, namely personal demands to be the best, academic demands such as the need to maintain academic grades, fitness and tight training schedules have an impact on student performance.

All of these stressors can lead to increased levels of stress and anxiety, which affects a person's mental well-being. While the perception of psychological health is characterized by a person's life satisfaction, ability to overcome challenges and adapt to a changing environment. Therefore, it depends on how well an athlete copes with stressors from his

environment and demonstrates mental well-being through increased performance and physical activity.

In addition, the results show that the perception of physical health is positively related to the perception of performance and physical activity of sports athletes. This means that if an athlete can maintain a healthy weight, muscle strength, and physical fitness, he or she may be able to maintain the level of physical activity required to achieve the desired level of performance (Vigoda-Gadot & Kapun, 2005). In addition, an athlete will perceive his performance positively if he feels he has the physical ability to do so; Perception of physical health gives athletes the ability and inner drive that leads to a sense of competence to achieve the desired level of performance.

Furthermore, the relationship between psychological and physical health with perceptions of performance and physical activity of student-athletes is positive and significant, which illustrates the importance of mental health in increasing self-confidence (Leisterer & Jekauc, 2019). Self-confidence reflects a person's perceived self-concept. Likewise, physical health has been shown to be an important determinant of self-concept perception as it increases the physical involvement of athletes (Osipov et al., 2020) which is then aligned with his self-image.

In addition, the results describe a positive relationship of the athlete-student's perception of physical self-concept with the perception of performance and physical activity, which proves that physical self-concept is an important factor that evaluates one's self-esteem regarding physical abilities and attractiveness (Van Zyl & Rothmann, 2012). Thus, promoting a positive self-image can help athletes develop abilities and skills to achieve desired performance and activities. Finally, the mediating role of the perception of physical self-concept is explored, which reveals that a positive self-image can help improve physical and mental well-being, and can also improve an athlete's perception of performance and physical activity.

As perceived, this physical self-concept increases self-confidence and satisfies self-esteem, leading to positive feelings related to physical and psychological health. Therefore, sports coaches and instructors should concentrate on building a positive self-image among athletes and providing resources and emotional support to achieve this (Weeldenburg et al., 2020). Therefore, it is evident from the findings that athletes evaluate their performance and physical

activity based on their perceptions of their physical and mental health and their perceived physical self-concept during the COVID-19 pandemic.

In addition to focusing on the inner abilities of athletes and comparing them to external standards, athletes strive and overcome various challenges (Lee et al., 2017). Because psychological well-being and physical health are associated with athletes' success; hence exercises like yoga, healthy diet and training can help fight stress and anxiety among athletes and keep them physically fit to improve their performance and physical activity. The presence of the COVID-19 virus makes people easily panic, anxious, anxious, and causes stress to them. This excessive feeling, because people receive too much information, causing people to become psychosomatic due to the COVID-19 pandemic. Psychosomatic is the manifestation of excessive anxiety with the feeling of the body causing symptoms similar to COVID-19. In fact, the body is not infected with COVID-19. This is a manifestation of excessive anxiety (Ilpaj & Nurwati, 2020).

This excessive anxiety factor will affect a person's attitude in dealing with the COVID-19 pandemic (Setiawan et al., 2020). Excessive anxiety will cause a person to experience stress. Stress is the body's response to any disturbed body needs. This is the result of a universal phenomenon that occurs and cannot be avoided. Stress will have a real impact on individuals, namely on the physical, psychological, intellectual, and physiological (Mayasari & Pratiwi, 2009). Anxiety is a form of negative emotion with feelings of worry, feeling always anxious, and accompanied by an increase in changes in the network system (Nurseto, 2018).

Anxiety is a situation that occurs where the physiological state of a person's body seems to feel suffocated, as a result, it will increase excessive heart rate (Hengki et al., 2018). Anxiety is a psychological problem that arises in every individual. The situation is often unclear but the anxiety itself is always felt (Ayu et al., 2018). Anxiety is an unpleasant feeling state accompanied by physical sensations that will alert a person to danger. This state is often unclear and difficult to detect precisely, but the anxiety itself can always be felt. Someone who experiences anxiety tends to always feel worried about bad conditions and circumstances that will happen to them (Nova et al., 2020).

Anxiety is defined as a feeling of worry. Anxiety becomes a form of warning to individuals about the possibility of a danger occurring so that appropriate adaptive reactions can be

prepared. Anxiety serves as a protective mechanism of the ego, because anxiety will give a signal that there is danger. If appropriate action is not taken, the danger will increase until the ego is defeated (Husdarta, 2010). Excessive anxiety will have an impact on a person's behavior, such as excessive fear. This will have a huge impact on a person's life both health and performance.

Anxiety can be reduced by the level of one's understanding of the conditions and situation of the problems being faced (Resti, 2014). The big impact of excessive anxiety can affect physical condition. Because when a person experiences anxiety, it will indirectly increase his heart rate. As a result of anxiety, besides having an impact on psychology, it will also affect a person's physical condition (Junaidi & Noor, 2010). This impact will cause dizziness, headaches, and others (Annisa & Ifdil, 2016). With this physical impact will be able to affect a person's performance. This impact can also affect a person's state of immunity, because anxiety will stimulate an increase in the production of the hormone cortisol in the body. This hormone will further suppress the body's immunity (Hammad, 2011).

May 35% not know that anxiety affects immunity? Anxiety will affect the body's immunity, because thoughts that cause anxiety will increase the production of the hormone cortisol in the body which can affect the performance of T cells in white blood cells. White blood cells play a role in fighting pathogens that enter the body. If the performance of white blood cells is disrupted, the body's immunity will decrease and it is dangerous, especially during this COVID-19 pandemic (Gumantan et al., 2020). For this reason, immunity must be maintained with regular exercise. Exercise is part of life and one of the important physical needs for humans (Mahfud & Fahrizqi, 2020). Because physical activity in addition to affect, psychological, cognitive, emotional, and social. Physical activity also affects the level of health (Mahfud & Yuliandra, 2020). In addition, regular physical activity or exercise causes the lungs to work more effectively, with the increased amount of oxygen entering this will help facilitate the work of the heart (Gumantan & Fahrizqi, 2020). With good performance it will have a good impact on the body. Factors that cause anxiety during the COVID-19 pandemic are the lack of information about this condition, the news that is too excited in the mass media or social media regarding victims and the lack of literacy related to the spread and anticipating the transmission of COVID-19. Information that needs to be known is that COVID-19 will be very dangerous if it occurs in the elderly with decreased immunity and in someone who has a history of chronic diseases such as diabetes, heart disease, hypertension,

respiratory disorders, and lack of public awareness of what to do and not to do for prevention (Ilpaj & Nurwati, 2020).

One way to increase immunity is by exercising or doing physical activity. Excessive anxiety will also disrupt the educational process, due to high fear of something, such as the current situation with the COVID-19 pandemic. Because excessive fear of some of these things will interfere with clarity in thinking, memory in learning (Suardana & Simarmata, 2013). There have been several studies of anxiety about COVID-19 in various fields. Research from Fitria et al., 2020 discusses the role of cognitive behavior therapy counseling carried out to overcome anxiety during the COVID-19 pandemic. Research from (Fadli et al., 2020) which discusses what factors affect anxiety in health workers in efforts to prevent COVID-19. Research (Fitria & Ifdil, 2020) discusses the anxiety that occurs in adolescents during COVID-19. In this case, some of the existing studies have not discussed student anxiety. In this context, students' mental health is important in supporting the process of daily activities, especially in the training process.

There are several rules and recommendations from the government to reduce and prevent the spread of COVID-19. The government through the Ministry of Health urges the public to keep their distance and avoid crowded places (Physical Distancing) and use masks as personal protective equipment (Ministry of Health, 2020). With good knowledge related to pandemic conditions and how to prevent and keep the body from being affected, it will reduce the level of anxiety in a person.

Conclusions

Every athlete must feel mental turmoil; the mental that usually appears is anxiety, either during practice or during competition, and during the COVID-19 pandemic. The physical and psychological stability perceived by student athletes is an important source of increased performance and physical activity. Based on the attribution theory, this study analyzes the psychological and physical health impact felt by student athletes on their perceived performance and physical activity. In addition, a unique construct, the perceived physical self-concept, was also accessed as an intervention mechanism among the study variables. This type of research is qualitative and the data collection technique uses a questionnaire given to the respondents, namely student athletes at the State University of Medan.

The scores obtained from the questionnaire were collected and analyzed using qualitative descriptive methods. The results of this study show that 58% feel anxious when practicing, 26% feel doubtful when practicing, and 16% feel less anxious when practicing in the presence of a COVID-19 pandemic like this, with different anxiety factors. The main factor of anxiety felt by student athletes is the fear of being exposed to this fairly dangerous virus. So, the results of this study were quite successful because the researchers knew the level of anxiety of student athletes when doing exercises during the COVID-19 pandemic. The results reveal that perceptions of psychological health and physical healthpositively related toperceived performance and physical activity during the COVID-19 Pandemic. In addition, it was found to be mediated byperceived physical self-concept. Furthermore, future research directions, key policy insights, along with theoretical and managerial implications for sport science scholars and policy makers are suggested.

Theoretical Implications

Previous research has focused on external factors that influence student performance, whereas current research differs in evaluating students' perceptions of performance and physical activity; therefore, has some theoretical contributions:

First, this study has explored the role of perceived performance and physical activity in a single framework, which has not been studied together in previous literature during the COVID-19 pandemic.

Second, it contributes to the literature by investigating the impact of perceived physical and psychological health on perceived physical performance and activity. The combination of physical and psychological constructs within a unique framework is an advance in science, which paved the way for future researchers to focus on these factors in influencing other athlete perceptions such as attitudes, behaviors, and preferences.

Third, this study investigates the mediating role of perceived physical self-concept, which serves as an intrinsic motivation for athletes to achieve higher levels of performance and demonstrate competitiveness. This unique exploration has significantly contributed to answering many unanswered questions in the literature posed to explore the mechanisms by

which various factors influence athlete performance and athlete physical activity which serves as an intrinsic motivation for athletes to achieve higher levels of performance and demonstrate competitiveness. This unique exploration has significantly contributed to answering many unanswered questions in the literature posed to explore the mechanisms by which various factors influence athlete performance and athlete physical activity.

Fourth, this study focuses on attribution theory to determine how athletes attribute their success and failure. Explaining the mediation of the perception of the physical self-concept is a major theoretical advance in current research. In addition, based on the internal locus of control, the findings suggest that the emotional and physical abilities of athletes must be analyzed, enhanced, and strengthened in order to be successful. In addition, competitiveness through team performance can be increased because it constructs an ideal self-concept which in turn makes them strive to achieve it. Furthermore, it justifies the importance of physical, mental and energy abilities for achieving performance-related goals and increasing participation in physical activity.

Finally, current research tooenhance our understanding of athletes' challenges in academic achievement, coach and team expectations, training rigor, required levels of mental and physical endurance, etc. This phenomenon identifies the need to overcome it through the development and improvement of physical abilities such as muscle strength, body shape, and endurance levels. Current research results can help achieve performance through turnaround time, success rate, and power output, as athletes' perceptions are subjective to their unique abilities and perceived level of performance.

Practical Implications

The current study assesses in detail athletes' perceptions of physical activity and performance which has many practical implications for policy makers; as universities and institutes promote sports and athletics among their students, they need to recognize how students feel about their performance, physical and mental well-being. First, this study highlights that students consider physical health to be very important in maintaining their physical activity. Therefore universities, sports departments, coaches and managers should provide programs that support and monitor student athlete health regarding physical appearance, weight, illness,

and dietary intake to ensure that athletes maintain a healthy physical outlook and are not under the influence of drugs.

Second, this study focuses on students' perceived psychological health and their impact on perceived performance and physical activity. Although physical activity has been associated with curing mental illness and promoting a healthy lifestyle, this study shows that students' perceptions of mental and emotional well-being strongly influence their engagement in any physical activity. Therefore, universities and policy makers should focus on recruiting counselors and psychiatrists to help athletes cope with anxiety, depression, substance abuse, and other physical and psychological factors that can affect their well-being. Their perceived mental and emotional well-being can greatly influence their involvement in any physical activity. Although physical activity has been associated with curing mental illness and promoting a healthy lifestyle, this study shows that students' perceptions of mental and emotional well-being strongly influence their engagement in any physical activity. Therefore, universities and policy makers should focus on recruiting counselors and psychiatrists to help athletes cope with anxiety, depression, substance abuse, other physical and psychological factors that can affect their well-being.

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Finally, this study introduces the role of physical self-concept perception, which can help increase student athlete self-confidence and motivation to perform better. Therefore, institutions and managers can hold workshops, seminars, conferences and arrange meetings with celebrity sports athletes (which students aspire to and strive for) to share their views and

inspire young athletes to focus and develop their skills in the necessary way with develop a high physical self-concept in it. Coaches and managers can use attribution theory to improve athletes' physical self-concepts by connecting them with top athletes nationally or internationally so that they resemble themselves with the top athletes in the game.

Limitations and Future Research

This study focused on the student-athlete perspective, but there is a lack of evidence on how coaches manage stressors and support students. Therefore, future research could focus on the coach-student relationship to determine how student perceptions affect coaches' expectations, perceptions and plans. Second, future research might focus on gender differences in perceptions of performance achievement or physical activity or differences in perceptions of physical self-concept between male and female athletes. This study highlights gender differences in the perception of physical self-concept based on the literature but does not investigate empirically because the results of the one-way ANOVA revealed no significant effect of gender on perception. Third, this study focuses on university students and athletes in the higher education sector. Future studies may focus on elite and professional athletes at the provincial and national levels as well as student athletes in college and elementary school education.

Due to limited resources and time, this study used a cross-sectional study design and an email google survey. For better causality, future research can conduct time lag studies to assess responses at different times. Future research can also look for focus groups and observation methods to adopt triangulation techniques which are not possible in the current study due to the COVID-19 scenario. Future researchers can also investigate the perception of physical self-concept and its role in the attribution of actual performance of athletes as well as athlete-student academic achievement.

Recommendations

The achievement of the results of this research is actually not only due to anxiety when athletes are practicing, because surely there are many other variables related to psychology in the world of sports that have not been revealed or researched during this COVID-19 pandemic, and in this study of course there are still many shortcomings and mistakes that

require justification, either from research results or otherwise. Therefore, further researchers are expected to be able to add to these deficiencies in order to help improve the results of this study with new research results and add other variables so that they can reveal various phenomena from athletes' activities in training during the COVID-19 pandemic.

Then it is expected to look for more appropriate references, because of the lack of references obtained by researchers. Anxiety will greatly affect body immunity, because the mind can cause anxiety, it will increase the production of the hormone cortisol in the body which can affect performance or exercise. That's why immunity must be maintained, then do exercise or physical activity while adhering to health protocols and keep eating vitamins so that endurance is maintained because physical activity is related to the domains of affect, psychological, cognitive, emotional and social. Therefore, physical activity is very good for the body with the right portion, because one of the benefits of physical activity is to increase the work of the heart and lung muscles and can control stress, reduce anxiety and depression. This anxiety is caused by the fear of being exposed while practicing, and in the field, there is no place to wash their hands, until they are worried when they finish practicing, experiencing symptoms such as COVID-19, namely cough, runny nose or fever and also those who feel worried even though they always exercise during a pandemic like this.

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Chapter 5 - A Study of Present-day Women's Family Status in China: Intimate Relationships among Chinese Post-90s Couples

Anran Li

Chapter Highlights

- This chapter aims to explore Chinese post-90s women's family status in contemporary society in China. That is, to examine whether women got a higher position in their family, what kind of role they play in some essential parts of their daily relationships with their partners, including the division of household labour and decision-making.
- To collect the information I needed, I conducted semi-structured interviews with seven couples who were recruited by phone. Some of them are my friends while some are strangers recruited by snowballing in China.
- This research is to explore whether the gender role ideologies of post-90s generation changes on the premise of a rich material and broad knowledge, instead of exploring the impact of economic status and educational level. In this light, all the participants should be married, living in urban areas, and at least have received college degrees which is the lowest level of higher education in China.
- I initially expected them to share their stories that reflect the changes of women's domestic position. However, after analyzing the interview data, I found that the way that post-90s people treated housework has changed, which means the housework women undertake is no longer as the same as it in traditional context.
- In contemporary young couples' daily life, women not only undertake the physical labour but also the cognitive and emotional labor, which is still a burden of women's life. Besides, some patriarchal ideologies remain in post-90s couples' relationships, which makes women fail to have a real discourse in their families.

Introduction

Conventional wisdom routinely presumes that women in China are in an inferior gender position than men. This is not surprising given the long-held belief that Chinese society is heavily influenced by Confucianism, which has long proclaimed a principle of *"nan zun nu bei*" — literarily translated as men are superior, and women are inferior(Shen, 2016). It is not until recently, however, that mass media suggested that the gender role in China might have undergone a tremendous shift among the younger generations such that women now have higher status and more power in domestic lives (Zhong, 2018). Yet there lacks rigorous evidence to demonstrate changes in gender ideology, nor is there sufficient research on the contemporary embodiment of gender ideology in intimate relationships. This research utilizes in-depth interviews to investigate whether gender role has reversed in China among the post-90s couples by examining their gender ideologies, emotions, and behaviours in intimate relationships.

The discussion of this research will be mainly around household labour and family power. Initially, with the high technology applied in the domestic field, the concept of housework among post-90s people has changed, which promotes them to deal with housework in a new way. In this light, women's physical labour seems to be relieved. However, with further studies in couples' daily life, cognitive labour and emotional labour raise people's attention, which is the burden that present-day women are suffering. And it is also a domestic field that is easy to be overlooked. What's more, women's family discourse is undergoing a 'negotiation' with a patriarchal voice in a new pattern of manifestation. All of those phenomena reflect the post-90s generation's gender role ideologies and contemporary women's situation in their families.

Housework and Women's Domestic Position

Household labour commonly refers to unpaid, valueless work done to maintain a family (Deng, 2009), is closely related to people's lives, which is used to be considered as the bounden duty of women under traditional gender role ideologies. This kind of domestic labour can neither bring economic benefits to women nor help them achieve personal development, which, on the contrary, leads women to fall into an inferior position both in social and domestic fields because, as Brines (1994) states, what family supporters bring to

marriages is something of market value, which is one of the reflection whether one has a power of discourse in a family. Such the inferior and obedient position of women has lasted for a long historical period until they were encouraged to participate in the labour market because of the widespread of an equal gender role ideology. Women gradually achieve economic independence rather than only rely on their husbands' support. In this light, women's household burden should be relieved since they spend part of their time on their career development instead of only focusing on housework. Nevertheless, according to the latest survey of national time use bulletin in 2018 (National Bureau of Statistics, 2019), the average time women spend in housework is 2.1 hours while it only takes men for 45 minutes on housework. The survey also showed us that the residents' housework participation rate is 40.4 percent for men and 75.6 percent for women. Women seem to fall into a worse situation of a double burden that they not only undertake most of the housework, but also spending time in their work. By exploring post-90s couples' domestic lives, we found that both the role of housework in contemporary young people's daily lives and the way in which housework affects women's family status have been already different from before.

Men's Protection of their Masculinity

In the traditional division of household labour, men only undertake some non-routine housework, like repairing some electrical household appliance or doing those who need physical power. Meanwhile, they regard material production activities as their main goal, which will help them gain a better position in society and domestic respect from their wives. Such a traditional gender role ideology that men dominate while women subordinate makes men stay in a superiority complex, which refers to a behavior that suggests a person believes they are somehow superior to others, and they may believe their abilities and achievements surpass those of others (Colman, 2015). In other words, men, in a patriarchal environment, still hold a belief that men are superior to women and they should be the breadwinner to support the family while women should be inside the home to doing housework. However, in contemporary modern society, the widespread of equal gender role ideology encourages women to achieve their value by participating in the labour market and being economically independent, which heavily runs counter to the traditional gender division of labour. Also, women's performances and personalities do not conform to the traditional cultural expectations of femininity that women are weak, inferior and dependent. Instead, post-90s career women are always considered as economically independent, confident and active. All

the changes of women's social role and personalities brought men a great pressure, which makes them have to keep their masculinity to protect their dominant position in their families because once women do not economically rely on men and pay attention to their development and value, men will lose the dominant sense that has existed for a long time. To protect their dominant position, post-90s men tend to spend more time and energy on their work in order to achieve greater career success and play a role of economic pillar instead of on household chores which used to be women's 'duty.' In this light, housework became a field that men negotiate with their wives to reset the discourse in their families. Initially, men try to emphasize their importance as a wage-earner by weakening the equal importance of women as a labour force in the labour market. To take participant 14 as an example:

> "I think that men outside for work and women for taking care of family represents 80 percent of the normal status in this society, so I can accept it if my wife doesn't go to work. And in my view, I think the most important thing for a man is whether he is useful. I mean whether he has a good wage-earning ability or a successful career. If a man does housework very well, but his workability is not that good, he is useless. I think this is a basic principle to judge whether a man is a man. I can take a friend of my dad as an example. He is friendly and kind to everyone, and he can also take good care of his family, but no one thinks him as a successful man because his wage-earning ability is ordinary. I even think this is kind of a failure to a man." (Participant 14, interview)

All the discussion about the man from this participant extremely reflects a male chauvinist ideology which holds a belief that men are superior to women (Mansbridge and Flaster, 2005). From his perspective, whether a man is of value depends on whether he has a promising career. He emphasized men's working abilities, but meanwhile, he can accept his wife to stay at home only for taking care of the family. This is the way that his masculinity can be kept in his family. In this light, a woman's social role, as a labour force, is underestimated even ignored. A woman's 'value' is judged not according to her working ability, and to some extent, a woman is not of value because such unpaid and unsocialized housework was considered worthless. Although post-90s women are not limited to find jobs, it seems that their husbands do not expect them to make money to support their families:

> "I only have one requirement to my wife that woman should go out to work. It does not mean that you should go out to make money, but that you should have your social network that I will not interfere." (Participant 4, interview)
>
> "Anyway, it is okay for me whether my wife will go out for work or stay at home, but actually, according to the current state, my son is still in kindergarten which needs to be taken care of, and my business is very busy recently so that I have no time to help her ferry my son to and from school. I think when my son goes to elementary school, there should be okay for her to find a job if she wants." (Participant 2, interview)

The meaning of a woman's going out to work is just for social activities instead of being expected to make any economic benefits for their families, like Participant 4. Also, as Participant 2 states, a woman's work seems like an inessential thing that needs to be arranged on the premise of taking good care of their child. In other words, women's 'value' is to assist men with housework to let them not distract from their careers. In this light, women have no value in their family or, at least, in their husbands' views, because the household is considered as a piece of unpaid and valueless work. Therefore, it is difficult for women who lost their value in their family to have a higher position and to be respected.

Besides, having access to more occupational resources is the other 'excuse' for men to imply a traditional division of household labour. In the process of interview, post-90s men, to maintain their image, fearing the pressure of critics from social media, never stated that their wives should undertake most of the housework (Zhang, 2016), but they have implied that the amount of wives' housework should exceed husbands' in terms of occupational resources, working hours and female housework ability. First, it is accepted that those who own more resources in the labour market will gain more bargaining power in the division of household chores. According to Blood and Wolfe, (1960), men's bargaining power in households increases proportionately to the levels of income, education, and occupational status compared to their partners. In such a patriarchal society, it is not that difficult for men to gain some resources or opportunities which may help with their promotion by comparison with women. Men then employ such a reason to explain why men are more competitive than women in the labour market so that they should spend more time working instead of housework. This kind of opinion regards that households as an obstacle that acquiring individual welfare instead of which needs to be shared together with their partners within families. Second, time availability is the other reason that men try to 'avoid' housework,

which advocates that people who have more spare time is supposed to do more unpaid work (Coverman, 1985), and those who specialize in labour market work will do less housework (Becker, 1991). As we mentioned before, in such a patriarchal society, men are supposed to own more resources than women, which determines that they will have more opportunities and needs to spend more time in paid work. Then, men 'have to' do less housework because they have no time. Thus, women 'naturally' became people who should pay more attention to families.

Finally, men try to compliment women, meanwhile, show their weakness in household ability in order to encourage women to do more housework. Some post-90s men emphasize that their wives can do better in housework than them because they are careful and skillful with it. As participant 12 states:

> "My wife is more attentive so that she does housework better than me. Like wiping the floor or television cabinet, she could make them very clean, so I think it should be better to let my wife do housework." (Participant 12, interview)

Actually, the household is a piece of work that may not need that much skill rather than time and patience, so the result that men chose to show their weakness to their wives is to make women have no choice but undertake more in the domestic field. However, the problem is that since part of housework can be purchased for the commodity market, it necessary for us to explore what kind of housework women undertake in contemporary society.

Women's Status in Household Labour

It is no doubt that the socialization of household labour has helped women relieve a lot of pressure from housework. But it seems that women's domestic burden has not decreased at all. Women's workload is almost three times that of men, which means the division of housework between males and females within families is still extremely unequal (National Bureau of Statistics, 2019). In such a context, we have to think about what kind of housework women are doing, which determines the necessary attention to contemporary types of household labour among the post-90s generation. Household labour is commonly considered as a set of physical tasks such as cooking, cleaning, and shopping, while there are other two types of household labour which are often ignored: cognition labour and emotional labour. The cognitive dimension of household labour refers to "the cognitive work of anticipating needs, making decisions, and overseeing family logistics" (Daminger, 2019). In the

contemporary social context, it is not that difficult for people to find some replaceable ways (e.g., employing intelligent household appliances, hiring a household nanny, etc.) to do physical housework. However, cognitive labour is commonly undertaken by people on their own. And when men tend to devote themselves to their career, the cognition dimension of household labour is naturally on women's shoulder:

> "Commonly, my wife can make a decision of those trivial things while I deal with some crucial and serious problems. But actually, there are few crucial and serious problem things happen in our families, so she can make decisions of everything." (Participant 14, interview)

As this participant states, his wife seems to have a great right to decide 'everything' of their family, but actually, she looks more like a 'housekeeper' or 'project manager' who spends the mental labour to worry and manage their daily lives. Also, he mentioned that there are a few crucial things in their family, which means this kind of 'everything' his wife spend time and energy in is all trivial and valueless housework. In this light, women are still in a disadvantaged position with these heavy burdens.

Emotional labour is the other form of household labour that is easy to be omitted. Hochschild (1979) explains that emotional work is about managing one's feelings and affect in order to complete the task. For example, participant 13 states her feelings of her mother-in-law:

> "There will be some conflicts between my mother-in-law and me, but I always choose to endure it, because I think that family harmony is the most important thing. So, I basically don't quarrel with her. Although sometimes I was really upset or angry, I will try to persuade myself not to think about this." (Participant 13, interview)

In order to maintain their family harmony, this participant chooses to endure the conflicts with her mother-in-law, which is the reflection of emotional labour. Daminger (2019) points out that emotional labour often occurs alongside physical labour, which means women have to bear emotional unhappiness while undertaking the burden of physical labour.

Besides all the three types of household labour: physical, cognitive, and emotional labour, the most complicated work in family is childcaring in the post-90s generation's contemporary life course. Participant 10 shared her opinions about childcaring:

> "I have to say that childcaring cannot only be regarded as one type of housework. It must be the sum of all housework… You have to take care of not only all the matters concerning your child's daily life but also his or her education… You should take good

> care of your child's health and safety, because once there is something wrong, your families will complain to you about how you bring up your child…" (participant 10, interview)

Most of the post-90s couples are now in the stage of just giving birth or preparing to have a child, so from the whole interviews, taking care of children is the main thing in post-90s families. And it is worth mentioning that it is women that undertake most of the work of childcaring. The statistics show us that residents aged 25-34 have the longest average lifetime of accompanying and caring for their children, which is 1.3 hours, including 29 minutes for men and nearly 2 hours for women. The average time for residents to accompany and take care of their children was over 3 hours, including 2.3 hours for men and 3.5 hours for women (National Bureau of Statistics, 2019). That is, even if we assume that women could get some help with part of basic physical labour, a large part of the housework is still born by women, including all care for the children and all cognitive and emotional labour for other family members. Of course, childcaring can also be outsourced to a caregiver in order to relieve women's burden. However, from the interviews, it is common that women choose to take care of children by themselves. And their husbands only play a supporting role in the process of childcaring.

Despite the influence of men's masculinity, there may be two reasons for us to think about these women's choices: on the one hand, post-90s women, living in such a patriarchal society, have partly internalized the traditional gender role ideologies. Despite the relatively high level of education of the interviewees, post-90s women themselves still cannot completely get rid of the shackles of traditional ideologies. The first manifestation is that some of them still recognize that women can do better in some kinds of housework than men, especially for childcaring. Life-course is an important reason to affect women's minds on their families. Compared women who have given birth to a child with those who have not, we found that women who have a child will naturally choose to take care of their families more, especially when their babies are still in the lactation period. People need to live in a family and rely on parenting since they were born. This dependent process is so long, and actually, babies tend to need a mother's parenting more when they are in the infancy stage because of physical caring (Zhu, 2012). Women then have more time to spend with their children so that they think children are emotionally and physically closed to their mothers. Thus, they bond themselves with childcaring. Another manifestation is that post-90s women, to some extent,

tend to compromise and would rather retreat to family in order to help their husbands to achieve career success. Even some women tend to make a career planning on the premise of well arranging their domestic affairs:

> "I think if I take good care of domestic work, my husband can keep his mind on his work with no worries about our family." (Participant 13, interview)
>
> "If nothing else, my original plan is that I will wholeheartedly take care of my son before he goes to kindergarten. I will go outside for work after he goes to kindergarten." (Participant 10, interview)

We can say that supporting the husband's career and being responsible for housework is still post-90s women's first consideration when there is a time conflict between their career planning and these domestic affairs. The result of such a 'compromise' must not be conducive to women's development. Initially, most of the post-90s people contend that the amount of household chores has no influence on one's discourse within the domestic field, and only material production capacity can enable individuals to control the family (Zhang, 2016). But, if it takes them lots of time to deal with housework, it may be difficult to gain further development in their work. That is, heavy housework will take up lots of their spare time, which will make them lost and have to give up many opportunities to renew their knowledge or improve their workability. Thus, it must lead women to be in a disadvantaged position in the labour market compared to men.

On the other hand, motherhood is constructed by a pre-discourse of patriarchal society as a default state without discussion. Rich (1995) puts forward a concept of institutionalized motherhood that refers to an expectation of motherhood in a patriarchal society. This expectation regards motherhood as an absolute justice that production is an important aspect for a woman's identity with no choice. The physiological structure of women makes conception, nurturing embryos, childbirth and raising children naturally linked together so that women taking care of children becomes an inseparable part with other links. Besides, the patriarchal society also constructs the other discourse that "mother is the primary caregiver of children" and "mother always puts the children's interests before self-interest" (Barclay *et al.*, 1997). Although there are some cases that the father starts to take care of the children, the mother is still the main caregiver. And if a mother chooses to focus on her interests first instead of her children's, she, to a large extent, will be criticized that how could there be such a mother. In the book titled *Of Women Born: motherhood as experience and institution*, Rich

(1995) concludes institutionalized motherhood allows women to rely on nature and intuition rather than wisdom to be mothers; mothers should be with selflessness rather than self-realization. Therefore, women, in such a patriarchal context, 'choose' to be still in such a position.

Power of Family: a Complicated Process of Negotiation

Family is a field where people are connected by consanguinity or affinity, which is considered as the smallest social unit in the society (Deng, 2009). With the economic development and social changes, family structure underwent a transition from extended family to conjugal family, which makes the family discourse transfer from the male family members that represented by the father to couples themselves. I would like to introduce the patriarchal family structure as an important context first.

Changes of Power Structure: from Patriarchal Family to Conjugal Family

Extended family used to be a relatively common form of family structure in traditional China (Yan, 1934), which includes parents, children, grandparents, grandchildren, and other patrifocal kinship. This kind of family structure lasted for a long time in ancient China since that the feudally patriarchal ideologies ruled people's mind in a long-term historical period. In such a patrifocal family system, male family members, represented by father, owned the only family discourse and represented an absolute authority. As Liu and Yao (2015) states, in traditional China, males have the right to arbitrate an speak in terms of morality, etiquette and economy, as well as the support of public opinion, which makes them at the core of family cohesion. On the contrary, women were in an extremely humble and inferior status that were required to obey the rules of 'three obedience' (O'Hara, 1945) and 'four virtues' (Wen, 1974) which requires women to listen to their fathers, husbands and sons, and to keep a good appearance, a submissive behavior, a good household ability and a virtuous morality. During this period, the patriarchal relationship represented by the father-son relationship was emphasized in the whole society. Women, in this light, were only regarded as men's property instead of wives so that the relationship between husband and wife is ignored. However, with the establishment of China's socialist system, the feudal family system in which men are superior to women was fundamentally abolished, providing a possibility of the realization of democratic equality in terms of social system. After the reform and opening-up policy,

women's extensive employment and the establishment of independent economic status have provided a realistic economic basis for guaranteeing their economic and personality independence (Wang, 2008). With the change of family economic structure and the needs of personal development, extended family can no longer meet people's lifestyles. The preparation from social system also promoted that people separate from their extended families. Then, family structure gradually changes from a 'big family' to 'nuclear family' which is also named conjugal family. (Smith, 2005) explained that the nuclear family refers to the family includes only one spouses and unmarried children who are not of age. There is only one couple in a nuclear family which means that the major power in this family is the couples themselves. It makes it possible for people to pay more attention to the conjugal relationships, and also make it possible for women to have the right to speak.

In addition to changes of family structure, the improvement of post-90s generation's discourse is the other reason that patriarchal power has been weakened. Post-90s generation, having received a food education and the baptism of new media culture, have formed new cultural ideologies, which is different from the cultural ideologies of previous generations. Ma (2019) suggests that at present, the main difference and conflict in China's society is the understanding of life and traditional morals and ethics. Among post-90s generations, the inheritance of filial piety in traditional father-son relationships has been given a new interpretation. That is, because the acquisition of knowledge and social position, post-90s generations are more willing to live according to their cognition instead of blindly obeying the authority of their fathers. I would like to take participant 8 as an example:

> "The main conflict in our family may be the conflict between my wife and my parents. My parents are very traditional that they think frugalness is a very good virtue, but my wife insists that she will be happy when she purchases something she likes. So, sometimes my parents may think it is too wasteful. When having this conflict between them, I usually persuade my parents, because after all we now have our own way of life. And they cannot demand us with the habits and ideas in their era, because it may not be correct from our perspectives." (Participant 8, interview)

This participant does not agree with his parents' habits of life, so when there are conflicts between his wife and his parents, he will speak for his wife to protect their own lifestyle, which reflects that the traditional parental power in contemporary young couples' family is gradually disintegrating.

The patrifocal family discourse is gradually giving way to the husband-wife family power in contemporary society, but does it mean that women have the same family power as their husbands? This is still a suspectable question. And the fact is that a series of male-dominated ideologies still exist although it seems that women is no longer extremely obedient to men. Such a patriarchal power structure remains as a new form to influence contemporary couples' families.

Women's Decision-making Power: Under the Judgment of Men

Power is regarded as the right that an individual can exercise his own will even if opposed by the other party in a specific social relationship (McDonald, 1980). The power of family, one of the types of power, is a reflection of power in the domestic field. Generally speaking, it refers to who has the final say in a family. To some extent, people's family power depends on the power of decision-making in their families. Decision-making power, according to Neil and Domingo (2015), refers to the rights that someone could influence something or some process. That is, people who own the decision-making power could influence and decide things of their family life. To analyze women's family power in such a complicatedly historical and contemporary context, Zuo (2002) advocates that we should divided the decision-making power into familial dimension and personal dimension. Family decision-making power refers to the final power of daily family affairs and some crucial matters (Zuo, 2001), which directly reflects the power status of women in the family. Personal decision-making power refers to the right that people could carry out matters related to themselves according to their own will without interference from others (Wang, 2013).

From the interviews, we found that in contemporary post-90s families, husbands still control the discourse, which reflects in the judgment of wives' decision-making process. For the dimension of family affairs, women's decision-making power is more like a power granted by their husbands. That is, it is husband that decides what kind of decision-making can be handed over to wives. Although as we mentioned before, some participant advocates that his wife could decide 'everything' (participant 14) in their family, it seems that this kind of 'everything' is incomplete. The husband selectively permits his wife to decide some household affairs that is more labourious and time-consuming, which does not help with wives' personal development at all. For examples, when I asked what kind of domestic affairs you usually decide at home, participant 7 answered:

> "I can decide everything concerning my child, such as buying him clothes, getting vaccinations, having diet and signing up for some interest-oriented classes. I generally take care of those things…" (Participant 7, interview)

What this participant have discourse in her families is those trivial affairs of childcaring instead of some crucial matters that influence the whole family's development. Besides this, some participants (Participant 3, Participant 10) seem have the right to discuss some crucial matters with her husbands, however, this kind of expression of opinion does not mean a real discourse that can decide one thing.

> "Generally, for some crucial things in our family, we will negotiate with others. But for some things like buying a house or a car, my husband usually has more ideas of that, because he knows which one is better. I might just tell him my likes and dislikes, then he will analyze which one is better for me or our family." (Participant 3, interview)
>
> "My husband always has a lot of ideas. Whenever we need to make a decision, he will ask for my opinion, and then convince me to listen to him." (Participant 10, interview)

From the descriptions of those two participants, it seems that they only have a right to be informed instead of the right to decide, because whenever they make decisions or express an opinion, their husbands always judge their decision or opinion, which prevents them from being the one who makes the final decision. Then, in other words, their husband, employs 'judgments' to hinder them from having discourse in family in domestic affairs.

Women's power in domestic dimension does not seem optimistic, so do women have the discourse in terms of personal decision-making power? For the dimension of personal affairs, husbands still deprived wives' family discourse, which is manifested in that they explain women's personal decisions still under the patriarchal eyes. That is, although to some extent, women have some 'freedom' to decide for themselves, men tend to give an explanation or a comment for women's decisions. These explanations or comments is completely from the patriarchal perspectives, which will implicitly be influenced women's discourse. I would like take participant 9 as an example:

> "My wife can choose to go out to work or not to work at any time, because I think the purpose of women going out to work after they get married is not to make a lot of money, but to make some friends and have their own social network so that they won't be uninformed." (Participant 9)

One of the important meanings of women participating in labour market is to achieve their economic independence, which makes them no longer fall into the situation of relying on their husband in traditional families. However, men give an explanation of women going out to work that aims to make some social activities to make friends. Such an explanation not only conceals the value of women as an independent labour force, but also weakens women's motivation to work hard to achieve economic independence, which, on the contrary, maintains men's discourse.

Besides, family-oriented thinking also affects women's personal decision-making. Family-oriented thinking refers kind of the thinking that takes the family as the center and always give priority to the family's interests. This kind of thinking restricts women from making personal decisions freely, and also provides another 'standard' for men to judge women's decisions:

> "I never restrict any of my wife's decisions. She basically does everything according to her will. But the only requirement is that these decisions must not break or harm to family's harmony and filial piety to parents. Don't break this principle, I will not restrict." (Participant 12)
>
> "I want to go out for work, and my husband also told me that I can go out for work anytime. But the current situation is that I have to wait until my son goes to kindergarten, then I will have time to find a job." (Participant 1, interview)

Despite of the implicit influence of women's personal decision making, family-oriented 'principle' can be a direct regulation when women make some decisions. Men employ family-oriented standards to limit women to choose to work or make other personal decision, which in fact is a kind of sacrifice to women. That is, women sacrifice her identity as an independent labour force, which directly influences her discourse in her family. As He (2010) explains, in China's early history, agriculture occupies a major economic position, which makes land as a very crucial factor to people. Agriculture depending on land makes people were confines to a fixed area. And due to economic needs, several generations of a family must live together, therefore, family becomes an important concept to Chinese people. However, from the small-scaled peasant economy to the market economy, the individual no longer needs to rely on family for production activities, but has becomes an independent labour force, which means that the individual's economic productivity directly affects his or her discourse in the family. In this light, men or families not expecting women to be the

breadwinners, actually, means that they deny the value of women and deprive women of the family discourse.

Conclusion

Extensive research has examined women's status in the family, however, there is still a lack of attention to the latest generation of couples' domestic life. This research has added to the academic discussion by exploring post-90s couples' intimate relationships. Throughout the approaching of this research, I have remained drawn to issues of how to collect information from interviews and the present complicated situation of women's domestic status and people's gender role ideologies.

Since family structure transits from the extended family to the nuclear family, women underwent a change from an extremely obedient position to a relatively equal status. For the housework, women's physical labour, to some extent, is relieved by some modern high technological appliances and the help from parents. However, women still bear a heavy burden from cognitive and emotional labour in the domestic field, because some patriarchal ideologies still remain in terms of the division of housework. Being bound with the trivial housework, women's value in labour market has been weakened or overlooked. At the same time, men, the beneficiaries of patriarchy, began to employ a new form of intervention to influence and hinder women's discourse: to judge women's decision. That is, women who should be treated as an equally independent labour force in labour market are not expected to bring more benefit to their families, which means that although women have gotten rid of the patriarchal discourse in traditional families, they are still not considered as an independent individual. A more complicated point is that not only men mentally controlled women's discourse but women themselves, to some extent, have internalized the traditional ideologies which is harmful to their development. In this light, it is still a huge task for women to gain a real family discourse and achieve an equal position in such a patriarchal context.

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Appendixes

Appendix 1: Background information of Participants

		Gender	Birth Year	Child Condition	Degree	Level of Annual Income	Living City
Couple 1	Participant 1	Female	1991	1 daughter 1 son	Bachelor	8-15w RMB	Shaanxi Xingping
	Participant 2	Male	1990	1 daughter 1son	Bachelor	8-15w RMB	Shaanxi Xingping
Couple 2	Participant 3	Female	1991	pregnancy	Master	8-15w RMB	Shaanxi Xian
	Participant 4	Male	1990	—	Master	8-15w RMB	Shaanxi Xian
Couple 3	Participant 5	Female	1990	1 daughter	Bachelor	8-15w RMB	Shaanxi Xingping
	Participant 6	Male	1991	1 daughter	Bachelor	8-15w RMB	Shaanxi Xingping
Couple 4	Participant 7	Female	1990	2 sons	Master	8-15w RMB	Shaanxi Xian
	Participant 8	Male	1990	2 sons	Master	8-15w RMB	Shaanxi Xian
Couple 5	Participant 9	Male	1995	—	Bachelor	12w RMB	Hubei Ezhou
	Participant 10	Female	1996	—	Bachelor	5w RMB	Hubei Ezhou
Couple 6	Participant 11	Female	1994	—	Bachelor	7w RMB	Xianyang Shaanxi
	Participant 12	Male	1993	—	Bachelor	7w RMB	Xianyang Shaanxi
Couple 7	Participant 13	Female	1991	2 sons	Bachelor	100w RMB	Wenzhou Zhejiang
	Participant 14	Male	1990	2 sons	Bachelor	100w RMB	Wenzhou Zhejiang

Appendix 2: Demographic Questions Form

Participant No.

Please fill in the list below:

Gender:	Birth Year:
Child Condition	Degree:
Level of Annual Income:	Living City:
Other you would like to add:	

Appendix 3: Consent Form

Participant No.

Title of Research: A study of present-day women's domestic status in China: intimate relationships among Chinese post-90s couples

Consent Form: If you are happy to participate please complete and sign the consent form below

	Activities	**Initials**
1	I confirm that I have read the attached information sheet for the above study and have had the opportunity to consider the information and ask questions and had these answered satisfactorily.	£
2	I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to myself. I understand that it will not be possible to remove my data from the project once it has been anonymized and forms part of the data set. I agree to take part on this basis.	£
3	I agree to the interviews being audio recorded.	£
4	I agree that any data collected may be published in anonymous form in academic books, reports or journals.	£
5	I understand that there may be instances where during the course of the interview/focus group information is revealed which means that the researchers will be obliged to break confidentiality, and this has been explained in more detail in the information sheet.	£
6	I agree to take part in this study.	£

Data Protection

The personal information we collect and use to conduct this research will be processed in accordance with data protection law as explained in the Participant Information Sheet and the Privacy Notice for Research Participants.

Name of Participant Signature Date

Name of the person taking consent Signature Date

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Chapter 6 - Recurring Emotions and Coping Mechanisms of Parents with Children having Autism

Nicole Marie C. Pascua, Cherry Amor Dizon

Chapter Highlights

- The purpose of this study is to identify Filipino parents' recurring emotions and grieving experiences that trigger it while raising a child with Autism Spectrum Disorder (ASD). The researcher also described various coping mechanisms used by these parents.
- The study involved parents who had a child with ASD whose age ranged from 12-18 years old from selected private schools and centers in Metro Manila, Philippines.
- This study employed a phenomenological approach and used Interpretative Phenomenological Analysis to explore and understand the meanings of the experiences of the participants.
- Three themes with sub-themes arose: Initial Diagnosis, Grieving Experiences, and Progressive Acceptance.
- Different recurring emotions were identified: These were triggered by events and challenges that were under the Grieving Experiences theme. The events that triggered recurring emotions identified had three sub-themes.
- The challenges identified had four sub-themes. Under Progressive Acceptance are the different coping mechanisms used by the participants to cope with their situation.
- This research described the cyclical grieving of Filipino parents. As their child grows and matures, frequency of events and challenges that triggers grieving emotions and intensity of felt emotions decrease.

Introduction

Any child's birth has significant effect on the growth of the family. Parents undergo various preparations to adapt the changes of having a new child such as lifestyle, financial demand, and emotional well-being; thus, the impact on the family members of discovering that their child has Autism Spectrum Disorder (ASD) can be even more intense. There are several studies and theories with regards the parental stress of having a child with ASD However, we have limited studies about parental stress and coping mechanisms used by Filipino parents with child diagnosed with ASD. This study aims to give deeper understanding of Filipino parents' emotions and why should the professionals give them proper guidance and understanding to their child's case.

ASD is defined as a disorder of neural development characterized by impairment of social interaction and communication, and by restricted and repetitive behavior. Early detection of ASD along with early intervention is proven to significantly enhance a child's development and achieve the best possible progress for the child (Manukonda, 2018). Autism is associated with a higher overall incidence of parental depression, anxiety, and stress this affects marital relationship and family lifestyle. Extra caretaking demands can be stressful due to special accommodations that have to be given to the child. This sense of stress may be associated with financial demands, child's characteristics and being unprepared for the parenting responsibilities, sense of loneliness and isolation from the community (Thwala et al., 2015).

Bearing a child with special needs is beyond any mother's control which is why when one receives the diagnosis; it results to frustration and emotional distress. The grief that Filipino mothers felt is focused on disappointment and emotional pain due to sadness, regret, hopelessness on their child's disability. Filipino mothers also often experience physical and mental exhaustion. The child's uncontrolled behavior and additional responsibilities that come with parenting a child with disability result to the mother's physical strains. Furthermore, mother's mental stresses factors are frustrations over their child's safety and future (Almazar, et al., 2017).

Today, there is a growing trend in the mental health field to consider importance not just related to the child alone, but the importance of the whole family. When a child is diagnosed with ASD, the lifestyle of the family is greatly affected. Adjustments are made to

accommodate the child with ASD. This spectrum of symptoms takes place within the circumstance of the family and may affect each member of the family (Dykshoorn, et al., 2018).

Although there are some parent support groups in the Philippines, there are still parents that are lack of knowledge when it comes to their child's diagnosis; it is also a tendency to give them a higher level of stress and/or anxiety (Tekinarslan, 2018). A study in Metro Manila stated that most Filipino parents were in denial and had hopes that eventually their child will catch up. Parents were afraid to face the reality that their child might have ASD hence the delay in consultation (Quiledrino, et al., 2015).

Picardi et al. (2018) mentioned that parents of children with ASD suffer from depression and anxiety due to the burden of child-care performance. Parents with children with ASD have higher levels of anxiety, anger, depression, emotional distress, and variety of psychopathological dimensions compared to other group of parents. In addition, Comorbidity of disorder such as challenging behavior or intellectual disability among adults with autism may contribute to family member's stress or anxiety nonetheless, support system received by a family member is important to the individual's well-being. It is also suggested that mental health support should be given both to the family members and the adult with autism to prevent challenges in the family (Herrema, et al., 2017).

Studies have also shown that mothers have higher levels of stress, than fathers. This may be because of higher caretaking demands amongst mothers. It may also be because fathers tend to keep their emotions to themselves (Scherer, et al., 2019). Filipino families actually perceived having children with special needs as a challenge and as a reward at the same time. Some challenges that Filipino mothers experience are emotional distress, physical and mental exhaustion, financial struggles involvement in social conflict, and wasted opportunities. However, mothers also claimed that it is rewarding for them to experience and become a mother of children with special needs in terms of personal growth, perception of the child as a gift, family unity, social auxiliaries and paid-off sacrifices (Almazar, et al., 2017).

Parenting a child with ASD is a lifelong process hence parents' grieving is cyclical. The grief of having a child with ASD has been compared to the grief of parent's experience when a child dies, except there is no closure. Emotions occur when an event happen (Midoneck,

2015). This type of event shows that parents carry severe burden of care and frequently suffer from significant symptoms of grief (Picardi, et al., 2018). Financial difficulty, severity of autism (Schener, et al., 2019), lack of social support, and parent's perception and understanding towards ASD are additional factors of parental grief (Illias, et al., 2018).

Parental Grieving process starts when the initial diagnosis is received by the parent (Cauda-Lauffer, 2017). Most parents have specific expectations about their child's future; disability shatters these dreams they had before the diagnosis. ASD diagnosis is being compared to mourning, loss of a normal child (Bravo-Benitez et al, 2019). All mothers noted that they felt an intense emotion of shock and disbelief after their child's diagnosis. The loss of expected normal and healthy child is changed by uncertainty about their child's disorder. Parents' loss of dreams to their child results to various intense emotions (Fernandez-Alcantara et. al, 2016).

Coping Mechanisms

It is discussed that taking care of a child with ASD means great stress and difficulty for the parents. Parent's acceptance of their child's diagnosis is a long and hard process for them to go through (Sahida et al., 2018). (Zhou & Yi, 2014) stated that parental emotions were related with parenting cognition and behaviors. Parents that are willing to adjust their expectations and open to change and for their special child is reported to be relieved with anxiety and were more tolerant with the challenges in parenting a child with ASD.

The emotional stability of a child with ASD as well as their progress seemed to be affected by parent's perception. Thus, attending trainings as a source of strength for parents is very much needed. Parent support group will also be a big help for them; it can provide breathing space for parents to exchange stories toward their experiences while raising a child with ASD (Sahida et al., 2018). It is proven that parents who obtained proper learning about ASD changes mother's viewpoint completely. Mothers claimed that they felt less sadness and anxiety, and developed more consciousness about ASD while gaining experience as a mother. It is necessary to give parents training and proper education about ASD after a child's diagnosis, that parents will be prepared emotionally as well as to be capable of handling their child's unique behaviors (Tekinarslan, 2018).

Most Filipino mothers reached the level of acceptance; thus, they handle the challenges in raising a child with ASD in a lighter manner (Dela Cruz, 2013). However, some parents claim they had no other choice but to accept their child's diagnosis. Acceptance means understanding their child's situation which affects their decisions. A parent also shared that realization becomes acceptance (Capote, et al., 2016). The fact that parents enroll their child in an inclusive school, therapy sessions and other programs means that they are still optimistic about their child's future (Dela Cruz, 2013). Ilias et al. (2018) cited that based on the past studies, parents with child with special needs use social support as coping mechanism that lessen parental stress. They also identified two types of support system that parents and caregivers engage with; (1) informal support, in which parents seek guidance from the professionals such as doctors, teachers, and therapists. (2) Emotional support, in which parents seek strength from their family and friends. They also mentioned the third source of social support parents engaged with, in today's advanced society now include online communities, such as Facebook.

In the Philippines, some parents prefer continuous support from their child's therapist while some parents prefer teaching their child personally (Lucero, 2017). Gopalan et al. (2017) also pointed out that parents with better support system and awareness has lower level of stress and depression. Parents also find support systems through parents who also have a special child from the school their child is enrolled in as they meet other parents and share story of having a child with ASD (Lucero, 2017).

Scope and Limitations

The researcher interviewed the parents of children with ASD who experienced substantial amount of their child's life. This would make it possible to determine the recurring emotions felt and effective coping mechanisms of the parents used while raising a child with ASD. The study involved 13 parents from 10 families who have children with ASD whose age is 12-18 years old from selected private schools and centers in Metro Manila, Philippines; 8 mothers and 5 fathers. Most of the respondents were in their 40's; The median age of the participants when their child was initially diagnosed with ASD was 32 years-old (range 26-41 years old). 4 participants had two children with ASD: Mr. and Mrs. E – aged 13 year-old (girl) and 4 year-old(boy); Mrs. H – her 2 sons' were 12 and 16 years-old; and Mrs. D – her children's age were 13 years-old (boy) and 6 years-old (girl) (see Table 1).

Table 1. Description of Participants

Codename/ Gender	Present age	Age when child's diagnosed with autism	Marital Status	Current Work	Number of Children
Mr. A	51	41	Married	Seaman	2
Mrs. A	47	37	Married	Housewife	2
Mr. B	46	33	Married	Government employee	3
Mrs. C	41	30	Married	I.T. Consultant	2
Mrs. D	44	34	Married	Business owner	3
Mr. E	40	29	Married	Teacher	2
Mrs. E	37	26	Married	Teacher	2
Mr. F	43	34	Married	BPO Agent	3
Mrs. F	38	29	Married	Secretary	3
Mrs. G	46	32	Married	Housewife	1
Mrs. H	44	30	Married	Housewife	3
Ms. I	56	40	Separated	House mom	4
Mr. J	44	32	Married	Creative Director	2

There were total of 11 children diagnosed with ASD; 2 were female and 9 were male (see Table 2). The median age of the children when initially diagnosed was 3 years old. The participants were limited to parents with children having ASD, coping mechanisms does not generalize those parents whose children have different disability. The sensitivity of the topic was also limitation to the study. The participants had a hard time remembering the events and challenges, as well as the emotions that come along with it while their child with ASD was young. A parent that had a child with autism but is younger than 12 years of age are excluded in the study because they have not experienced much in life having a child with autism transitioning to adolescence. Furthermore, the researcher only put age 18 because that is the oldest age of a participant's child.

Table 2. Description of Participant's Children having ASD

Codename/ Gender	Age when diagnosed with autism	Present Age	Educational Program	Auxiliary Services
Boy-A	3	12	Prevocational	Speech Therapy Occupational Therapy Sped one-on-one
Boy-B	3.3	17	Prevocational	Speech Therapy
Boy-C	3	13	Inclusive	n/a
Boy-D	4	13	Inclusive	n/a
Girl-E	3	13	Mainstream	n/a
Boy-F	4	14	Mainstream	Academic tutorial both at home and in school
Girl-G	1.6	16	Inclusive	ABA Art Class
Boy1-H	4	16	Inclusive	ABA Basketball
Boy2-H	1.8	12	Mainstream	ABA Occupational Therapy
Boy-I	2	18	Prevocational	Occupational Therapy Functional Home Skills Functional Socialization Skills
Boy-J	2.6	14	n/a	Verbal ABA Occupational Therapy

In future researchers, the researcher recommends doing a longitudinal study and interview the parents periodically following the bracket of cyclical grieving: young children, adolescents, and later life to record the accurate data. The future researchers should also consider parents from public schools, grand-parents, siblings, helpers (caregivers beside from parents), and professionals who handles children with ASD.

Conceptual Framework

Joan K. Blaska, developed *cyclical grieving model* to help parents and professionals to fully understand the cyclical nature of parent's grieving, it was designed based on parents with kids diagnosed with disability that the author had interacted for over 20 years. Cyclical grieving is reoccurrence of one or more emotions which are part of grieving process that is experienced by parents who have children with disability. Cyclical grieving represents the cyclical nature of grieving experienced by parents who have children with disabilities (see Figure 1).

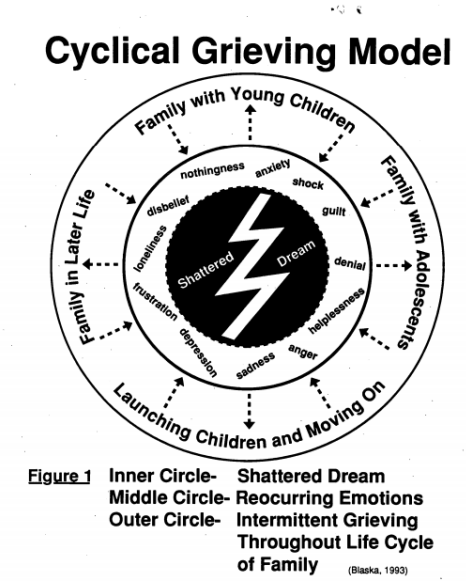

Figure 1. Blaska's Cyclical Grieving Model

Method

This study utilized qualitative research specifically phenomenological design to identify and to understand Filipino parents with children with ASD's recurring emotions. Interpretative Phenomenological Analysis (IPA) was used to analyze the participant's answers during the interview. Interpretation Phenomenological Analysis or IPA is a qualitative research approach. Qualitative research explores and understands the meanings people assign to their experiences. The uniqueness of the qualitative inquiry is its experiential understanding of the complex interrelationships among phenomena and its direct interpretation of events. IPA is particularly attractive because of its commitment to explore, describe, interpret, and situate the participants' sense making of their experiences (Tuffour, 2017).

The researcher asked permission from different private schools and therapy centers around Quezon City, Metro Manila, Philippines along with written consent letter. Once approved, the researcher asked consent to the parents personally, along with inform consent form that were duly signed by the agreed participants that allows the researcher to conduct the said interview. The place, date, and time were determined by the availability of the participants. The sample study interview questions that were answered by the parents was developed by the researcher to gather data; and were validated by three professionals that have enough experience in the area of study (see Appendix for the sample study interview questions). Data were collected using semi-structured interviews. The interviews were video recorded to see that participant's facial expression while sharing their lived-experiences; however, parents who decided to remain anonymous were not shown in the video. The recorded videos were deleted after the researcher transcribed the data. The researcher opted to withhold the names of parents and their children involved in the study to protect their rights and privacy. The researcher interviewed the participants at least twice to gather data and to confirm the consistency of the parents' stories with an interval of 5-7 days per participants.

After collecting all the data needed in the study, the researcher transcribed the data then used the Interpretative Phenomenological Analysis (IPA) to analyze the parent's answers. IPA is a detailed and systematic analysis of a phenomenon (Tuffour, 2017). The researcher then proceeded to the proposed steps of data analysis of Peat et al (2017): (a) Reading and re-reading (b) Initial noting (c) Developing emergent themes and search for connection of the said themes: This is where the researcher clustered the data and organized into themes and sub-themes using by memo writing, coding, and charting method (d) Moving the interpretation to a deeper level. Main categories were identified and most important data were used. In the final stage of analysis, the researcher drew on existent concepts to further explore the data. The gathered data in the study were labeled and treated accordingly. This study was reviewed by Our Lady of Fatima University Institutional Ethics Review Committee (OLFU-IERC).

Results

Table 3 shows the identified categories and themes emerged from the participants' interviews. These categories are associated with recurring emotions of the parents. The data were compared, analyzed and categorize by themes. The researcher clusters the data that she

derived from the study according to their characteristics.

Table 3. Themes identified

Initial Diagnosis	Grieving Experiences	Progressive Acceptance
Anticipated Grieving Emotions Shattered Dreams Intervention	Events and Challenges that triggers recurring emotions	Coping Mechanisms Factors that lessen grieving emotions

Themes under Initial Diagnosis

Anticipated

Some parents anticipated their child's diagnosis during their child's early years (1-2 years old). They observed early warning signs or red flags such as speech delay or no communication at all, stereotyped and repetitive behavior, and regression of developmental milestones. Some compared their child's development to other kids with similar age. Other parents compared the development of their child to their child's sibling. Even though they are somewhat prepared with their child's initial diagnosis parents still can't help to feel worried towards their child's future. Meanwhile, other parents did not observe the warning signs of ASD. They only became alerted because someone observed it for them.

> *"Actually, hindi ako na schock… kasi before pa siya ma-diagnosed napapansin ko na, na kakaiba kung icocompare ko siya sa panganay ko…iba behavior niya" (Mr. J)*

Grieving Emotions

A child's ASD diagnosis affects family members especially parents in different ways; range of emotions occurred when the doctor revealed the diagnosis to them. This is where the grieving process begins for most of the families. Parents, who are aware of autism, were highly emotional when they learned about their child's diagnosis. Mixed emotions were felt by most of them for instance denial and sadness or fear-helplessness and shock were felt at the same time (see Table 4). Some parents described their emotion that as if everything is falling apart. Fear-helplessness mainly concerns about their child's future situation and who will look after them when they are gone. However, parents who haven't heard about autism

are feeling lost in the circumstances; a mother said that autism was an alien to her. Other parent also agreed that it is more of ignorance than denial because they have nothing to deny in the first place because they don't know what autism is. Parents learn about autism simultaneously with the child during therapy sessions.

> *"Ako kasi nagkakaroon lang ng awareness nung nag ttherapy na… Na kumbaga habang yung bata natututo, natututo na rin ako – so sabay yung learning namin." (Mrs. H)*

Parents like Mr. and Mrs. F and Mr. B received a different diagnosis prior to ASD. Both claimed that they were somehow relieved when they heard that their son is not autistic, although it evoked different emotions. However, it is not as intense as what they felt when they confirmed that their child has ASD. Their common reaction was worrying about the long-term effect to their child's situation.

> *"Na diagnose siya nung 3 years-old as GDD (Global Developmental Delay)… So nakampante kami that time. Hindi siya nag therapy kasi ang ano namin, hindi kami nag worry kasi nga ang sabi GDD." (Mr. B)*

In this early stage parents have self-realization that their child will have ASD for the rest of their life but still feel strong grieving like emotions, such as sadness, feeling lost, denial, shock, and fear-helplessness.

Table 4. Direct Quotations associated with Grieving Emotions

Grieving Emotions	**Quotes**
Sadness	*"…nalungkot ako pero tinanggap ko nalang kasi ano magagawa ko pagka ganun talaga si Boy-A." (Mrs. A)*
Feeling lost	*"Ako kasi actually ang autism sakin parang alien yan e… So totally parang 'ano yun?' parang wala e, blanko ako. Hindi ko alam. Hindi ako aware." (Mrs. H)*
Denial	*"In denial ako, sabi ko 'marunong pa ba sila sa Diyos?" (Mrs. D)*
Shock	*"So umuwi na kami, nung andito na kami sa bahay parang na shock kami tapos umiyak na kami." (Mr. B)*
Fear-Helplessness	*"pag tanda natin, sino mag aalaga sakanya? Mga ganung worries namin; yun agad ang na kwan namin, sino mag aalaga sakanya?" (Mr. B)*

Shattered Dreams

This study supports Blaska's Cyclical Grieving model, once a developmental pediatrician confirmed their child has ASD to the parents they feel that their world is shattered right in front of them. All parents expressed their shattered dreams for their child – the loss of a parent's dream for their child to have a successful life. ASD interferes with their expectations about their child's future proceeds with strong feelings of regret and disappointment. Parents were certain about their child's future before the diagnosis. The parent's expectations were shattered and were replaced with questions and fear about their child's future. In this group, shattered dreams only occurred on the beginning of the cyclical grieving process (see Table 5).

Table 5. Direct Quotations associated with Shattered Dreams

Shattered Dreams	**Quotes**
Regret	*"as a parent (mapapa-isip ka) na 'paano na yung anak ko?' Ang dami pang pangarap e, parang pano na yung pangarap ko sa mga bata." (Mr. J)*
Disappointment	*'Yung parang sinasabi mo nga na shattered dreams ganyan. Syempre disappointed din kasi first child tyka only son… (Mr. F)*

Intervention

ASD diagnosis from the doctor is just confirmation for the parents. Participants who anticipated their child's diagnosis revealed that when they verified their child's disorder, they provided the proper intervention right away. The doctor's verification of ASD is a big part of the decision-making process of the family. When it comes to the intervention choices, most of the participants complied what the doctors suggested.

> *"May clue na kami agad na may developmental delays si Girl-E kaya ini-expect na namin 'yon. We just need confirmation from the doctors and waiting what are the interventions to be given." (Mr. E)*

Themes under Grieving Emotions

Events that Trigger Recurring Emotions

Events are incidents that cannot be anticipated by the parents; it may trigger occasionally. Some events may result to challenges. The data show that parents experienced variety of events that triggered recurring grieving like emotions. Most of the participants underwent the same events at least once in their parental life.

However, the emotions felt were different with regards on the point of view of the parent. Meanwhile, due to numerous events encountered by the participants, some are events unique and may not be experienced by other parents. The data also revealed that the events that triggers grieving emotions are lesser as the parents and child with ASD grows old and matures.

School Setting

School stressors are associated with extreme disappointment, anger, dismay, and frustration from the parents especially if school professionals triggered the event because parents least expected it from them. Most parents expressed intense emotions towards the teachers and therapists who mishandled their child. They pointed out that professionals must have enough knowledge and capability to handle kids with special needs because they're supposed to be exposed and trained. Almost all the participants argued that teachers, and therapists still lack experience and capability in handling/treating kids with special needs; there was a manifestation of dismay because they're paying costly tuition fees. However, they feel like their time was wasted, yet their child is regressing or being mistreated.

Center-based students have a different environment from school-based students. Center-based students are less likely to be bullied and they are very much accepted by the center community meanwhile school-based students are prone to bullying and isolation. Frustration was felt by all the fathers due to their child's slow progress, specifically in speech during their son's younger years. They were also discouraged because of the costly amount of the speech therapy. All children are now verbal. Different emotions were described by the participants such as worry, helplessness, sadness, guilt, and sympathy (see Table 6).

Table 6. Direct Quotations associated with School Setting

School Setting	Emotions	Quotes
Negative Comments	Disappointment	*"Diba nga dapat sila yung nakakaintindi rin?" (Mrs. C)*
	Anger	*"hindi ko pinalagpas… na-hurt ako sa sinabi niya" (Mrs. D)*
Unprofessional Teacher/ Therapist		*"Narinig ko sinisigawan siya… tas pinagalitan ko yung ano, yung therapist" (Mr. F)*
	Disappointment	*"Nakakasama ng loob kasi kaya nga sa SpEd school namin siya inenroll, na sana dapat mas naiintindihan siya" (Mrs. E)*
Teacher's lack of SpEd Training		*"They just accept teachers without the background of handling special children" (Mrs. H)*
	Frustration	*"Ako pa nagsasabi ng activity sa teacher…" (Mrs/.G)*
Child's Slow Progress		*'doon ako na f-frustrate before sa speech niya…" (Mr. J)*
Professionals Giving False Hope		*"Ako nafrustrate sa… You know your paying this much pero teka muna parnag lumala ng lumala si Boy2H." (Mrs. H)*
	Disbelief	*"Kasi lahat ng fnfeedback sakin ng mga therapist puro positive… Kaya ko tinigil e... " (Mrs. I)*
Bullying	Worry	*"Ngayon saamin ang lagi lang naming worry is yung situation niya dun sa school; yung welfare niya. Hindi siya masasaktan at hindi rin siya makakapanakit…" (Mr. E)*
Isolation	Guilt	*"Minsan iniisip ko pinipilit ko ba si BoyA dito sa mga batang normal? (Mrs. A)*
	Sympathy	*"Actually, wala siyang friend sa school… pag walang nag yaya sakanya, hindi siya sasama…" (Mrs. E)*
Unpredicted BMTs due to behavioral Issues		*"Basta kung ano naman yung ginagawa ng teacher hindi naman ako nagagalit (pero) syempre naawa din ako… (Mrs. A)*
	Sadness	*"Talagang mejo emotional na po talaga ako… Talagang iyak ako. Umiyak talaga ako." (Mrs. C)*

Home Settings

The Philippines is a developing country, awareness about ASD is spreading from the internet world to the television. Public and private organizations are putting effort to spread awareness about PWDs. However, there are still ill-informed individuals that are insensitive

to their environment. This brings vulnerability, annoyance, and anger to the parents (see Table 7).

Table 7. Direct Quotations associated with Home Setting

Home Setting	Emotions	Quotes
Wishful Thinking that their Child is Verbal	Hopeful	*"Nag dream ako na makausap or the normal thing na sabihin mo sakin nangyari sa school" (Mrs. D)*
Realization of Loss of a Normal Child	Depressed	*"Uy minsan na d-depress din ako pag nakikita ko na syempre lumalaki na si BoyA Imbes na siya e namamasyal, nag pupunta sa mga kaibigan …" (Mrs. A)*
	Concern and Uncertainty	*"minsan napapaisip ka – paano pag wala ako? Sino mag aalaga sa bata?" (Mr. J)*
	Frustration	*"Isa pang frustration ko jan… yung mga laruan na hindi ko nakuha nung bata ako – binibili ko ng binibili sakanya… hindi naman 'yun yung gusto niya." (Mr.F)*
Neighborhood's lack of awareness	Vulnerable	*"dun siya pinag usapan, lahat ng kapitbahay tinitignan siya…. Dun ako nadurog." (Mrs. D)*
	Annoyed then Understanding	*"Na DSWD ako kasi nga siguro nakikita ng kapit-bahay 'yung bata may pasa pasa…" (Mrs. I)*
	Anger	*"Kinompronta ko yung matanda... hindi ko pinag eexplain sinisigawan ko ng sinisigawan." (Mr. F)*
Child's Safety	Worry and Thankful	*May time na nakaalabas siya ng bahay. Nakapasok siya, may tindahan… buti naman may nakakita sakanya. (Mrs. E)*
Questioning Parenting Style	Regret	*"Parang yun ang siguro regrets ko na hindi ko nagawa with Boy2H. Yung hindi ako nakapag drive na nanjan lang siya,.."(Mrs. H)*
	Guilt	*"Kung pwede ko lang sisihin sarili ko, sisisihin ko e." (Mr. A)*
	Distress	*"So, hindi ko mai-apply sa akin anak (training) kasi ganyan siya… bakit ganun hindi ko mapag aralan…" (Mr. B)*
Health Problems	Frustration and Helplessness	*"Kay Boy2H ako maraming ano kasi nonverbal e. Na kapag may masakit, hindi mo alam kung san ang masakit…" (Mrs. H)*
Milestones	Extreme Happiness	*"I remember si Boy1H, nakasipsip lang ng coke. I was crying while I was driving…" (Mrs. H)* *"Talagang we celebrate every little milestone." (Mrs. D)*

Moreover, families who live in a healthy community have no issues about discrimination. Some Events are results of Challenges, for instance health issues becomes a triggering event due to child's limited communication, then grieving for the loss of a normal child is felt, due to excessive caretaking demands. Unnecessary extreme emotions and child's slow progress brings guilt to some parents that causes them to question their parenting style. Additionally, a child's milestone triggers passionate emotions such as extreme happiness. Numerous emotions were described such as being hopeful, distress, vulnerable, annoyed then trying to understand, worry, thankful, guilt, frustration, concern and uncertainty, helplessness, and extreme happiness.

Community Setting

Recurrent grief caused by social factors in the Philippines involved ignorance and lack of awareness of the community. The most common cited situation begins with the child's unwanted behavior, such as tantrums and hyperactivity during child's younger years. It constantly draws attention to the people in public places. Often the parent's initial reaction is either being angry towards the person. They feel that they were being judged by the public eye because of how their child behaves. Negative reactions turn into positivity and justify people's reaction by understanding that the Philippines still have an uninformed society. Some parents described the feeling of embarrassment because of their child's unwanted behavior. However, the embarrassment felt was only during the younger years of their child due to lack of exposure to such situation. Moreover, most parents expressed that they don't feel ashamed over their child's unique behaviors and they don't care what other people think.

There are times that parents cannot avoid comparing their child with another child, at times like this, some parents feel upset seeing that their child acts differently. All parents said that it was only during younger years when they compared their child to typical children. During adolescent years, comparing becomes more of an eye opener to the parents. They compare their child to other children with special needs in a positive way. It is more like an epiphany of how they are going to be a better parent for their child with ASD.

> *"Teka muna hindi normal ang anak ko, why would you compare yourself with them? Kasi sakin ngayon ang naiisip ko, comparison is a theif of happiness." (Mrs. H)*
>
> *"natapos na sa stage ng comparison sa part earlier part nung diagnosis niya… natuto na kasi ako na wag siya i-compare sa normal child eh." (Mrs. D)*

Table 8. Direct Quotations associated with Community Setting

Community Setting	Emotions	Quotes
Child's Tantrums	Disappointment	*"Ang ganda ganda na prinepare mo yung nupng araw, you would expect him to enjoy himself kaso may mga instances na iba ang reaction niya." (Mrs. C)*
	Embarrassment	*"Nung una syempre nahihiya, may time kasi hindi namin totally naiintindhan pa…" (Mr.B)*
Uninformed Society	Irritated	*"may mga instances din na parang kala mo nanakawan sila ni BoyJ… Minsan napipikon ako sa mga ganun." (Mr. J)*
	Dismay	*"Pinsan niya, minsan ano 'ahh hindi nagsasalita' Bata eh, hayaan mo na lang… (Mr.A)*
	Sadness	*"Yun yung masakit 'dun. Yung the fact na hindi mo siya maisama sa party niyo… Ayaw mong pag simulan ng gossip. Ayaw mong pintasan yung anak mo." (Mrs. D)*
	Worry	*"yun yung takot ko, yung society dito is not very accepting and inclusive pa." (Mrs. C)*
Child's Hyperactivity		*"Iniisip ko yun baka makasakit siya ng ibang bata hindi nila maintindihan. Kaya dinedepensahan ko yung siya para hindi siya makapanakit." (Mr.A)*
	Fear and Anxiety	*"Pagbaba namin ng jeep…. Bigla siya gumanyan, umalis siya sa pagka hawak ko. Yung sa Quezon Ave… Naghahabulan kami sa gitna ng kalsada. Tumutulo yung luha ko, yung sipon ko, yung pawis ko" (Mrs, I)*
	Anger	*"Nung bata siya may mga tao na sinasabi na sobrang kulit. Nagagalit rin pero tinitignan ko lang. "(Mrs. F)*
	Embarrassed	*"… Kasi kung nasa loob naman siya nakakahiya, naddistract yung mga nagsisimba." (Mrs. I)*
Comparing	Epiphany	*"More on positive comparison; Kinocompare ko siya sa may autism na nag bloom… Na kasi baka maging ganun siya." (Mrs. D)*
	Upset	*"Yun yung sad although may acceptance sayo pero pag nakikita mo yung ibang kid andun pa rin yung pain. yun yung mahirap." (Mrs. D)*

Challenges that Trigger Recurring Emotions

Challenges are problems or hindrances that parents experience while raising a child with ASD. The data show that parents experienced variety of challenges that triggered recurring grieving like-emotions. Most of the participants shared the same challenges due to the demands that come with their child's disorder. However, the emotions felt were different with regards to the point of view of the parent. Events and Challenges that trigger recurring emotions are connected – Events that were not handled properly by the participants may become a challenge to them. As well as, a certain challenge may cause another type of challenge for the parents.

Child's Placement

The results of the events that triggers recurring emotions attest that finding an effective child's placement is still a challenge here in the Philippines. An effective school, center, therapist, and teacher are a big factor to the child's development especially during early intervention up to transition life. Most parents have experienced jumping from one center to another just to find the best program and most effective therapist that would manage their child. One of the raising concerns is the awful traffic in Metro Manila which is very hassle for them and the child.

Moreover, there are still *inclusive* schools that have an inconsistent or flawed program which precipitates to parents grieving emotions. Sadly, one parent experienced rejection because of these inconsistencies and flawed SpEd program. Parents stay in a school or center where they feel that their child's unique characteristics are fully accepted, well-managed, and accommodated.

Most of the child placement challenges are lessened since most of the parents are contented with their child's school or center. However, their most fear is the child's placement after grade 12 or 10 years from now. Trainable children are planned to be enrolled in prevocational courses while teachable children are planned to be enrolled in a college that accepts children with ASD. Moreover, some parents are thinking of HOME for the special needs for their child's placement 10 years from now. Parents who secured their child's future do not worry anymore (see Table 9).

Table 9. Direct Quotations associated Child's Placement

Child's Placement	Emotions	Quotes
Flawed SpEd Program	Empathetic Pain	*"Sa isang mainstream school…kinausap ako nung principal na hindi pa nga daw tlga kaya ni Boy-F yung big-school... Alam mo ano masakit dun? Tinanong ko siya 'Do you like it here?' ang sagot niya 'Yes, I love big school" (Mr. F)*
	Worry	*"Ang problem is yung count ng subjects (masyadong marami)" (Mrs. C)*
	Frustration	*"Ang na frustrate ako dito sa ano, inclusive sila na hindi totoo, fake pala, as in." (Mrs. G)*
	Disappointment	*"Siguro mali yung expectation ko kasi hinahanap ko dito yung IEP uhm… pero inexplain naman nila na hindi ganun, na iba ang curriculum." (Mrs. C)*
Finding an Effective Therapist	Dismay	*"Pag hindi nila feel talagang kahit anong gawin ni therapist hindi nila mapapasunod." (Mrs. I)* *"More of hindi lang ba ko nakakakita ng therapist na talagang makikita ko yung development or yung big difference sakanya? Baka naman hindi lang talaga ako nakakakita pa… "(Mrs. D)*
	Determined	*"Ay talagang halos lahat ng centers napuntahan ko ko" (Mrs. H)*
Finding an Accommodating Inclusive School		*"Yun na nakiusap ako, umiiyak ako sabi ko 'Bigyan nyo naman ng chance na mag grow siya as a student, na maranasan niya ang big school'. Lumuhod ako sakanila tapos yun pumayag naman basta daw may tutor siya dito tyka sa school" (Mr.F)* *"Sa ngayon naghahanap talaga kami ng school kung saan fully accepted siya yun lang…" (Mrs. E)*
	Dismay	*"hindi ko masyado nakita na home yung school. It's more of business" (Mrs. D)*
Child's Placement after High-school / After Center	Positivity	*"Ttry ko nga jan sa isang college kasi tumatanggap daw sila." (Mr. F)*
Child's Placement After 10 years	Fear-Anxiety	*Mrs. C: I will out-live him dba? Who's gonna take care of him kapag wala na kami, yun. Yun ang main fear ko talaga (Mrs. C)*
	Cautions	*"Planning, may planning ka dapat. Kung may goal ka may plan ka dapat…"(Mrs. G)*

Financial Challenges

Financial challenges are the most obvious hindrances in raising a child with ASD. The interventions that come with autism are very expensive. During younger years was the most challenging part because all auxiliary services including group classes are simultaneously enrolled and most of the families are not financially ready for that kind of responsibility. One mother also explained that their payment for these various therapies is per hour that is why the burden is doubled. One mother argued that here in the Philippines there is very minimal government assistance or no assistance to these kinds of programs, although all the participants attested that they managed financial burden properly and still made the ends meet. Countless adjustments were made to cope with this challenge.

> *"Kasi may occupational therapy ka, may speech therapy ka dapat sabay yun. Sabay or magkasunod" (Mr. F)*
>
> *"Challenging talaga kasi masyado siya magastos…" (Mrs. E)*

Burden is mostly on the father's end. They claimed that their frustration is mostly in the financial side. In order to prevent jealousy between siblings, they spend as much as they are spending with their typical child. Parents worry that they might neglect their other children because of too much attention to their child with ASD. Extra effort is needed to nurture and support not just the needs of their special child but of the whole family. However, most participants stated that as their child's independence progress, therapies are minimized, and inclusive schools are cheaper than therapy centers, so the financial burden is reduced. Also, most families are thankful to be financial stable despite their situation (see Table 10).

Table 10. Direct Quotations associated with Financial Challenges

Emotions	Quotes
Concern and worry	"*para sakin kailangan lagi ako may trabaho, o may income o may negosyo para masuportahan ko si BoyA" (Mr.A)*
Ashamed	*"parang nakakahiya pagka halimbawa hindi mo napag therapy kasi wala kang pera. Nakakahiya. Parang napaka iresponsable mo" (Mr. F)*
Stress	*"More on sa financial side yung stress" (Mr. J)*
Determined	*"gagawa ka ng paraan para hindi lang yung trabaho namin. Hahanap ka ng other source of income eh, raraket ka talaga." (Mr. B)*

Family Setting

Home setting events are linked in family setting challenges (see Table 11).

Table 11. Direct Quotations associated with Family Setting

Family Setting	Emotions	Quotes
Behavioral Issues	Stress	*"Yung hitting niya dun talaga ako na sstress." (Mrs. I)*
	Patience	*"Nung younger years talagang ang dami niyang nasira…. Talagang masusukat mo yung pasensya mo" (Mr. B)*
	Cautious	*"Yun talaga yung issue niya, transitioning. So we try our best talaga to make a schedule for him" (Mrs. C)*
	Sadness	*"…May mga time pa rin na ganun siya, dba? Yun talaga lagi yung lungkot" (Mrs. A)*
	Worry	*"Nung bata si GirlE, madaming iyak yan hindi namin alam kung anong gagawin biglang tatakbo sa labas kaya iba yung worry naming pag mag isa siya" (Mrs. E)*
Limited Communication	Frustration	*"Kung yung communication nung bata siya, mahirap talaga. Kasi kumbaga may sinasabi ka o pinapaliwanag ka sakanya kaso hindi niya naiintindihan or hirap kami ipaintindi sakanya so, nakakafrustrate." (Mr. E)*
	Sadness	*"Nawala totally yung komunikasyon, talagang wala kasi non verbal si Boy2H eh. Yun na siguro yung sad part na hindi mo na siya totally makausap." (Mrs. H)*
Behavioral Issues due to Difficulty in Communication	Frustration	*"Nakakafrustrate lalo na minsan pag hindi mo maintindihan mga gusto niya. Hindi niya masabi sayo kung ano talaga gusto niya nung bata. Naiinis ka kasi sigaw siya ng sigaw, iyak siya ng iyak pero hindi niya masabi kung ano ba talaga gusto niya…." (Mrs. F)*
	Anger then Understanding	*"Pag hindi niya maexpress yung gusto niya tapos nasagot mo siya, dun siya nag wawala. Sigaw siya ng sigaw, nagwawala talaga nananakit… Ngayon, Nakikita naman namin nagbabago na siya" (Mr. B)*
	Feeling Lost and Worried	*"Hindi niya kasi ma-explain, hindi ko ma-gets kung anong gusto. So wala iiyak nalang kaming dalawa, mag iiyakan nalang kaming dalawa dahil hindi ko makuha eh." (Mrs. I)*
Jealousy	Guilt	*"Ngayon na si ate kasi syempre nagdadalaga na siya…. Yung guilt ko na minsan mas natutuunan ko si BoyA (pero) 'yung ma pride din ako." (Mrs. A)*
	Cautious	*"So as much as possible kng pano namin I treat si kuya ganun din siya." (Mrs. C)*

Children's behavioral issues branches to different events and challenges that triggers grieving emotions to parents and other family members such as extra caretaking demands that leads up to marital issues and jealousy among siblings and other challenges that makes participants feel stressed, guilt, annoyed, and cautious to their actions (see Table 12) .

Table 12. Direct Quotations associated with Caretaking Demands

Caretaking Demands	Emotions	Quotes
Finding Secondary Caregivers	Dismay	*"Kagaya nung umalis yung nanay niya, pano gagawin namin?.... Dun pumapasok yung siguro kung malaki lang to di na natin kailangan ng yaya…" (Mr. J)*
Changes in family Dynamics	Worn out	*"Ang point ko ngayon, ang laki na ni Boy2H e… Parang eto pa ba? Eto pa rin ba'ko hanggang ngayon?" (Mrs. H)*
	Contentment	*"Na accept na talaga yata namin kasi talagang nag bago na rin talaga yung lifestyle" (Mrs. C)*
	Frustration	*"So yun, dun yung frustration kasi… ako lang mag-isa yung nag aalaga jan…" (Mr. J)*
Difficulty in Time Management	Guilt	*"Since pareho nga kaming working hindi na namin masyado nabibigyan ng time yung dalawa" (Mrs. E)*
	Dismay	*"Yun lang talaga 'pag may pupuntahan hindi ka makapunta kasi anjan si BoyA – wala pang bantay." (Mrs. A)*
	Exhaustion	*"halos wala kaming tinutulog sa gabi and my 3 elder kids are studying then… kaya iiyak nalang ako" (Mrs. I)*
Missed Career Opportunity	Regret	*"Pag nag rereflect ka tas naiisip ko yung mga gusto ko sanang ma-achieve sa career ko kaya lang I would look at him and see na, it's worth it." (Mrs. C)* *"Siguro yun yung sinacrifice ko para sa mga anak ko." (Mrs. H)* *"Ayun lang minsan may regret bay un? na 'sayang' na sana ganito. Mga panghihinayang na sana may iba ko nagagawa." (Mrs. A)*
Skipping Events or Work	Guilt	*"I have no choice but iwanan si kuya (graduation)… kailangan ko umuwi at walang magbabantay sa anak ko" (Ms. I)*
	Regret	*"Kasi syempre mag pa-party tapos sila – hindi naman ako makasali sa kwentuhan kasi nga nandun lang ako kay BoyA; Hindi naman sa pag aano minsan talagang pagsisihan mo - lahat nalang ng emosyon naramdaman mo na." (Mrs. A)*

Nonetheless, behavioral issues always have antecedents frequently it is because of the child's limited ability to communicate. According to the narratives, limited communication creates frustrations and sadness to all parents. The data also show that these behavioral challenges lessen if parents and therapists address the unwanted behavior properly. But it also depends in the severity of the child; non-verbal children have very limited communication skills thus various unwanted behaviors manifest until adolescent age that leads to higher level of frustration and anxiety for the parent.

Caring for children with ASD has a great impact in the family dynamics. Meeting the needs of a child with ASD requires much patience, time, attention, and effort thus, one must sacrifice profession and other activities that ones used to do, mostly mothers. Child's severity is a big factor in amount of caretaking demands. The more severe the child's case is, the excessive the demand is and the extreme the grieving emotions are. This often results to dismay, worry, worn out, frustration, exhaustion, regret, guilt to the primary caregiver of the child.

One participant is terminally ill due to the stress that comes with excessive caretaking demands. One of her fears is leaving his son with his other children knowing that they might have a life like hers. Moreover, Parents who adapted to the changes feels determined or contented to their family's new set up. Based on the narratives, fathers take caretaking demands in a less emotional side rather in a more practical way, thus they feel less stress and anxious.

Possible Challenges in Later Life

As parents are exposed and adjusted to the different caretaking demands that come with their child's diagnosis, they had become more cautious of the possible challenges they might experience. That is why in transition years parents learned to expose their child and trained them to manage possible problems that come with adolescent life. Hence, parents have less worry because they had been prepared and may go through these expected struggles quickly. Moreover, the parents fear is more on the societal factors that's beyond their control, such as possible abusive people their child might encounter and how would they would defend themselves. Yet teaching sense of danger to their children is still struggle for the parents (see Table 13).

Table 13. Direct Quotations associated with Possible Challenges in Later Life

Anticipation	Emotions	Quotes
Possible Abusive People	Fear	*"Ang talagang problem nalang naming… yung talagang tao na mag ttake ng advantage sakanya… Kasi dalaga na'to mahirap na…" (Mrs.E)*
Teaching Sense of Danger		*"Yung sa danger, hindi pa aware. (Tulad ng pag tawid)… Takot pa'ko dun" (Mrs. G)*
Preparation to Adolescent needs	Cautious	*"pnprepare na kami (seminar) na it would be very different na pag nag adolescent na…" (Mrs. C)*
		"Before pa siya magkaron na exposed na siya." (Mrs. G)
Transition to Adolescent life	Frustration	*"Yun ang isa sa frustration ko na inabutan na kami sapag tubo ng buhok ni Boy2H na hindi niya natutunan yung pag ligo" (Mrs. H)*
	Worry	*"Yung worry lang ng magulang, pano pag hindi mo na siya kayang awatin kasi mas malaki na siya sakin" (Mr. J)*

Themes under Progressive Acceptance

The researcher used the term *Progressive Acceptance*, because the data confirms that parent's grieving is cyclical. It means they only reach a certain level of acceptance that their child is in the spectrum. The fact that the respondents admitted that some events still trigger grieving like emotions proposes that there is still no full acceptance of their child's diagnosis. Although, the frequency of events and the intensity of emotions lessen as they mature. Some parents disclosed that frustrations often trigger but just for a meantime because they already had self-acceptance that their child is in the spectrum. Most parents shared that they've accepted it but at the same time there is still pain.

> *"…wala naman ako magagawa eh, so I have to move on… You don't have any choice but to accept pero masakit talaga" (Mrs. I)*
>
> *"Siguro meron ka ng acceptance, fully accepted kung nasan ka sa buhay mo… Alam mo na e na may condition yung anak mo. Pero meron, meron talaga, hindi mawawala. Tyka merong behavior ang bata na nagttriger din ng frustration mo…" (Mrs. H)*
>
> *"Minsan meron pa rin (pain) pero for the meantime lang tapos mawawala agad." (Mrs. G)*

"Ngayon kasi accepted na talaga namin pero pag may nangyari nanaman na hindi maganda, ayun hindi nanaman okay para samin yun, syempre." (Mrs. E)

The extremity of grieving emotions felt by the participants depends on the maturity of the person, as they mature their life perspectives change. Hence, the level of Progressive Acceptance depends on the maturity, personality, and mental well-being of an individual. These factors affect the stress level of the parents. The more mature an individual is, the greater the Progressive Acceptance is therefore the adjustments needed, extra caretaking demands, and other responsibilities that come in raising a child with ASD are easily tolerated. Moreover, frequencies of events that trigger grieving emotions are lessened, challenges are handled healthier, and patience with their child's behavior is longer (see Figure 2). Furthermore, as parents mature, they do not compare their situation anymore; also the expectations to the child's progress are more attainable. Parent's perspective in their situation is more on positive than negative, despite their child's disorder. They do not see their child's situation as a burden anymore because there is self-correction already.

"Depende sa mood mo, syempre may mood ka rin eh. Tyka yung maturity rin katulad nung pag nag mamature ka nag iiba perspective mo eh." (Mrs. G)

"Tapos yung acceptance kailangan tanggapin mo kung ano siya kasi hindi mon a mababago kung ano siya." (Mrs. F)

"Ako kasi wala akong expectations e, hindi ako nag eexpect para hindi ka masaktan" (Mr. J)

"Habang lumalaki siya yung expectations namin hindi na ganun kalaki kumbaga kasi alam na namin yung capability ni GirlE." (Mr. E)

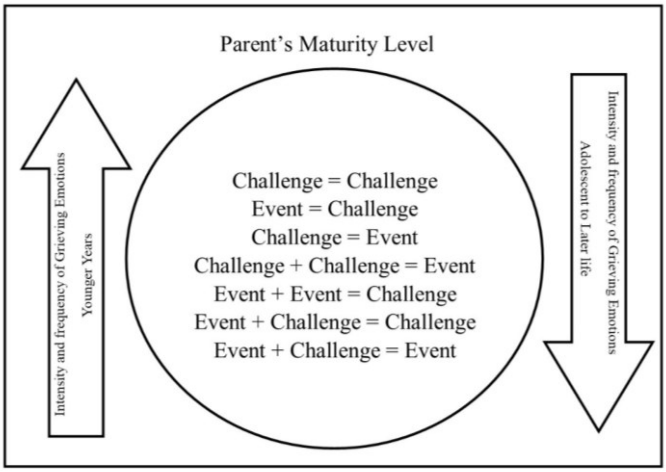

Figure 2. Pascua's Intensity of Emotions Model

Coping Mechanisms

Parent Support Group

It is vital that a parent of a child with ASD has a strong support system in place (Illias et al., 2018; Lucero, 2017; Shahida, et al., 2017; Tekinarslan, 2018). Parent support group is one of the most accessible coping mechanisms that a parent could have. Most participants meet their support group in the center or school that their child is enrolled in; these are caregivers who also have a child with disability. They share common experiences and struggles about raising a child with special needs. They also help each other by giving advices on how to manage feelings and emotions when faced with the challenges of raising a child with ASD. Parents can relate with one another's journey of discovering their child's unique condition. It is also healthy for the parent's mental well-being. There are also various online support groups and private support groups that gives seminars and trainings for the parents with children with ASD.

> *"Ngayon ang nakapag pa motivate sakin yung mga parents din ng mga may special child." (Mr. B)*

Invest in Relationships (Family and Peers)

One thing that can be a challenge is sharing the child's diagnosis to other family member, relatives, and peers however some parents overlook the importance of being open to their community. We've already discussed the excessive caretaking demand of a children with ASD thus parents need the people that surround them to understand what they are going through (Gopalan, et al., 2017; Illias, et al., 2017; Lucero, 2017). Some mothers invest relationships with their closest family members for the security of their child's future, whatever might happen to them, someone trustworthy will take care of their child with ASD. This will encourage full acceptance of your family and friends and avoid social exclusions. Parents who have typical children teach them to be as inclusive as they can be. One father said that as early as possible he mindset their other sons to have a special love for their older brother so that when the time comes, they will not neglect him. Other parents try to balance their attention, time and financial support to both of their typical and atypical child, in order to prevent jealousy.

> *"Mnmindset namin sila simula nung mga bata pa sila na 'sino ang pinaka love natin dito sa family?' 'si Kuya BoyB kasi special siya" (Mr. B)*

"Mag invest ka dapat ng relationship with your sibling, hindi lang sayo pero for GirlG also kasi wala siyang kapatid eh…" (Mrs. G)

Attend Trainings and Seminars

Previous studies prove that attending trainings, workshops, and seminar about handling child with ASD decreases depression and anxieties among parents (Shahida, et al., 2018; Tekinarslan, 2018). Aside from autism awareness, trainings educate parents on how to manage unique characteristics of a child with ASD, strategies, different techniques, and approaches to different behaviors a child with ASD has. Addressing the child's behavior correctly will result to child's progress and independence which will lessen caretaking demands thus, less stress for the parents. It also prepares parents to possible withdrawals, changes, and challenges that they might experience. Advantages of being prepared with these possible situations are that parents may handle the challenges efficiently and cope up quickly. Parent's perspectives about autism changes as they understand the behaviors manifested of an individual with autism hence, they become more confident about their parenting style.

"Mahilig din akong umattend ng mga seminars, mga trainings, hanggang sa nag SpEd education ako para at least mas lalo akong maging aware sakanila" (Mrs. E)

Spiritually Stable

Based on the narratives, regardless of the religion, Filipinos are known to have strong faith to their Creator. Participants guaranteed that having strong faith to the Lord helped them cope with their situations especially during the younger years of their child. Being spiritually stable made parents matured and has positive perspectives in life. Instead of a burden they perceive their son's situation as a gift from the Lord. They believe that the Creator is teaching them to be grounded, to make a home, to slow down in life.

"Maganda rin na spiritually stable kasi alam mo na hindi siya pababayaan… Tyka yung faith mo kay Lord na alam mong 'uy may purpose' ka. The more I realize yung promises ni Lord sakin" (Mrs. G)

"Yung hindi talaga nawala sakin 'yung mag church. Pagka-feel mo andami mo nang pasanin, church lang."(Mr. J)

"Siguro ano rin nakatulong yung Christian faith ko, yung faith ko talaga. Na as I surrender, I will accept you for who you are." (Mrs. D)

Selecting Desirable Environment and Withdrawal from Undesirable Environment

Changing environment might be helpful for the whole family especially the child with ASD. Various adjustments are already made by the family members just to cope with child with ASD's needs; so forcing the family into an undesirable environment adds stress. Changing the environment expand situations, relationships, places and opportunities that are successful. A desirable environment is where their child with ASD is very much accepted from friends, family members, relatives, school environment to bigger community. That's why parents tend to jump from one school to another, to find the most inclusive environment. They find a place where their child will mature and progress in the greatest possible way.

Also, it is the parent's defense mechanism to avoid their child to an undesirable environment. They are protecting themselves as well as their child with ASD from gossip, pain, and social exclusions. Parents are looking for an environment where they don't have to explain their situations, as they fear that everyone will not understand and put themselves in an unwanted situation. Healthy environment helps lessen parental burden because there is lesser factor to trigger their grieving emotions.

> *"Protecting myself from pain. So ang ginagawa ko more on avoidance, inaavoid ko siya sa isang lugar kung saan masasaktan ako…, so siguro kaya hindi ko siya masyado na-encounter… Pag dating naman sa school well accepted siya e, as ganun siya… So hindi ko rin masyado tuloy na naramdaman na sort of may discrimination" (Mrs. D)*
>
> *"Pag kaibigan, there's a lot of explaining to do kasi e. Tyka isa pa, baka hindi maintindihan nung mga tao, pangatlo nalang yung point na nakakapagod..." (Mr. F)*

Recreational

After a rollercoaster of emotions, as parent with children with ASD, it is important to reward themselves every once a while. Participants find a hobby, travel, or have a time for themselves. It helps clearing their mind, pause from the responsibilities, and breathe. Some parents do this to avoid idle time; it is their way to prevent thinking about their problems and escape reality.

> *"Kailangan walang idle time, kailangan walang idle mind…*" (Mrs. D)

Parent and Teacher Active Collaboration

Parent and teachers/therapists provide an essential support system to help children with ASD improve holistically. School and home management works as a team. Based on the narratives, parents who trusts and complies with their child's teachers and therapists' results to the child's greatest possible improvement in term of cognitive, speech and language, socio-emotional, and self-help skills. It creates healthy and open relationship between the home and school environment hence the child with ASD will most likely progress. Parents who also do follow ups at home learn the basics about managing their child's unique characteristics which they may use in later life (see Figure 3). Parent's total support is very important to the maturity and development of the child. Child independence means less worry and fear for the parents.

> *"Kasi most of the time nae encourage ako ng therapist ko e… Kung anong recommended nila nag ccomply ako kasi sila may alam nun." (Mrs. G)*
>
> *"… Nag ffollow ako sa bahay, para akong teacher na…" (Mrs. H)*

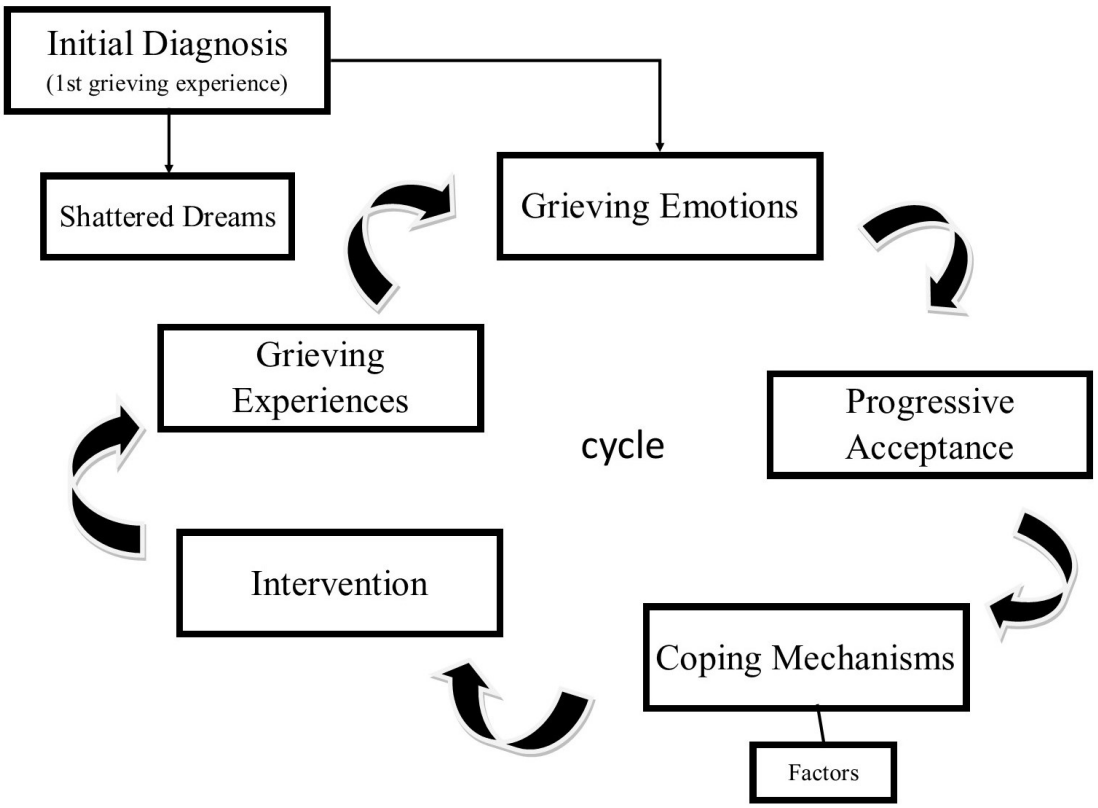

Figure 3. Pascua's Cyclical Grieving Model

Factors that Lessen Grieving Emotions

Table 14 shows the factors reduces stress and anxiety to the parents. These are beyond the parent's control still it influences higher parental satisfaction

Table 14. Direct Quotes associated with Factors

Factors	Quotes
Inclusive Environment (school, work, home, bigger community)	*"Big Factor ang community kaya nga dapat mapalawak pa yung social awareness pa..." (Mrs. E)*
Child's Maturity, Independence, and Severity	*"big factor ang severity ng case ng bata sa stress ng magulang." (Mrs. H)* *"Nakakaintindi siya pansin ko sakanya nung mga between nung mga teenage years niya ganun, ngayon na siya ganyan hindi na siya." (Mr. B)*
Financial Stability	*"Malaking bagay din, isa yun sa nakawala sa burden ko e… Kasi kung ang nanay ay walang pang pa therapy at yung pang bili ng pagkain, pamalengke, pambigas dadalhin pa sa therapy… Yun yung mag ttrigger ng bakit pa kasi ako nagkaanak ng ganito?... So malaking factor na we are well sustained na sobrang supportive ni tatay." (Mrs. D)*
Healthy Marital Relationship	*"Si tatay sobrang supportive yan, nung na diagnose si BoyD kaya siguro ganito ako ka positive" (Mrs.D)*
Entrusting Secondary Caregiver	*"Very fortunate ako na ang yaya ko, tita ko… So talagang tutok din sakanya..." (Mrs. C)*
Ensured Future of the Child	*"Confident ako na may mag aalaga sakanya in the future." (Mrs. G)*

Discussion

This study explored the grieving experiences that trigger recurring emotions of parents while raising a child with ASD and identify the effective coping mechanisms used. The data were analyzed and categorized into three themes with sub-themes.

The doctor's diagnosis is just confirmation for the parents to provide the intervention required for their child's prognosis. It brings great impact to the family members as adjustments are needed to cope with the child's disorder as (Tenikarslan, 2018) also suggested. Most Filipino parents anticipated their child's diagnosis that is also mentioned by (Bravo-Benitez et al, 2019; Capote, et.al, 2016), implying that autism awareness in the Philippines is improving yet there are still some individuals who are unaware about the spectrum.

This study supports Joan Blaska's Cyclical Grieving Model that parent's dreams shatter after learning their child's diagnosis although in this group, shattered dreams only occurred in the younger years of the child which rejected Blaska's theory that it occurs lifetime. Moreover, the researcher interviewed parents of children with ASD in adolescent years and the data shows that parent's grieving comes in cycles, as other research discussed (Midoneck, 2015; Bravo-Benitez et al., 2019). The present study described grieving like emotions that parents felt while raising a child with ASD were inclined with past studies (Bravo-Benite et al., 2019; Fernandez-Alcantara et al., 2016; Midoneck, 2015; Picardi, 2018).

Grieving Experiences has two sub themes which are *events and challenges that trigger grieving emotions.* Various *events* are described by the parents. It is under three sub-themes: school, home, and community settings. Grieving emotions relation to events are concern and uncertainty, distress, embarrassed, extreme, fear and anxiety, happiness, guilt, helplessness, hopeful, irritated, worry, regret, and sadness. Furthermore, school stressors are associated with anger, disappointment, disbelief, dismay and frustrations from the parents especially if school professionals triggered the event because parents least expected it from them. The results of the events that trigger recurring emotions attest that finding an effective child's placement is still a challenge here in the Philippines. Recurrent grief caused by social factors in the Philippines involved ignorance and lack of awareness of the community. The most common cited situation begins with the child's unwanted behavior such as tantrums and hyperactivity during younger years. Moreover, challenges identified are financial challenges, family setting, excessive caretaking demands, child's placement; some of these challenges are also stated by these studies (Gona etal., 2016; Almazar, et al., 2017). The present study also described parent's anticipating of possible challenges that may arise in the later life of the child with ASD. Grieving emotions relation to challenges are anger, anxiety, ashamed, determined, dismay, concern and worry, fear, frustration, sadness, and more. Most of the

feelings and emotions are also mention in the previous studies (Bravo-Benitez et al., 2019; Fernandez-Alcantara et al., 2016; Midoneck, 2015; Picardi, 2018; Zhou & Yi, 2014). Children's behavioral issues branch to different events and challenges that trigger grieving emotions to parents and other family members such as extra caretaking demands that lead up to marital issues and jealousy among siblings and other challenges that make the respondents feel stressed, guilt, annoyed, and cautious in their actions. These findings agree with prior study in the Philippines (Abear et al., 2017).

Events and challenges that trigger recurring emotions are correlated: school setting is associated to child's placement challenges while home setting is associated with family setting challenges. Moreover, an event and challenge may arise at the same time, or a certain event may produce a challenge, vice versa. An event and a challenge may develop another challenge or event, vice versa. Regarding the identified events and challenges, an event will only be a challenge if a parent takes it as a hindrance; one's maturity plays a big role in perceiving these events and challenges. Most parents were very sensitive during their child's younger years. However, during transition years the frequency of events and intensity of recurring emotions had lessen because they've tolerated these situations and become more cautious in managing these challenges. When the participants were younger, they used to consider almost everything as event and challenge, they are delicate to their surroundings. But as their child grow old and parents also mature, they tend to tolerate negative comments and negative emotions. This approves (Zhou & Yi, 2014)'s study, they argued that parent's willingness to adjust for their child's welfare has less stress and anxiety. As their child grows old the frequency and intensity of cyclical grieving lessens. Parent's priority is more of the child's future, worry and concern about their child's placement 10 years from now.

The researcher used the term Progressive Acceptance, because the data confirm that parent's grieving is cyclical, means they only reach a certain level of acceptance that their child is in the spectrum. The fact that the respondents admitted that some events still trigger grieving like emotions proposes that there is still no full acceptance of their child's diagnosis. This study supports (Fernandez-Alcantara et al., 2016).

There are several coping mechanisms identified and it is significant to most studies (Gona, et al, 2016; Lucero, 2017; Ha, 2018). These coping mechanisms are parents support group, relationship investment, spiritual stability, attend trainings and seminars, recreational, and

parent teacher active collaboration. Although most researchers only discuss how social exclusion relates to grieving emotions of parents such as feeling socially isolated and having negative effect on their socio-emotional stability (Gona, 2016; Capote et. al, 2017; Clauda-Lauffer, 2017). This present study examined how Filipino parents choose a desirable environment and withdraw from an undesirable environment where they feel socially isolated or stigmatized. Since awareness in the Philippines is still spreading, Filipino parents adjust and avoid their child to such negative atmosphere. They expose their child into a community where their unique capabilities are well accepted and honed in the greatest way possible. This current study states selecting desirable environment and withdrawal from undesirable environment is under coping mechanisms as it makes parents confident towards their child's welfare, which (Prata, 2019) specified that social support reduces grieving emotions of parents. This study also associates factors that lessen the intensity of grieving emotions among Filipino parents and increase parental satisfaction. Factors that lessen parents stress are also acknowledged, these factors are beyond parent's control, such as inclusive environment, government assistance, child's maturity, independence and severity, financial stability, healthy marital relationship and having a trustworthy caregiver.

Conclusion

In conclusion, this study presents two models; *intensity of emotions model wherein* the intensity of grieving emotions and frequency of events and challenges are lessened as children with ASD grows old while the parents mature and *cyclical grieving model* that shows parents of children with ASD grieve in cycle; thus, they only reached a certain level of *self-acceptance* that their child's autism is lifetime. Their *progressive acceptance* continues as grieving experiences occurs and grieving emotions are felt. Parent's physiological and psychological well-being play a big role in perceiving these grieving experiences. The identified coping mechanisms and factors help the parents with ASD have better perspective with their situation and have better character development.

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Appendix. Sample Study Interview Questions

1. Could you please give brief information about you regarding:
   a. Gender;
   b. Present age;
   c. Age when child is initially diagnosed with autism;
   d. Marital Status;
   e. Current work;
   f. Number of children;
2. Could you please give brief information about your child regarding:
   a. Child's gender;
   b. Child's age when initially diagnosed with Autism;
   c. Child's present age;
   d. Child's Auxiliary services:
   e. Child's educational Program?
3. What was your reaction during the initial diagnosis? What are the emotions you felt?
4. During your child's younger years, were there events that trigger recurring grief? Could you share to us your thoughts and experiences during that time?
5. During your child's younger years, were there challenges that trigger recurring grief? Could you share to us your thoughts and experiences during that time?
6. Were there events that trigger your recurring grief during your child's adolescent years? Could you share to us your thoughts and experiences during that time?
7. Were there challenges that trigger your recurring grief during your child's adolescent years? Could you share to us your thoughts and experiences during that time?
8. Could you share to us the things that you did to cope with these feelings? How did it help you?

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SECTION III - STUDIES ON TECHNOLOGY

Chapter 7 - The Role of Educational Technology in the COVID-19 Pandemic

Eva Faridah, Indra Kasih, Rudi Hartono

Chapter Highlights

- The purpose of the chapter to show the importance of educational technology and information systems for educators and learners in conducting online lectures during the COVID-19 pandemic.
- The presence of the COVID-19 outbreak has an impact on various sectors. This chapter focuses on the education sector.
- The world of education is also required to adjust to situation and conditions caused by the COVID-19 pandemic.
- Currently, millennials must be observant in choosing a job. As a result of the development of technology old jobs become lost and also emerged new professions that were previously unthinkable.
- With the rapid development of technology makes the learning process faster and more effective.
- Especially in education during the COVID-19 pandemic there is communication and interaction indirectly, namely through the internet.
- The problem of online lectures in the COVID-19 pandemic requires a good learning strategy. In this case, the use of educational technology as the implementation of informationsystem is needed both by educators and learners.

Introduction

The Information and communication technology (ICT) as part of science and technology in general constitutes all interconnected technologies and retrieval, collection, management, storage, and information. The development of information technology is very large, especially in our country. It is growing with information and communication technology that can make it easier for someone to learn and get the information we need where and whenever we need it. In the world of education, the development of information technology began to have a positive impact because with the development of information technology in the world of education that began to shift to significant changes. ICT consists of three main components, namely there is technology, both information, and third communication. By using smartphones and laptops, we can use all three components into one. Therefore, this device is called an ICT device.

Information and Communication Technology (ICT). All activities that use technological devices are also called information and communication technology. Information and communication technology is divided into three parts, namely technology is a means whether it is hardware or hardware or software or software used to help us. Next there is information that is processed into news that can give us a certain impact. Communication is the process of exchanging information and data through the sending and receiving of messages from two or two or more people. We need to know, that ICT is different from IT or information technology. If it is IT, we will focus more on processing existing information and become an important data. ICT is divided into 3 parts, namely technology, information and communication. For example, data analysis of results from the sale of toast in our class bazaar, or the result of data obtained when finished summarizes the results of online classes. The following, are some examples of information and communication technology in everyday life, namely computers, laptops, tablets, and, smartphones, internet use, radio, television, telephone, cable phones, satellites, and also video conferencing.

Many things feel different and change compared to the way that developed before. Distance and Time today are not a meaningful problem to gain knowledge. Many applications are created to facilitate from technology sources. In areas, the process of obtaining information is still limited (in rural areas) because Indonesia is spreading information and communication technology has not been fairly evenly distributed. Now it is only in big cities that have easily

enjoyed and utilized the facilities available. Thus, the development of education becomes hampered and also uneven for some communities. The Internet as one of the media of learning and information and knowledge search can be easier and maximal even though internet access in Indonesia itself is not fully felt by everyone.

Zoom Meeting

Since the COVID-19 pandemic, it has hit almost all countries around the world, including Indonesia. Policies for WFH (Work from Home) apply to companies, organizations, and institutions that allow it to be carried out. This is to reduce social and physical contact (Social Distancing) so as to minimize the spread of COVID-19. WFH policies require employees and students to work and study from home. Due to the limitations of contact and face-to-face communication, video conference is the choice.

With video conferences, employees and students can connect, discuss, and conduct meetings and webinars so that work and activities can still be done. Although many obstacles occur but this is a new choice and culture that may continue to be used in the present and the future. To conduct video conferences, there are various platforms that can be used for free and paid such as Zoom Meeting, Google Meet, GoToMeeting, Teams, and others. The most popular and widely used zoom because its features and needs are more complete than others. Zoom Meeting features Meeting, Webinar, Recording, Share Screen, to Zoom Room. For more details, see the following understanding, features, and how to use Zoom;

Zoom is a video conferencing service that allows users to chat online by utilizing cloud computer technology and 256-bit TLS encryption. Zoom was developed by Zoom Video CommunicationsCommucations, Inc. Based in San Jose, California, United States. Zoom was founded by former Cisco Webex executive Eric Yuan in 2011 and launched publicly in 2013. With Zoom, users can connect with each other, conduct meetings and webinars, chat, to have discussions in a Channel. Zoom is an alternative to working and learning remotely from many organizations and institutions around the world. OS support for Zoom services is also very diverse ranging from MacOS, Windows, Linux, iOS, Android, Web App, to extensions for Google Chrome and Firefox.

Zoom provides two conversation options, which are free for 100 user meetings with a

maximum limit of 40 minutes. While the paid, Zoom provides needs that can be tailored to the user. The price is quite affordable, between $15-100 per month. In its development, in 2017 Zoom's status as a company became a unicorn with an evaluationof a valuation that reached $ 1 billion. Even since the beginning of 2020, the use of Zoom services has continued to increase due to the COVID-19 virus pandemic that is spreading around the world.

There are several things to understand and pay attention to when using Zoom. Some Zoom services have different functions and needs, such as Zoom Meeting for online meeting needs from anywhere. Zoom Webinars for Webinar Events needs such as campuses, schools, or institutions by inviting many people to participate. Zoom room for different indoor meetings has more complete functions and tools. Of these services, all have the following basic features:

1. Audio and Video Support: As a video conference service, of course Zoom support with HD (High Definition) Audio and Video. In a meeting, the need to talk and meet face to face is certainly needed, although on some occasions many users turn off audio and video functions to maximize listening. In addition, speaking alternately will be better so as not to disturb other speakers. Many Indonesians are still middle to lower so that the use of video features is more reduced due to the limitations of internet quotas. Considering the longer the use of video features also affects the internet quota that quickly runs out.

2. Share Screen: In a meeting, sometimes users need to make a presentation to explain the purpose and intent. Most presentations are usually in the form of PowerPoint (PPT) slides to make it easier to explain. Well, Zoom itself supports with this kind of feature, where users can take advantage of the Share Screen feature. What is a share screen? Share Screen is a Zoom feature that allows users to share computer screens, opened documents, files accessed online (Google Drive, Dropbox, Microsoft OneDrive, etc.) to share a second camera. This feature not only works for document presentations, but more than that.

3. Scheduling (Schedule): Before meeting, an admin can create a meeting schedule in advance. This is so that users who will participate know and can get ready to follow it. When creating a meeting schedule, admins can set dates and hours as desired for the meeting limit between 30 minutes - 14 hours. For the free version, admins can only have a time limit of up

to 40 minutes, while the premium version has a longer time limit.

4. Security: Speaking of security, any communication and data shared through Zoom will be encrypted using 256-bit TLS encryption. Many media outlets inform that Zoom is potentially unsafe. Many controversies occurred, but Zoom continues to make improvements and developments to make all services and features safe to use.

5. Chat: Zoom also presents a Chat feature so that users can discuss each other when conducting meetings or webinars. Interestingly, all the chats are stored in a history so that users can see it again. Users can also submit files, screenshots, and documents within. All files will be stored for 10 years, and after that time is up, the files are automatically deleted from the server.

6. Recording: When meeting, admins can also record and save it on the computer. This feature is very important so that every meeting that is done can be watched again or when there are other users who can not join can still see it. The recording file is automatically saved to the computer, but if the user wants to save to the cloud then the admin needs to upgrade to the premium plan for between $40 and $500.

7. Reactions: Need reactions in a meeting or discussion? Take it easy, Zoom presents reactions feature to make the atmospherefeel fun and fun. In sending messages (chat) in Zoom without meeting there is also a reactions feature so that users can provide reactions to other users that are interesting and exciting.

Google Meet

The outbreak of the COVID-19 pandemic around the world made many activities such as business, employment, and education turn to digital. This becomes something new by forcing many people to use the internet in communicating. The WFH (Work from Home) policy has been set by the government to reduce the spread of COVID-19 but still do work from home. Google Meet, Zoom Meeting, Skype, Cisco Webex, and others are the options to keep meeting online. Zoom meeting is one of the most widely used meeting programs today. In April 2020, Zoom Meeting had up to 300 million daily users. This is the reason why some platforms also develop and add meeting features. One of them is Google which is also serious

in improving Google Meet features and services. The combination of features between Google Hangouts and Google Chat makes Google Meet the second choice, in addition to Zoom Meeting. Curious about Google Meet, see the understanding, features, benefits, and how to use Google Meet below; online video conferencing/meeting services developed by Google. The Google Meet service is a combination of Google Chat and Google Hangouts with development more devoted to online meetings. In October 2019, Google Hangouts discontinued its classic version and users were able to switch to using Hangouts for a more modern version.

Google Meet was secretly introduced in February 2017 for iOS (iPhone) users. The following month, Google Meet was publicly introduced and can be accessedin access through web browsers, iOS, and Android. In the free version, users can meet with a maximum number of 100 participants. While the premium / business version, users can meetmeetings from 100 to 250 participants. Anyone with a Google account can create meetings or participate in online meetings. For security reasons, the host has full access to a meeting. Hosts can refuse to sign in and delete users during the meeting. In April 2020, Google has also added a dedicated noise-cancelling audio feature for business plans. For privacy reasons, Google also states that it does not record or store video meetings for ad targeting. But information from the Meet privacy policy analysis, Google reserves the right to store the duration of the call, the participating users, to the IP address of the user. Google Meet presents a myriad of features and benefits to maximize users in conducting online meetings.

Google Meet's featured features:

1. Users can join a meeting via the web, Android app or iOS (iPhone).
2. Integration with Google Calendar that allows users to create meeting schedules.
3. Allow users to share screens for document, spreadsheet, or presentation presentation needs.
4. Chat feature is available so that users can have discussions or send text messages during meetings.
5. Hosts have full access to deny or allow users to connect.
6. Calls are encrypted so that security is more secure.
7. G Suite plans have access to many improved features such as recording, attendance tracking, retention, and greater cloud storage.

In addition to integration with Google accounts, Google Meet presents a variety of features that allow users to meet online, presentations, chat, and recording. Google Meet strives to deliver services and features according to users' wants and needs. However, Google Meet is also not separated from its shortcomings.

Advantages of Google Meet:

1. Easy to join. Joining a meeting on Google Meet is fairly easy; participants can join through the web, Android application or iOS.
2. Access using a Google account. The majority of Android users have a Google account so access to Google Meet will be easier and faster, without having to register.
3. The meeting time is quite long. Meetings on Google Meet can last for 60 minutes (free). This is much better than zoom meeting which is only 40 minutes.
4. Connect to Google Drive. Google Meet integrates with Google Drive for storage of recording files and documentsand documents if needed. Users who choose the G Suite premium plan can record and record results stored in Google Drive.

Disadvantages of Google Meet:

1. The free version does not support recording. Unfortunately, the free version of Google Meet is not available recording feature. Unlike Zoom Meeting and Skype which in the free version is available recording feature.
2. Sharing the screen feels heavy and slow. When doing a presentation by sharing the screen through a browser, the computer feels very heavy. It may take a computer with better hardware specifications so that the presentation feels smooth.
3. Unable to change background screen. Some video conferencing services have featured to change the background screen so that visualization looks more attractive. Unfortunately, Google Meet does not yet provide this feature.
4. There is no Desktop version of Google Meet yet. Until now, there is no desktop version of Google Meet which means that meetings through the computer must be done through a browser.

Generation of Technology

Millennials are a generation that is around 18-30 years old. They are called native or native generations to technology, because since birth they have known technology. With its

capabilities in the world of technology and existing facilities, this generation has many opportunities to be far ahead compared to previous generations. But some research shows that they tend to focus more on a lifestyle of freedom and hedonism, like things that are instant and do not appreciate the process.

In the midst of this phenomenon, not a few also success achieved by those who are able to take advantage of the development of this technology. Millennials can be very creative in utilizing technology. Even a lot of money can come into its own if they are able to adapt quickly. Look at the profession of being a YouTuber. They can earn a lot of money by uploading videos with a certain number of viewers. Names like Atta Halilintar, Ria Ricis and many others are examples of this generation's boundless creativity. On the contrary, those who do not fight in this competition will be crucified by the times.

Currently, millennials must be observant in choosing a job. As a result of the development of technology old jobs become lost and also emerged new professions that were previously unthinkable. Rhenald Kasali mentions some of these professions for example: baristas, bloggers, web developers, apps creator/developer, smart chief listener, smart kettle-ketle manager, big data analyst, cyber troops, cyber psychologist-psichologyst, cyber patrol, forensic cyber crime specialist, smart animator, game developer, smart control room operator, medical sonographer, prosthodontist, crowdfunding crowd funding specialist, social entrepreneur, fashionista and ambassador, BIM developer, cloud computing services, cloud service specialist, dog whisperer, drone operator and so on. This profession was born because of the direct impact of technology as well as the impact of the behavior or lifestyle of technology users.

The new job of course requires skill and intelligence. In this era with all the sophistication of technology, the level of competition is also getting higher. The quality and performance of humans is also required to be higher. Millennials must be able to adapt quickly, learn and get better quickly and navigate agile and precisely to be able to solve every problem, have high creativity and a strong work ethic, because they have to compete with more qualified human resources on a global scale. If you are able to compete, success will be the answer. The ability to use technology becomes the ticket to success in career and future, as well as evidence of the success of the nation's children in welcoming progress.

The back and forth of this nation lies in the hands of millennials who have a tough mentality, intelligence, and skills in utilizing information technology. They number about 81 million. This means that almost 32% of the total population in Indonesia. Can they be the determinants of the nation's progress? This is the biggest challenge for millennials in Indonesia.

Educational Technology

Educational technology is now very much developed. With the rapid development of technology makes the learning process faster and more effective. We still remember to get a reading in the form of a book is very difficult, especially in remote places. They could only rely on their teachers as the sole source of matter. In contrast to now, the development of technology has brought many changes to the world of education. Call it technology that plays a very important role is internet service. Just type a word related to the information we want to search on the web search engine, then quickly we will get the information. Here are some definitions of educational technology:

Educational technology is a systematic way of designing, implementing, and evaluating the overall process of learning and learning in the form of specific learning objectives, based on research in learning theory and communication in humans and using a combination of human and non-human learning resources to make learning more effective. Thus, since the 1970s and1970s, there has been a view that humans (in this case, teachers) are not the only source of learning.

According to Cutchall (1999), educational technology is the research and application of behavioral science and learning theory by using system approaches to perform analysis, design, development, implementation, evaluation and management of the use of technology to help solve learning and performance problems. The main goal is the utilization of technology to help solve learning problems and human performance.

Educational technology is a field in facilitating human learning through the identification, development, systematic organization and utilization of all learning resources and through the management of all of them. Formal objects according to this understanding are how to facilitate learning.

Technology Education is a complex integrated process encompassing people, procedures, ideas, means and organizations for analyzing problems and designing, implementing, assessing and managing problem solving in all aspects of human learning. The formal object of educational technology is solving the problem of human learning. It is done by analyzing the problem first, then implementing, assessing and managing the problem solving. Educational technology is the study and practice of ethics in an effort to facilitate learning and improve performance by creating, using or utilizing, and managing appropriate technological processes and resources. Obviously, the main goal remains to facilitate learning (to be effective, efficient and engaging) and improve performance.

Based on the above definitions it can be concluded that:

1. Educational technology is a discipline (field of study)
2. The term learning technology is used interchangeably with the term educational technology.
3. The main purpose of learning technology is o to solve learning problems or facilitate learning; and o to improve performance;
4. In realizing it using a sistemi approach (a holistic / comprehensive approach, not a partial approach);
5. Educational technology areas can include activities related to analysis, design, development, utilization, management, implementation and evaluation of both processes and learning resources.
6. Learning technology is not only engaged in school but also in all human activities (such as companies, families, community organizations, etc.) as far as efforts to solve learning problems and to improve performance.

Educational Technology during the COVID-19 Pandemic

Education is the most important element in educating children bang-sa, as expressed and implied in the opening of the Constitution of the Republic of Indonesia year 1945 (NKRI Constitution 1945) in the 4th alinia, then described in article 31 paragraph (1) reads "Every citizen is entitled toeducation"and paragraph (3) reads "The government strives and implements national educators, which increases piety and piety and noble morals in order to educate the life of the nation regulated by law". The law that regulates is Law No. 20. In 2003 about the National Education System (SISDIKNAS) in the tenth paragraph (31) specifically

explained the description of Distance Education (PJJ). This verse explains that PJJ is held on various pathways, levels of the type of education using various forms, modes, supported by learning facilities and services and assessment systems guaranteeing the quality of graduates in accordance with national standards of education educators.

So, this is a milestone for the development of PJJ in Indonesia, after a long journey in the end the PJJ system is recognized as the main educational alternative in the national education system, with the nature and special education of PJJ is considered to have the same potential as the existing education system. PJJ was first implemented at the Open University (UT), based on this that to implement PJJ online in the time of the COVID-19 pandemic there is no problem because there is already a legal umbrella.

Talking about the educational process of educators can not be denied by the existence of educational technology and information systems because sociologically basically humans in achieving their life goals always communicate, interact, and adapt to others as well as the natural environment, either directly, or indirectly. Especially in education during the COVID-19 pandemic there is communication and interaction indirectly, namely through the internet. Education is a business that is carried out deliberately, regularly and planned with the intention of changing human behavior in the direction desired. If during the education process there is no change theof learners, then the failure of education, so that the learning strategy is required with educational technology.

The application of educational technology in the learning process is intended to learn more effectively, efficiently, meaningfully for the lives of people learning. Therefore, there are products that are deliberately made, and there is the discovery and use of it, through the development of communication and information technology is very massive lately, has offered a number of possibilities that were initially unimaginable can reverse way many people think by taking advantage of the benefits. These include overcoming the problem learning or online lectures in the COVID-19 pandemic. In this case it is necessary intelligence for educators and learners to set learning strategies considering conventional or face-to-face conventional learning cannot be implemented.

Agree or disagree, whether or not we have to deal with Technology, especially information technology, is because it has affected our daily lives. We should not "stutter technology"

many research results show that "whoever is late master information, then late also has the opportunity to advance" as said by Green (2020): "People who master or termed as nouvau information riche It will further increase their knowledge and skills towards information technology, while people who are left behind by information as information poor are increasingly marginalized because of their lack of visibility, so that they do not receive their basic needs services such as education, health and economy, which leads to difficulty improving living standards."

Information is already a commodity like as another economic item so the role of information becomes bigger and more real in the modern world. This is understandable because society is now heading to the information society (science society). The social structure of information society is formed with the character of a creative and multifunctional networked society. This value is embraced by the community in this era related to creativity and knowledge maximizes the utilization information technology, therefore it does not become something special that many universities offer or open a department of information systems / information technology such as at the University of Dirgantara Marshal Suryadarma (UNSURYA), Jakarta.

Literature Review

Educational technology is the study and ethics of practice to facilitate learning, improve performance creating, using, managing the management technological processes according to resources. Educational technology is also a systematic way of evaluating the overall process of learning with specific learning objectives, based on research in learning theory and communication in humans, using a combination and learning resources from humans as well as non-humans to make learning more effective. Educational Technology is seen as a visual learning medium in form of films, images, and media displays that feature subject.

Educational Technology is a complex process that is integrated including people, procedures, ideas, tools and organizations to analyze problems and design, implement, assess, manage problem solving in all aspects of human learning. "Educational technology is an applied discipline, meaning it develops based on the needs in the field namely learning needs" (Prawiradilaga & Siregar, 2004). The utilization of education is planned and implemented properly will help produce resilient as expected.

Information systems are a combination of information and communication technology with the activities of people who use these technologies to support operations and management. "Information and Communication that is educational in nature is to increase knowledge and work skills, increase awareness and insight, besides that information and communication are also a means of social contact to increase social intimacy, which can foster a process of cooperation and sensitivity between cultural values and social ethics" (Prawiradilaga & Siregar, 2004). Therefore, information systems cannot be denied to create an information society or modern society with knowledge creativity so that they can carry out the use of information technology.

Daniel Bell (McQuail, 2000) was the first expert to introduce the term information society because it relates to the emergence of many information-based economic sectors at the end of the industrial society. Based on Daniel Bell's terminology, McQuail describes the information society as: "Those that have become dependent upon complex electronic information networks and which allocate a major portion of their resources to information and communication activities" (Tahir, 2013).

Online Lectures are lectures conducted online and supported by information and communication technology, in this case the internet. Online lectures or non-face-to-face lectures, students are not required to come to campus regularly. Online lectures are also one of the means of interactive learning. Lecturers and students can communicate using the internet. Lecturers can provide lecture material, either in the form of files, videos, or writing (text).

With online lectures, a lecturer can also teach in several places at the same time. Students can get lecture material in the form of files or readings from the lecturer concerned. Online Lectures contain Open Content, namely learning materials that can be used together. Online Lectures can also be Mobile Learning (Mobile Learning). Students can attend lectures anywhere and anytime, as long as they have an Internet connection. Some lecture materials after being downloaded can be accessed even if there is no internet connection. In the online system, students still have a "face-to-face" schedule with the lecturer. In addition, discussion classes in chat rooms are also regularly held. In online lectures, several systems can be applied, including:

E-Learning: E-learning is one of them. Lecture facilities that provide features or display icons that can be used to access materials, tasks and projects from the lecturer concerned. E-learning can be defined as learning facilities and support by utilizing Information and Communication Technology (ICT). E-learning is also a type of teaching and learning that allows the appearance of teaching materials to students using internet media, intranets, or other computer network media. E-learning refers the use of internet technology to deliver a series of solutions that can improve knowledge and skills. Therefore, it can be concluded that

E-learning is a learning system online media with the use of technology and communication used to convey materials or teaching materials from lecturers in improving knowledge and skills the student. "E-learning is composed of two parts, namely 'e' which stands for 'electronica' and 'learning' which means 'learning'. So, e-learning means learning by using help of electronic devices. So, in its implementation, e-learning uses the services of audio, video or Computer devices or a combination of the three" (Basri & Amelia, 2018). The use of E-learning cannot be separated from the use of the internet, the use of E-learning in the process of lectures where lecturers and students must use and utilize E-learning as a means to share information related to the of lecture materials, assignments, quizzes and discussion forums. One of the goals of the application of E-learning in lectures to increase student so that learning achievement will be better results.

SPADA (In-Network Learning System): SPADA (Online Learning System) is implementation of distance education implementation at universities that aims to access to quality learning. With the online learning system, SPADA Indonesia provides opportunities for students from one particular college to be able to follow a certain quality course from another college and the learning outcomes can be recognized equally by the college where the student enrolled. "Two-way communication in the SPADA lecture program between lecturers and students will be better because of the increasing number of communication media options available. Communication media allows instructors or lecturers to provide lectures directly via video conference or recording. Then, in the next process, students can play back the video or footage repeatedly as learning material if there is material that is difficult for students to understand" (Efendi & Wahidy, 2019).

Blended Learning: Blended learning is advantages of learning that is done face-to-face and virtually. Blended learning is a facility of defenders that combines various ways of delivery,

teaching models, and learning styles, introducing a variety of media options of dialogue between facilitators and people who get taught. Blended learning is also a combination of face-to-face teaching and online teaching but more so than that as an element of social interaction. In the Blended Learning model, you can interact directly in the form of direct discussions in the pros and learning of teaching and learning. "The existence of pro-gram lectures with Blended Learning, the lecture schedule will be flexible so that students can balance academic and non-academic activities" (Efendi & Wahidy, 2019).

Nation of Constructivism: The Nation of Constructivism is the the new theory of learning with shifts that occur, because of the advancement of information and communication technology is things that are very in line and strengthen each other. Constructivism and computer technology separately together have been Offer new opportunities in the teaching and learning process both in the classroom, distance learning, and self-study. Information can solve the problem and draw relevant conclusions the computer in this case will play a role in providing services through the process collectingand compiling information, inquiry and collaboration. "The ideas and principles of learning that exist in the Nation of Constructivismivism have such explicit about the need for a technology-supported learning environment" (Prawiradilaga & Siregar, 2004)

The presence of the COVID-19 outbreak has an impact on various sectors (Akerson & Carter, 2021; Jackowicz & Sahin, 2021; Paudyal & Rana, 2021; Sahin & Shelley, 2020). This study focuses on the education sector. According to the World Health Organization (WHO) began with a crowd of news about the COVID-19 virus, a novel coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), in December 2019 in the city of Wuhan, China, more precisely has a connection with the wholesale market in Wuhan COVID-19 patients who experience symptoms such as acute respiratory disorders such as fever, cough, even shortness of breath, initially come from traders, market employees or regular visitors. "Novel coronavirus or new virus from the corona family can be spread in just a matter of minutes through droplets or even by touching the surface of an object that has previously been in contact with someone who has problems with the problem" (Toquero, 2020).

The withdrawal of ling-kungan samples showed the results that the market in Wuhan City had a role in the initial amplification of this novel coronavirus. Then the market closure occurred

on January 1, 2020 and WHO set world public health emergency on January 30, 2020. The spread of SARS-CoV-2 is widespread around the world, including in Indonesia which announced two cases of COVID-19 positive patients on March 2. 2020. Since then, there has been a rise in positive patients and even the death rate caused by the novel coronavirus which President Joko Widodo to issue a large-scale social restriction (PSBB) policy to prevent and reduce the spread of COVID-19 by the end of March 2020.

The enactment of the United Nations caused restrictions on the activity's community outside the environment where they live. The term online lectures are widely used by the educational community, supported by the useof digital and internet tools that are signs of methods of work. The world of education is also required to adjust to situation and conditions caused by the COVID-19 pandemic.

Although the younger generation is currently adept at using technology, especially digital but the division of technology is not only limited to access or use of technology, but about the ability to integrate technology digital technology in meaningful social practice so as to benefit from its social practices. Therefore, it is important that young people adopt a critical and proactive attitude towards digital technology, i.e. they must critically consider how it can and should, not just accept the current state of being (Iivari et al., 2020). Educational facilities and educators also need insights and practices in the use of digital technology. As with the PSBB restricts and even prohibits the existence of Teaching and Learning Activities (KBM) directly. All activities are diverted at home using digital technology and the internet.

Thomas L. Friedman predicts that in the future students simply sit in front of a computer connected to the internet anywhere, can already do lecture process even though it does not state the specifics of COVID-19, only a very famous comment from him, namely the statement that "The World Is Flat." This shows that the longer a country's borders with other countries disappear. Including education can be felt by everyone through the process of teaching with the internet, one of which is online lectures, thus encouraging lecturers and students to be more creative and effective and build a wide network with various people both in the field and betweenfields of in various parts of the world (Kusnayat et al., 2020).

Advances in information and communication technology in such arapid way raise greater opportunities for lectures to explore various information data so that they can build

knowledge with the help of internet media and create a learning environment that can provide variety of options that are able to stimulate lectures or learning to optimize cognitive, affective, and psychomotor potential, will indirectly affect the tasks of educators and learners, in KBM. Based on the description above, the problem of online lectures in the COVID-19 pandemic requires a good learning strategy, in this case the use of educational technology as the implementation of information system is needed both by educators and learners in KBM online, therefore the problem in this study is "How to Technology" Education Information Systems can be carried out in online lectures in the time of COVID-19 pandemic?" The purpose of this chapter is to study and show the importance of educational technology and information systems for educators and learners in conducting online lectures during the COVID-19 pandemic.

Analysis and Problem Solving

This research uses descriptive content analysis study. This method uses content analysis intended to describe the content of particular information or text (Munirah, 2005) analysis is carried out various scientific articles related to online lectures during the COVID-19 pandemic, both from books, scientific articles obtained through journals and from other sources related to the problem. Then the paper is arranged systematically and based on scientific rules, the presentation of writing is in the form of a description or description.

Results

Speaking of Pen-technology

Education as the implementation of information systems (information and communication technology) in online lectures during the COVID-19 pandemic cannot be denied because of third wave of human civilization by Alvin. Toffler is referred to as information society because this civilization was then the beginning of the emergence of a society that most of its members made information as one of the main needs in his life, through electronic media in other words the internet. There is a belief that the internet provides vast opportunities and the creation of what Kenichi Ohmae refers to as "The Borderless World." According to Ohmae (in Budiyanto, 1991) the geographical and political boundaries of the nation state are irrelevant and no longer needed.

Technology is changing the system of information such as internet, making messages disseminated instantly and quickly, the dynamic nature of the internet, making internet-based online media deliver messages quickly. In addition, the channels are available many, so the number of sources of information is many and diverse. This is what makes the source of information available to anyone looking for it to change the response to the media (Kharisma Nasionalita, 161, 2014). This media will be able to be carried out properly according to its function, if there is adequate infrastructure let alone connected with the geography of Indonesia. The government has tried hard to provide information and communication services for all regions in Indonesia which include Western Indonesia Time (WIB), Central Indonesia Time (WITA), and Eastern Indonesia Time (WIT) through the Palapa Ring.

In terms of leadership that initiated the process for the construction of the Palapa Ring, the palapa ring development planning contained in Presidential Regulation No. 96 of 2014 was initiated by President Susilo Bambang Yudhoyono. Then the initiation was continued by the next leader, namely during the reign of President Joko Widodo. During this reign a good scheme was established in which there was a risk sharing between the government and the private sector. The Minister of Communication and Information was appointed as the Person in Charge of the Cooperation Project (PJPK) (Oniwati & Juwono, 2019). With the mission of "Merdeka Sinyal" to unite Indonesia through the internet, on October 14, 2019, Indonesian President Joko Widodo inaugurated the operation of Palapa Ring Project. Fiber optic backbone network project along the 12,128 kilometers were built by the government through the Telecommunications and Information Accessibility Agency (BAKTI) of the Ministry of Communication and Information.

Indonesia still has a lack of connectivity including 149,400 public service points consisting of educational facilities, local governments and even health facilities. The regions experiencing this are known as 3T (Lagging, Leading and Outermost) (Siswadi, 2020). This fact invites public demands against the government to answer and address problem of limited communication their territory. Satellite training is one of the answers and the solution provided by the government in dealing with 3T areas. The operation of the Palapa Ring satellite is expected to answer Indonesia's geographical challenges to provide a comprehensive terrestrial network. With the extent of Indonesia, the Palapa Ring will cover areas divided into three categories of categories, West (Riau Province, Riau Islands, Jambi Province and West Kalimantan Province), Central (North Sulawesi Province, Central

Sulawesi Province, Southeast Sulawesi Province, North Maluku Province and East Kalimantan Province), and East (East Nusa Tenggara Province, Maluku Province, Papua Province, and West Papua Province) (Student, 2020).

Now in the third civilization, where technology has an important role in aspects of human life, especially the need to access and distribute information and communicate, insights and supporting tools are needed to fulfill it. Indonesian society is currently often included in the category of digital society (digital society), namely people who in carrying out their activities are fixated on digital technology. Especially with the COVID-19 pandemic that hit the world, forcing everyone to access digital technology, move physical documents into digital files, communicate face-to-face into online conferences or online meetings and even physically shop for goods and food, switch to using online applications, where things -it can be implemented with the support of the internet.

Dynamic development demands efficiency and effectiveness on everyone. The presence of technology and the internet that supports it should be used optimally, especially for the development of each individual and the surrounding environment. Supporting tools oblige people to be creative and innovative. The reach of the internet which can cover every corner of the geographical area in Indonesia, accompanied by information dissemination about technology and the internet will make it easier for Indonesian people to access information and communicate through various digital technology media, making individuals interactive with one another.As long as digital transformation proceeds dynamically, various applications or media emerge. In the field of education, driven by the COVID-19 pandemic situation in Indonesia, online applications and tools have emerged to support digital and virtual teaching and learning activities using various teaching methods with innovative content such as teaching using images, audio, animation, video, and electronic book (e-book) or electronic book.

The internet, which allows humans to operate in cyberspace without limits, presents various advantages in the world of education. Digital learning has both beneficial and detrimental impacts in several aspects. Beneficial because it can contribute to minimizing individuals who do not continue their education, improve the performance of education personnel in hard-to-reach areas while at the same time reducing educational disparities between students in remote and remote areas and students located in urban areas, as well as with technology

and internet that support, virtual education can be done anywhere and anytime. While the detrimental impact is seen from how students are often distracted when virtual teaching and learning runs, teaching preparation can last longer by preparing material that previously used physical books to be converted to digital then making links (links) for meetings, attendance and assignments virtually, there is an opportunity for this to happen violation of Intellectual Property Rights (HAKI) for the work of educators and misuse of technology.

Virtual education through online media by utilizing the internet network that can access teaching applications such as Google Classroom, Google Meet, Zoom, WhatsApp groups, as well as Youtube, which provide live chat facilities between educators and students, provide flexibility in the time and location of teaching. However, the innovation and variety of applications and media offered does not guarantee that the teaching process will run smoothly or even better than direct KBM. This depends on the situation and conditions as well as the learning strategies made by the educator. The success of the teaching and learning process cannot be separated from how individual students accept the content and methods presented by the educator. According to Nakayama (in Dewi, 2020) even though it is easy to access electronic literature in e-learning, the learning environment and individual characteristics of students indicate that not all will succeed in carrying out and receiving online learning.

A few obstacles are also experienced by educators as well as educational institutions. Distance learning, which requires educators to be familiar with technological equipment and digital features in order for the teaching and learning process to take place, is considered quite tiring, especially for those educators who are less able to understand and operate digital technology, thus requiring assistants or assistance in preparing and implementing virtual learning. Preparation of digital teaching and learning materials is also an issue in itself, which takes a long time compared to normal teaching and learning materials.

Giving assignments or quizzes digitally at each KBM meeting session becomes a challenge for educators because in practice, assignments and quizzes. Digital technology restricts educators from writing specific and comprehensive textual instructions for students working at home. Also, in preparing learning links, where some applications involve mastery of coding (Google Forms) which is somewhat complicated.

In distance learning, educators must be able to predict what challenges will be faced by students and what are the right solutions to overcome them. Therefore, virtual conferences or meetings are held between educators and institutions to answer existing problems regarding virtual learning using zoom and youtube. Migration from the traditional education system, namely through face-to-face to a more modern education system with the use of digital technology and online is required to occur for educators as well as educational institutions (Bao, 2020).

In Indonesia, both educators from private institutions and state institutions, both experience challenges in implementing online learning, especially since the start of the online learning system is relatively short and lacks proper counseling. Educators need adjustments in new routines, negotiating about teaching and learning time with students or even parents of students, making weekly lesson plans for each student, as well as assessing and evaluating the work of each student. One of the challenges is the lack of tangible and physical resources in the homes of students, which are usually prepared by institutions at their respective schools or campuses.

This makes educators and institutions to come up with solutions that can overcome these problems. As in practice classes, the institution will invite students back to school or campus with a limited number to prevent the spread of the COVID-19 pandemic and make shifts for each student who will hold practical classes with a warning that each individual in the room follows the policies and procedures, sterilization rules for the prevention of COVID-19 (washing hands with soap or sanitizer, wearing masks and face shields, maintaining distance). "Learning through digital technology virtually with the use of internet or online networks has hit the world of education like a tsunami" (Goldschmidt & Msn, 2020).

The worrying weakness with online learning is that when educators or parties from institutions are unable to communicate or contact students during quarantine as a method of implementing PSBB and mentally, students often find online learning easy so they choose to be indifferent in following the KBM process (not bringing materials, wearing untidy or polite clothes, eating during the KBM, less interactive in the question-and-answer session). Educators are worried that if there is no intervention to motivate educators and institutions, it will be more difficult for both parties to overcome these problems if in the future educational facilities are opened normally and return students to their normal routines.

Distance learning by utilizing digital technology and the internet can provide benefits for students, especially for those who enjoy learning independently without noise and interference from the outside environment with learning carried out in their respective homes. Such students will be more active and productive compared to their situation in the classroom which sometimes does not guarantee the order and silence they want. So that they will contribute optimally, even enthusiastically with the tasks given by educators. Flexibility in choosing a time and location is certainly felt in virtual learning by utilizing varied methods and content in the implementation of teaching and learning activities that can help educators and students connect with each other. In various obstacles and difficulties during the online education process, an evaluation from educators is needed to complete and fill educational aspects such as the process of knowledge, morals, skills, intelligence and aesthetics (Dai & Lin, 2020).

Online lectures are a solution needed by educators and students during the COVID-19 pandemic with existing applications where each educator has a strategy in the online lecture process, so that it doesn't get boring quickly as in the use of the Zoom application in collaboration with audio and visual support lecture material. If the lecture runs for 150 minutes, equivalent to three semester credit units, it is the teacher's job to divide the time into 50 minutes of delivering material using digital presentations. Along with the video showing, then followed by 50 minutes of giving interactive space (question and answer and discussion) between educators and students, as well as among students, then the last 50 minutes for giving assignments in the form of digital quizzes using the Google Form application, which support to spread links containing questions about the material presented by educators in the lecture session.

Quizzes and interactive discussions are intended as motivation for students to be more appreciative of time and be able to think creatively and innovatively in utilizing the right technology for the advancement of science. Educators need to know that the material that will be delivered online must be in accordance with face-to-face material, besides that online lecture learning media must be able to facilitate students to actively build knowledge through interactive discussion forums. In the end, the evaluation of the implementation of online lectures can be measured by the assessment that is available on the online media.

Along with the development of this learning technology, internet-based PJJ is basically favored by generation Z. This generation is also often referred to as the internet generation, consisting of children born in 1995-2009; this generation was born in an era of increasingly sophisticated technology so that their learning styles are different. Generation Z's learning styles are audio-visual, dependent on technology, easy to understand examples that are more accurate, concrete and useful. So that the purpose of online lecture learning can be conveyed properly, then one of the innovations used is to use online media wisely, in accordance with learning objectives. Thus, educators act as motivators, facilitators and supervisors according to the level of education.

Conclusion

Information in this case is information and communication technology, cannot be separated in online lectures during the COVID-19 pandemic because the spread of SARS-CoV-2 has spread widely throughout the world, including in Indonesia which announced two cases of positive COVID-19 patients in March 2, 2020. Since then, there has been an increase in positive patients and even deaths caused by the novel coronavirus which prompted President Joko Widodo to issue a large-scale social restriction (PSBB) policy to prevent and reduce the spread of COVID-19 at the end of March 2020.

The enactment of the PBB causes restrictions on people's activities outside the environment where they live. The term Working from Home (WFH) is widely used by the community, supported by the use of digital tools and the internet which are signs of a shift in working methods. The world of education is also required to adapt to the situation and conditions caused by the COVID-19 pandemic.

Virtual education through online media that utilizes internet networks can be done by accessing teaching applications such as Google Classroom, Google Meet, Zoom, Whatsapp groups, and Youtube which provide live chat facilities between educators and students providing flexibility in teaching time and location. However, the innovation and variety of applications and media offered does not guarantee that the teaching process will run smoothly or even better than direct KBM. This depends on the situation and conditions as well as the learning strategies made by the educator.

As in practice classes, the institution will invite students back to school or campus with a limited number to prevent the spread of the COVID-19 pandemic. The schools will make shifts for each student who will hold practical classes with a warning that each individual in the room follows the policies and procedures, sterilization rules for the prevention of COVID-19 (washing hands with soap or sanitizer, wearing masks and face shields, and maintaining distance). Hence, good cooperation is needed between institutions, educators, and students, as well as their parents.

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Chapter 8 - On a Novel Approach to Undergraduate IT Education

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Chapter Highlights

- This chapter introduces a new collaborative programme in Computer Science developed by academic staff of the universities of Novosibirsk, Russia, and Hertfordshire, UK who formed an initiative group for this development.
- The study combines the advantages of the Russian and UK academic traditions to achieve a product superior to both in the area of advanced undergraduate computer science education.
- This chapter provides a new approach to structuring Computer Science degree programmes.

Introduction

This chapter presents the results of a 3-year experiment in undergraduate curriculum development conducted by an initiative group that includes academic staff of a leading Russian and a British university. The collaborative effort has been channelled into a synthetic product, which combines the strong points of the British and Russian education systems while bolstering conceptual consistency and student motivation. The advantage of the Russian system is in its broader intake requirements and later specialisation. Russian school leavers are required to be well prepared in areas not directly connected to their chosen degree course. Also, they expect, and acquiesce to, an extensive programme of general studies with hardly any professional subjects available before the studies are completed. This should not be confused with the US liberal arts approach, where the subjects taught are freely chosen to provide general appreciation of several areas according to the student's interest.

In the context of computer science and engineering education (the core of modern IT) general studies mean primarily studies of mathematics and physics as a preparation for the subsequent vocational stage. On the one hand, these give the students a chance to learn their chosen field ab initio, without accepting most of its fundamentals as black-boxes filled with received knowledge. Such an approach stimulates the students' critical faculties, creativity and makes them confident in their graduate learning, whether in postgraduate education or on the job. On the other hand, the part of the class whose motivation is strictly pragmatic and whose propensity for analysis is limited often become demotivated and switch off. Without seeing "where it is all leading" in practical terms, they treat general subjects as a perfunctory hurdle, learn little and benefit even less.

The advantage of the British, and generally western, education system is in its focus on the students' future profession from the word go, which includes careful positioning of the undergraduate stage on the landscape of higher education. It is generally recognised that the majority of the students will, upon graduation, seek a job in IT industry where much of the job-specific learning will take place in the early years of their career. Masters degrees are not treated as specialist training necessary for the students' first professional engagement — it is the bachelor stage that is supposed to provide that already. Another strong advantage of the western system is project-based learning including the group-project element. For IT-related degree programmes experience of teamwork can easily be a decisive factor in a graduate's

early career success, even when their academic attainment is not outstanding.

Yet there is only so much that can be squeezed into the university timetable before the students are overloaded with compulsory scheduled work. The programme development team must do a careful balancing job as they pare back and combine available syllabi, and develop new modules. (In this chapter we will keep to British terminology and call units of delivery modules. For the reader more familiar with American jargon, those correspond to courses.) They must emphasise the modules' mutual motivation and other horizontal links in the programme, especially when practice motivates theory, while enriching the delivery with a variety of assignments, including individual and group projects. This is a much more difficult challenge than the typical incremental improvements inside the Russian or western paradigm of education: besides a painstaking alignment of modules and stages, it requires a strong sense of purpose and at the same time adherence to academic values. In this chapter we will expose the logic of the curriculum development process and outline some of our evaluation results.

The structure of the sequel is as follows. In the next section we will discuss the fundamental stage, Year 1 of our programme. Section 2 discusses some inherent challenges and trade-offs of Year 2, Section 3 outlines the concept of Specialist Learning Package and the structure of the final two years of the programme. Section 4 focuses on evaluation and draws some conclusions.

Year I

The challenge of Year 1 is to quickly level off the difference between school and university experiences while making the studies interesting and challenging in equal measures to maintain the student's engagement. From the academic point of view, the profession is based on three fundamentals: mathematics, design and systemic vision.

Mathematics in Russia is a very conservative field with a "classical" pedagogic strategy. The subject is presented in a deductive manner: from fundamental generalities to particular results with the completeness and rigor carefully guarded. Our programme being a combined product, we required two mathematical modules at the introductory level: one for conventional engineering mathematics (calculus, linear algebra and geometry) and one for

discrete maths (logics, deduction, sets, relations, graphs, languages/machines). The former is required for many second-year studies, such as stats, AI, electronics, etc. and the latter is the basis for programming semantics, verification, concurrency, complexity, models of computation as well as all sorts of key algorithms.

Approaching the challenge *ab initio*, we agreed with the engineering maths professor that the level of detail be kept moderate, while the core theorems and their proofs retained — unlike standard western practice, where engineers are taught mainly to use black-box recipes. We had in mind coordination of engineering and discrete maths (especially set theory and logic) as far as possible with a view to helping the students to appreciate the integrity of maths as an analytical method. Drawing on the Russian partner's expertise, we included a substantial module of discrete mathematics, studying logic and deduction extensively (as befits a preparation for the theoretical side of computer science) and also a much larger area of graph theory than is normally taught to freshmen, bearing in mind the pivotal role of graph algorithms in modern computing.

Programming. Paradoxically, while the Russian approach to basic science is heavy handed, the country's universities deliver programming courses from an exceedingly pragmatic point of view. One sign of it is popularity of "sports programming", a codecraft competition between students where programming tasks are fulfilled against the clock. What is being tested here is implementation skills, detailed knowledge of a specific programming language and its inherent design patterns as well as finely honed debugging skills. On the other hand, familiarity with a variety of programming paradigms, some of which are not yet rife in industry, but which inform overall design and development culture, is not seen as a necessary step in most Russian universities. Declarative programming in general and functional in particular is not included in the introductory stage. We resolved to improve that by allocating two programming modules, *Introduction to imperative programming* and *Introduction to declarative programming*, in the first year of the programme. Both modules combine a programming language part (C and Haskell/SQL, respectively) and basic algorithms/problem solving. C programming is supported by an exercise bank that contains more than 200 programming assignments of varying complexity and which is further supported by a test system for automated marking of students' solutions. (This component is provided by the Russian collaborators and is a product of many years' refinement.) Haskell programming has a smaller but equally refined exercise bank, and the students' solutions are marked by tutors.

Finally, SQL (without state-changing queries) is used to show that the declarative approach is not confined to computation, but can be used for data retrieval. The combined effect of the modules is that successful students learn basic skills of problem decomposition, both iterative and functional/recursive, really well. They also become well versed in programming abstractions, especially thanks to functional programming, explicit and inferred types.

The programme provides yet another form of programming experience to its first-year students. In the module *Computing platforms,* contributed by the British collaborators and reflecting their pedagogic approach and iterative refinement since 2015, learners are presented with a low-level study platform comprising an original 8-bit teaching microprocessor (CdM-8) with memory and instrumentation/visualisation for assembly language programming. This is supported by a bespoke IDE, including a system-level emulator, a macroassembler with a macro library that supports high-level control structures (ifs, loops, etc) and facilities for monitoring/debugging program execution. The tools make it possible to master bit manipulation skills, learn machine arithmetic, data representation, simple and linked data structures, and develop good cost intuition to appreciate algorithms and optimisations to be studied later.

To this end, the students offered an exercise bank complete with a robotic tester (an email robot). Individual tasks are assigned to students automatically from various levels of complexity depending on their progress. The solutions are submitted back to the robot, which subjects them to randomised tests. The testing is fairly effective: incorrect solutions are failed at a near 100% rate and a detailed report showing the syndrome is emailed back to the student. Unlike high-level programming exercises, the assembly programming ones are offered for repeated submission to get the students to debug their solution and to learn how the platform works in the process.

Systemic vision. The study microprocessor is also available as simulated hardware, serving as introduction to computer architecture, which includes all the basic blocks: ALU, registers, memory and even I/O. The module “Computing platforms” contains a starter course in digital circuits supported by a popular circuit simulator Logisim. The study of architecture begins after a circuit-design exercise bank has been traversed and an in-depth understanding of signals, circuits and multi-bit functional units (such as adders, multiplexers, etc.) developed by the students. The aforementioned robotic tester supports circuit testing in the same way as

it tests assembly programs: randomised data input is produced and if the circuit's behaviour is not as expected, the syndrome is returned to the student for analysis and correction. Adaptive exercise assignment takes care of performance-dependent student progression across the bank for both assembly programming and circuits. As the module is both unique and key to our Yr 1 curriculum, we present the full syllabus of "Computing Platforms" in Table 1.

As a result a multilevel systemic vision of computing is formed, which facilitates understanding of virtual machines, de-mystifies the process of compilation of imperative programs and, most importantly, provides a solid base for the cost intuition that any professional software developer must have (especially if working in multidisciplinary areas such as high-performance computing or IoT).

Table 1. Computing Platforms. NSU Syllabus

#	**Semester 1**
1.	Introduction. Platforms and platform levels according to Tanenbaum. Compilation and interpretation.
2.	Description of the architecture of CdM-8. Registers and random-access memory. Basic data transfer instructions (*ld, st, ldi, move*), some arithmetic instructions. An example of the simplest program without using labels (the program is linear, addresses in memory are given by decimal constants). Labels and directives for reserving memory for data. An introduction to assembler syntax. Using *cocoide*.
3.	The cmp instruction and some conditional branch instructions (those whose semantics can be explained without a precise description of all the flags). A simple program with conditional branch over the labels. "Structured" macros: *if / is / else / fi, is or/ is and, while / until / stays / break / continue / wend.*
4.	Representation of numbers. Positional number systems with different bases. Column addition. Binary arithmetic.

	Possible representations of negative numbers. Binary-complementary arithmetic. The exact semantics of the CdM-8 condition flags and a complete list of branch instructions. Using the carry flag to implement addition and subtraction of digits.
5.	Storing numbers from high to low and from low to high (big- and little-endian). BCD representation and BCD addition.
6.	Multiplication of integers. Multiplication by repeated additions. Multiplication by a power of two by shifts. Multiplication by a constant using the expansion of a constant into the sum of powers of two.
7.	Long multiplication. Long division.
8.	Data structures. Arrays. Pointers. Indicative arithmetic. Linked lists. Representation of sets using bit strings. Implementation of set-theoretic operations using bitwise logical.
9.	Data structures. Aligning margins. Packing structures with bit fields. Prefix encoding. Presentation of the text. ASCII encoding. Length-prefixed strings and zero-terminated strings. Cyrillic single-byte encodings. Unicode. Unicode representations: UTF-32, UTF-16, UTF-8. UTF-8 as prefix encoding.
10.	Stack and subroutines. SP and instructions *push, pop, jsr, rts.* Calling conventions. Instructions *ldsa* and *addsp*. Passing parameters through the stack. Stack frame.

	Pseudo-instruction *tplate*. Pointers to subroutines. Setting the stack pointer. Coroutines.
11.	Separate compilation and linkage. Relocatable assembler sections. Object files and CdM-8 memory image files. An introduction to the problem of dynamic memory allocation.
12.	Macro assembler. Simple macros for example *ldv* (*ldi rx, addr ; ld rx, rx*). Limitations of Aggregation as an Approach. Context-saving macros. Simple implementation of *if /is/else/fi* macros. Unique labels and preservation of the macroprocessor context. An *if/is/else/fi* implementation that allows nesting.
13.	Instruction codes CdM-8. Symbol tables. Assembly procedure. Cocas two pass assembler. Multi-pass assemblers. One-pass assembly. Separate compilation as incomplete assembly and linking as completion.
14.	Architecture extensions: Harvard architecture, memory banks, I / O. Interrupts. An introduction to the problem of critical sections. System and user modes.
15.	Additional material. Overview of ARM and x86 architectures.
	Semester 2
16.	Introduction to digital circuits. Voltage as a way of representing zeros and ones. Passive elements of the logic circuit. Open drain "Or". Switches. Electromagnetic relay as a switch. Logical "And", "Or" and "Not" on switches. Combination schemes.

	Using Logisim to emulate logic circuits.
17.	Switch implementations. Babbage's car. Electromechanical relays. Radio tubes. Transistors. Implementation of basic logic gates on complementary transistors. Imperfection of digital circuits on transistors.
18.	Logic gate symbols in Logisim. Input and output terminals. Subcircuits. Tunnels. Naming of subcircuits and tunnels. Component libraries. Requirements for circuits tested by the exercise robot *Cocomaro*.
19.	NOR and NAND gates. Pierce's arrow and Schaeffer's stroke. XOR implementation on 9 transistors. Implementation of XOR on 4 transistors and its imperfection. Using the imperfection of digital circuits. Open drain "Or". Pull-up resistors. Tri-stable output.
20.	Combinational and sequential schemes. Adder. Quarter-, half-, and full adders. Approaches to the implementation of a multi-bit adder. Serial adder. Parallel sequential carry adder. Carry-saving adder. Accelerated transfer.
21.	Truth tables. Boolean algebra. Sum of minimum products (Normal Disjunctive Form, NDF). Implementation of a combinatorial circuit with an arbitrary truth table using NDF. Software tools for such an implementation. Programmable Logic Arrays (brief overview). Decoder. Multiplexer.
22.	Sequential Circuits. Basic elements of sequential circuits. RS flip-flop. Level activation and edge activation.

	Edge detectors. D-latch. Two stage D latch (MS latch). Implementation of a simple and Master-Slave D-latch on CMOS transistors.
23.	Register. Clock driver and register synchronisation. Input multiplexers and tri-stable output. State machine based on a state register and PLM. Introduction to VHDL.
24.	Memory. Static RAM. Dynamic RAM. Mask ROM. ROM with fusible links. ROM with UV and electrical erasure. Flash memory.
25.	Register file. ALU. Data path implementation based on a register file, ALU and a set of multiplexers and decoders. Register Transfer Language.
26.	Connecting memory to the processor. Decoder instructions. Sequencer. Implementation of a two-stage decoder in CdM-8. Firmware machines. The processor is a microprogram machine.
27.	Connecting peripheral devices to the CdM-8 processor. Address decoders. Clocking of peripheral devices. Interrupts. Changes in processor circuitry related to interrupts.
28.	Connecting multiple devices and implementing arbitration in CdM-8
29.	Additional material: an overview of advanced circuitry solutions used in modern computers. Caches, peripheral bus bridges. Switched buses. Direct memory access. Autoconfiguration of devices.

Group Project. One of our stated collaborative objectives was to introduce project work wherever possible. We started right from Year 1, where, as the final part of the module *Computing platforms,* the students are required to design and implement (as a Logisim simulated circuit) a simple game console, based on the study microprocessor provided. They design and implement all hardware and all firmware components, write a definitive report and do a product presentation/demonstration.

Year II

We dwelled on the first year at length because it crystallises our combined approach and sets the boundaries for what follows. Moving up to Year 2 we will consider individual modules in much less detail. The second year programme comprises five new study directions:

1. Further theory:
   a. further engineering maths: differential equations, complex variables and stats
   b. introduction to theoretical computer science: models of computation and theory of concurrency
2. Programming methodology (OOP) and its language support
3. Platform-enhancing technologies: Operating Systems and Artificial Intelligence
4. Connecting technologies: communication, networking and analogue electronics
5. Embedded systems design and implementation

The logic behind the above is as follows. We treat Year 2 of the programme as the final preparation for specialisms. Year 1 supports Year 2 with basic competencies: the ability to understand complex discrete abstractions, to design and develop small programs and digital circuits, and the familiarity with basic engineering mathematics. Those we believe to be sufficient for all five of the above objectives. In turn, the objectives support the learning of Year-3 topics ranging from OOP design to data storage and security, to machine learning. Even more importantly, the skills and knowledge developed in the second year should be sufficient for all Specialist Learning Packages that span the last two years of the programme; these will be discussed in the next section.

Direction 1a is represented by a module in Differential Equations and Functions of a Complex Variable (DEFCV). Our distinctiveness is in that we expect it to also support Analogue Electronics (AE): e.g. passive electronic components connected in an RC- LC-

CLC- and other types of differentiator, integrator and filter circuits are used as examples in differential equations and Laplace transform, and the AE module is able to make explicit references to the materials studied in DEFCV.

Another module in Direction 1a is Probability Theory and Statistics (PTS). Not only is it necessary for studying all sorts of performance characteristics (networks' latency and throughput, queue length, service response time, etc), it is a necessary preparation for the area of machine learning, which is a compulsory part of any modern CS undergraduate programme. Furthermore, probabilistic aspects are common to the study of signals and measurements, which are also relevant to AE and Embedded Systems. The PTS module is designed to cater for all such applications.

Direction 1b prepares students for a study of ordinary and parallel algorithms and also facilitates the learning of complex typing paradigms characteristic of modern OOP. Furthermore, complexity and computability, covered at an introductory level in Models of Computation (MC), have a bearing on various complexity and optimisation topics encountered in the subsequent year.

Direction 2 is key for the development of software engineering skills and competencies; it is also a major contributor to the Year 2 Group Project. (The reader is reminded that it is our stated intention to provide projects in every year of learning as an essential feature of our combined methodology.) Here we aim to provide an extensive two-semester knowledge-and-skills module to bring the students to the proficiency level of a graduate programmer (but not yet to the same project-development skill level).

Direction 3 is supported by standard OS and AI modules. Our OS module benefits very much from the understanding of platforms developed in Year1. This module is offered to students of the NSU IT department as well, who do not study our CS programme. The module leader is the same in both cases, and he reports a drastic difference in students' learning on average between the two cohorts.

As far as the AI teaching is concerned, it also benefits from Year 1 very much; the contributing module here is the one on declarative programming: the students are well used to

seeing solutions that do not “tell the machine what to do” by the time they study classical rule-based AI.

Direction 4 is distinguished by the fact that its focus is not on building a better virtual machine of any kind (intelligent or not) but on connecting the available software and hardware with either another platform or the physical world. The networking part is facilitated by the OS module, which introduces basic network programming patterns (sockets and socket methods), which also helps the networking module to produce concrete examples. Our treatment of AE is mainly from the sensor and actuator points of view: the students learn to process (filter, amplify and de-noise) signals in the analogue before the results are converted to digital. Besides that, a cross-module link to networking is established whereby AE provides some basic coverage of modulation and demodulation, useful for discussing transceivers in the context of network links.

Finally, *Direction 5* continues the study of Platforms begun in Year 1 by getting the students to appreciate a real physical microcontroller-based system. Students learn to develop, implement and debug embedded software within the limitations of a small platform. This includes carrying out individual projects using real hardware.

In keeping with our aims, the Year 2 programme includes a *Group Project* but now it is a separate two-semester module. This means that the project is quite large and that the approach we take here is aligned with industrial practices of software development. It includes several stages of developing the project idea and detailed specification, elements of project management and the use of specific methodologies.

Flexible Learning, SLPs and the Rest of the Programme

Each undergraduate programme must introduce an element of choice that reflects the variety of subject domains in the chosen field on the one hand, and the students’ preferences on the other. In the context of Computer Science, the former factor gives rise to specialisms varying in a very broad range: from theoretical computer science to microelectronic design and sometimes beyond. Not all can be accommodated on the common foundations laid by the first- and second-year teaching. Already the second-year programme that we have developed has a broad software-engineering orientation, which supports purely software-orientated

areas, such as Cloud and High-Performance Computing and Big Data. It also supports embedded systems and the IoT, but not robotics and microelectronics to the same extent. At NSU all these directions share our first-year programme and regard it as an indivisible, necessary and sufficient foundation for the full spectrum of modern Computer Science.

The second-year programme is offered to related degree streams as an *à la carte* menu of modules to be combined with those developed by colleagues to produce a different flavour programme for themselves. At the moment we have one related programme in the NSU taught provision, namely "Mechatronics and Robotics" (MR), administered by the NSU Upper College of Informatics. However, the future programme in Microelectronics and Telecommunications is likely to come on board taking an even greater proportion of our existing second year modules.

Another source of flexibility is realised via Specialist Learning Packages (SLPs), which we have mentioned earlier. The programme leaves three semesters largely free of compulsory modules to accommodate them, starting with the beginning of Year 3. An SLP is a cluster of modules some of which are prerequisites to other, but the cluster as a whole has no prerequisites other than the degree programme in which it is offered. Interestingly, some of the prerequisite-free modules in the cluster can be made available to a related degree programme. We have only started SLPs last year and it is too early to report the results, but the anecdotal evidence we have gathered points to a good level of preparedness our students showed in approaching those challenging specialisms.

The final year accommodates a two-semester individual project that students do nearly full-time from September to April. This is quite common in the Russian system and we decided to retain the final project as is. A small number of compulsory modules are included in Years 3,4 to take care of advanced topics believed to be common to all flavours of the profession. Those are databases, machine learning, cyber security and professional/social/legal/ethical aspects of engineering.

Method

At the early stage of programme development, the initiative group had to propose a set of strategic principles that would guide us in the choice, placement and mutual adaptation of any

modules. In this section we will shed some light on the methodology we have been guided with, and which ensured the consistency and clarity of the final product.

Purpose

It often happens nowadays that programme development is due to a change in education markets driven by three key factors:

1. *Quantity of the intake* into Bachelor programmes. The developer wishes to increase the appeal of their undergraduate provision to secondary school leavers in order to increase the fee income, institution visibility or both. This is especially true of undergraduate programmes in the United Kingdom, where universities struggle to resource their operations from the government grant, but the situation is not unique to the UK. University managers are keen to adopt undergraduate programmes that attract large numbers of candidates. On the one hand, they argue that increased applications provide for a better choice of future students, but on the other they simultaneously lower the bar so that the student cohort may grow year on year in line with the organisation's ever-increasing expenditure.

2. *Label compatibility*. Subjects such as Computer Science are known to be strongly dependent on the current trend. Not only is research funding channelled into narrow sectors that the politicians perceive as benefitting the economy in the short to medium term, teaching activities also advertise themselves along similar lines. Teaching leaders argue that the media and social networks have created a certain image of the subject in the candidates' minds, which has to be adhered to if point 1 above is to be taken on board. For example, labels such as Cybersecurity, Machine Learning and Cloud computing have achieved such pre-eminence in advertising undergraduate programmes that classical computer-science areas such as languages and compilers, program verification, concurrency, functional programming, etc. have been completely eclipsed. There are countless Masters provisions exploiting just these labels, often without much depth or even substance.

3. *Alignment*. British and Russian cultures are risk averse. Any undergraduate provision is only allowed to be innovative if it is properly aligned with the understanding of the

subject codified by professional bodies, such as the British Computer Society and the Russian Ministry of Higher Education, respectively. It is the least restrictive factor of the three presented here, since the required alignment is typically quite superficial, but it has to be reckoned with nevertheless.

As an experimental programme, ours was free from the above shackles. The advantage of the Russian education system is in its positive interpretation of elitism. While the word has a very negative connotation in the UK, where the dominant perception of elitism is in terms of class privilege, in Russia, just as it was in her predecessor the Soviet Union, elitism is defined in strictly meritocratic terms. Elite education in Russia is a type of instruction that is reserved for highly selective institutions, where candidates are expected to demonstrate above-average propensity for the subject. It is assessed through such evidence of lateral thinking, resourcefulness and ingenuity that is linked to the candidate's intellect and personal qualities, and which cannot be purchased by paying private school fees, hiring personal tutors, etc., i.e. resources typically associated with class privilege.

Furthermore, a Russian elite-education institution does not form an implied contract with the candidate that offers graduation in exchange for just hard work. It is recognised that some will simply not be able to cut it and that they will unfortunately be sent down within the first year or two of their degree studies. After two years the notional contract is finally in place, so third-year departures are not considered normal unless they happen as a result of the student's diminished motivation.

The purpose of the new programme is thus to increase the scope and depth of NSU's undergraduate (non-elitist) curriculum in Computer Science. The programme was designed to break through interdisciplinary barriers by sweeping in areas from theoretical Computer Science to Electronic Engineering and to produce graduates with a high degree of adaptability. The Russian market is less well structured than most labour markets in the West, with many jobs requiring job seekers to take a broader spectrum of challenges in their stride. For example, besides the usual enterprise Web-development market with its focus on large database-driven server systems and client-side mobile apps, demand is strong in machine learning, IoT (especially industrial IoT), and cybersecurity. The first area requires competencies in applied maths and stats, the second one needs good knowledge of hardware and signals and the third one call for, again, knowledge of hardware and low-level

programming. Those are not currently seen as Masters-only roles, and the graduates just do their best to embrace the broadest range of competencies by self-learning, if nothing else.

Module Development

One consequence of Russian elitism is that module developers do not have to include in their teaching and assessment a significant proportion of what is usually termed *bookwork*, i.e. knowledge not linked directly to skills and problem-solving techniques. Abuse of bookwork is something Western educators are acutely aware of. For example, in (Bradforth et al, 2015) the authors lament: "too often, faculty members talk at students rather than engaging them in activities that help them to learn and apply core scientific concepts and skills." At NSU, STEM departments tend not to even examine bookwork to any appreciable extent. Students irrespective of their background, if admitted to a degree program at NSU, are expected to cope with bookwork well due to their ability to assimilate advanced material and also because of the Russian elite universities' very low student-to-staff ratio (around 4 to 6), so help is readily available with more challenging parts of theory. Assessment at NSU focuses on problem solving, which explains why the majority of examinations are held *viva voce*.

This last circumstance has a major influence on curriculum development. All modules have to present the material as a progression of goals, one leading to another, punctuated by problems and solutions. Such delivery may be oblivious of the needs of less able students, who are often tardy at the early stages and overwhelmed when they skip over earlier work to keep up with the schedule. On the other hand, a flatter learning curve often necessitates a larger volume of exercises with its attendant assessment requirements. The key consideration here is that the best students are easily bored with work that does not challenge them every step of the way; there is a risk that they may disengage if the right balance is not found early in the delivery.

The key methodological issue here, in combining the western motivational with the Russian elitist approaches, is one of assessment automation. By developing plenty of simple exercises intended for the students' independent work and by providing a facility for automated testing of the solutions, the needs of all students in the class can be addressed, not just the more or the less capable ones. Depending on their progress, students can be assigned exercises with

just the right amount of difficulty, either by their tutor or automatically, by assessment software.

Another key point that was addressed in our collaboration is a single-narrative approach. Several modules are taught concurrently in a semester, but the NSU lecturers on the new programme get together at short regular intervals (1 week) to discuss their current topics and pedagogic findings. In those meetings they formulate requests to each other and articulate a common strategy.

For example, the lecturer of Imperative Programming would talk to the lecturer of Discrete Mathematics to find out what graph-theoretical algorithms were being currently taught in the latter module to introduce relevant implementation techniques in the former. A similar interaction happens when, for example, pointers are learned in C programming and those are correlated with memory references studied in Computing Platforms. To facilitate such discussions the programme manager maintains a cloud spreadsheet where each module team controls a column that sets topics against academic weeks.

Results

The Programme schedule is presented in Table 2 (more info in (Portal, 2021) and (Faculty, 2021)).

Table 2. BScCS Computer Science and System Design. Programme Schedule

Year 1	
Compulsory modules	**Semester**
Introduction to algebra and analysis	1, 2
Introduction to discrete mathematics and mathematical logic	1, 2
Declarative Programming	1, 2
Imperative Programming	1, 2
Computing Platforms	1, 2
Instrumentation lab	2
Year 2	

Compulsory modules	Semester
Operating systems	3
Embedded digital control systems	4
Introduction to Analogue Electronics and Instrumentation Technology	4
Group Project	3, 4
Object-oriented programming	3, 4
Models of computation	3, 4
Introduction to Artificial Intellect	3
Introduction to computer networks	4
Concurrency	4
Probability theory and mathematical statistics	3
Differential equations and theory of functions of complex variable	3
English	3,4
Year 3	
Compulsory modules	**Semester**
Cybersecurity	5
Computational mathematics	5
Information storage and processing	5, 6
Machine learning	5
Software design	5, 6
Group Project	5, 6
Elective modules	**Semester**
Models and methods of Artificial Intellect Introduction to mobile programming	5
User interface design Deep learning Bioinformatics-1 Java code optimisation Computational linguistics Python programming Computer modelling	6

Year 4	
Compulsory modules	**Semester**
Knowledge Economy and Technological Entrepreneurship	7
Management of software development	7
Information Security	7
Software documentation standards	7
Safety	8
Economics	8
Elective modules	**Semester**
Knowledge representation using Semantic Web Distributed algorithms Bioinformatics-2 Computational linguistics-2	7
Colloquium: "Design solutions in system development" Colloquium: "Design techniques in software and hardware developments"	8

The concept of the programme was presented and discussed in (Lavrentiev at al., 2018).

Conclusion

We have presented a *system* of curriculum development that enabled us to combine the advantages of Russian and Western (more specifically, British) concepts of Computer Science education. Full quantitative evaluation is a matter for subsequent research, when graduate employment metrics become available. However, even at this preliminary stage we can report certain anecdotal evidence that confirms our findings. It is as follows.

1. The programme includes a 3-month work placement in the fourth (final) year of studies. Our very first class have just entered this stage, and we have been monitoring their activities closely. Each student is placed with an IT company, typically a technological start-up or a development branch of a large corporation. The students' industrial supervisors are in touch with us throughout the placement period. Already we are getting very positive differential feedback, with mentions of these students' much

broader knowledge and skills, and especially the ease with which they fit in teams and become productive on development projects.

2. Due to a clear orientation of the programme and its public set of objectives, it is also much more flexible and easier to control. As mentioned earlier, we manage the delivery by maintaining a public annotated schedule that displays themes/topics against modules and weeks of study. We hold short sessions weekly, where academic staff have a chance to raise cross-modular concerns for specific weeks/topics and can make suggestions. Discussions are referenced to the annotated schedule; the latter plays a role of a continually updated delivery document, which we find instrumental in controlling the quality and conceptual integrity of the programme. We maintain delivery schedules and hold staff sessions in Yr1 and Yr2, but the practice is so successful that we are thinking of organising the same for the first semester of Yr 3 as well.

3. Several modules are shared with a sister undergraduate programme "Information Technology", which predates ours. Some staff teach both classes. They are in a position to observe both cohorts. Their feedback indicates that our students are much better prepared for second and third year modules occurring in both programmes.

Recommendations

While Yr3 and especially Yr4 of the programme have not yet been fully evaluated, the Common Stage (Yr1 and Yr2) has been monitored in real-world conditions of higher education quite extensively. We are able to state our recommendations based on the lessons we have learned so far. They are as follows:

1. It is quite clear that both sources, British and Russian have made complementary contributions and the combined product is better than either of them. The British approach does not focus enough on *lateral thinking*, i.e. honing problem-solving skills early in the programme when the amount of knowledge and understanding at the learners' disposal is quite modest. However, in its communication strategy, the British pedagogy elevates introductory, motivational and practical aspects to a level that the Russian academic culture tends to eschew. The Russians are focused too much on the "proper" sequence, leaving nothing behind, proving and explaining everything to such

an extent that it, they believe, may nurture critical faculties of the student cohort. A Russian professor would consider most kinds of simplification in the basic concepts as their unacceptable vulgarisation, even when only details are omitted and the rigour is kept. When it comes to problem solving, the situation is quite opposite. The Russian approach at the Common Stage can be summarised as exercise-led learning. The logic of the corpus of knowledge, its fundamental drivers and inherent limitations are considered less important for junior undergrads than the hundreds (and sometimes thousands) of carefully composed exercises. It is correctly believed that conceptual problems of a learner have a certain cognitive underpinning; multitudes of solved problems instil the learner with confidence and intuition — and those are crucial factors in successfully superating cognitive barriers. What is not done right in the Russian system is the control of the learning curve. It is not sufficiently flat initially, it tends to ramp up too soon. Students' learning failures are mistakenly attributed to their lack of ability when in most cases they stem solely from insufficient motivation. Our recommendation would therefore be to learn from both cultures' mistakes and to carefully combine exercise-led learning with unhurried introduction and a light-touch approach to fundamental concepts.

2. Modularisation of education in the UK, where students are often treated as consumers who are invited to order from a menu of education experiences that suit their interest, has led to a much greater isolation of units of learning. Departments see module prerequisites as necessary evil and limit them to a minimum, while any part of the background the students may lack is expected to more or less be included in the modules that rely on it. Organisationally it is very convenient, as it opens up an avenue to ever expanding paraphernalia of degree-level products. Academic managers feel that this is how their departments acquire the necessary flexibility to withstand sudden changes of tack as they sail into uncharted waters in pursuit of labels and alignment. The British system works by combining and rebranding existing units of provision to make it possible to limit development of new modules to fit the available resources. As a result, programme designers simply package sets of modules into semesters not even trying to encourage cross-module conceptual consistency and commonality of purpose. Not so in our proposed programme, where module development was approached *ab initio* and where the annotated schedule is set in Cloud to facilitate a single-narrative style of delivery. We strongly recommend our approach; it ensures that as modules

mature, they also become more tightly integrated with each other. The benefit of self-containment is much overrated. Omitting unwanted parts and filling in background material is not too difficult when the concept is well developed and the module has passed the test of time. However, the benefit of cross-module references for students' motivation is hard to overestimate, just as it is hard to overestimate the cognitive benefits of their exposure to the same problems from two modules' standpoints at the same time.

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Chapter 9 - Locating Visual Arts Instruction in Malaysian Higher Education: COVID-19 Epoch

Lilian Lee Shiau Gee

Chapter Highlights

- The Pandemic of COVID-19 has altered the educational environment in Malaysia, with the change from face-to-face to online courses. Concerns have been expressed about the suitability of distance learning art activities and the emerging online learning climate for local art students.
- The aim of this study was to determine art students' acceptance of online learning during Malaysia's COVID-19 pandemic.
- This study included 195 art students from Universiti Malaysia Sabah.
- The results indicate that the majority of art students have a positive perception toward online education.
- The majority of students is eager and open to online art education.
- The study's findings are hoped to act as a benchmark or guideline for developing visual arts education in response to student needs and demographic factors during the COVID-19 pandemic.
- To maximize the benefits of online learning, stakeholders could work collaboratively to strengthen the approach of this learning structure in terms of content context, facilities, technological level, and platform advancement, with the goal of increasing student productivity and quality of learning.

Introduction

The design studio approach is the core and discipline of art teaching, which has been practiced for over 100 years around the world (Orr and Shreeve 2017). This has also led to design studios being accepted as the backbone of the curriculum (Corazzo, 2019; Toprak and Hacihasanoǵlu, 2019) in a number of university-level art and design education programs, including fine art, architecture, interior architecture, product design, design graphic design, digital media design and fashion. The uniqueness of the attribute of teaching through design studio in teaching activities is the emphasis on, project-based learning, learn-by-do and one-on-one teaching in the classroom.

However, the COVID-19 pandemic's impacts have raised significant concerns about the visual arts discipline's teaching and learning paradigm in the subsequent period. Crucially, the design studio's dominant point is the students' physical immersion requirements. With the physical studio's vital role in offering a richer account of visual arts education (Crowther, 2013; Marshalsey and Sclater, 2018), its significance and contribution to learning should not be dismissed lightly. Thus, the transition to a 'digital or virtual studio' will be able to better 'cover' it from further deterioration and instruct the adaptation to pandemic times in response to changing needs during the current period.

Online teaching is a new concept in Universiti Malaysia Sabah's Visual Arts Technology Program (HA 32). This approach was implemented in early 2020 in response to the COVID-19 pandemic. The use of online education, or e-learning, as a platform for art and design courses is a topic that needs to be discussed further. Apart from the inability to reinforce expectations and easily resolve misunderstandings, virtual communication becomes one of the most significant challenges. Subsequently, Abdul Hamid and Khalidi (2020), Van Weele (2020), and Ubell (2016) argue that online courses have a high potential to degrade the learning experience and minimize learning effectiveness. Directly, the researchers' discussion resulted in an initial review of the pandemic's effect on visual arts practice in Malaysia, especially in Sabah, in terms of pedagogy and education.

This study was conducted with the importance to reflect on the alternative measures implemented for online art learning in Sabah, Malaysia. By considering the specific demographics of university students, this study aims to: i) identify students' views and

attitudes towards the application of online learning to art and ii) evaluate the influence of student demographic factors on e-learning exploration in art. This study aims to provide insight into the difficulties relating to the application of online learning, which has been commonly regarded by universities, the education industry, lecturer groups, and students.

Challenges in Online Art Teachings and Learnings

While online learning is not a new novel, however, this abrupt transformation poses significant challenges for educational activities, particularly courses in art and design, which are often manifested by physical and practical interactions. As Fleischmann's (2019) study shows that not all design art courses are suitable to be taught as fully online courses. This is a challenge that needs to be faced by the application of online art learning in higher education in Malaysia. As Loughran (2020) mentions, the context of creativity is crucial in art learning, and creativity is another challenge relating to online art learning. Students' creativity can be constrained by communication and attention issues, which makes online art learning incredibly difficult.

Without the ability to interact physically as they would during normal academic performances, students, for example, are unable to express themselves more effectively. Moreover, lecturers struggled to track students both emotionally and physically. Students' socioeconomic status adds another layer of challenges to those who use online education (Choong, 2020a; Nur Hanani, 2020; Arumugam, 2020), especially our indigenous students (Wan, 2020). Thus, the Art students from low-income households are unable to use hardware and software for online learning. Besides that, they also share resources with other family members, and some also use smartphones to access educational opportunities, complete assignments, and take exams. Consequently, family issues prohibit students from enrolling in online courses.

Additionally, art students are located in resource-scarce environments such as rural areas, where a lack of internet connectivity presents significant challenges for university students attempting to incorporate digital learning processes, especially significant infrastructure gaps in Sabah and Sarawak (Jalli, 2020) to support online learning. This is another challenge for art students in Sabah when it comes to online learning. In general, online learning is often affected by students' attitudes and engagement in self-centered learning, which is a part of the

process of self-directed and digital teaching and learning. Additionally, the sudden transition presents difficulties for students, especially those with less familiarity with technical devices, a lack of distance learning training, and an insufficient information about how to use online learning applications.

Although, online learning appears to be one of the academic disciplines to some curricula in the 21st century, however, lecturer support is much needed (Juhary, 2020), as this discipline requires direct experience as part of art teaching activities. For instance, lecturers' proclivity for providing comprehensive digital feedback to students, lecturers' positive attitude toward teaching art online, and lecturers' motivation of students to use digital platforms in learning operations. Additionally, lecturer stimulation is important to the continuation of distance art instruction during the COVID-19 pandemic, such as adapting extensive physical work online through the use of digital reminders, online discussion components, instructional videos, and the posting of online lesson recordings.

Methodology

In this study, a questionnaire was used to obtain university students' perspectives on online learning (distance), specifically on the factors influencing the use and acceptance of e-learning in the context of art and design lessons during the Semester II 2019/2020 learning session. The instrument for this analysis is an online form (Google Forms) that was adapted from Turner (2008), Venkatesh et al. (2012), Tan (2013), and Yuan et al. (2014), and then adjusted for the purpose of this study. Throughout the research, this study group consisted of 195 students enrolled in the Visual Arts Technology program at the Faculty of Social Sciences and Humanities, Universiti Malaysia Sabah.

The questionnaire is divided into two sections:

- The first section contains information about the respondents' demographic characteristics, such as their gender and area of residence.
- The second section investigates respondents' views of online learning enabled by digital technology.

All of these items were evaluated on a five-point Likert scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree."

Results

Among the respondents, 57 were male and 138 were female. A large number of respondents (120) are in rural areas, while 75 respondents are living in urban areas. Table 1 shows the demographics of the respondents.

Table 1. Demographic Information

Label	Frequency	Percent
Gender		
Male	57	29.2 %
Female	138	70.8%
Area		
Urban	75	38.5%
Rural	120	61.5%

Cronbach's alpha test was conducted to measure the construct reliability of the item. Reliability test results (see Table 2), Cronbach's alpha for aspects A, B, C, D, E, F and G with all items is greater than 0.6, and this indicates that all items are reliable and acceptable.

Table 2. Realbility Test

Acspect	Cronbach's alpha	Status
Self-Efficacy	0.885	Reliable
Perceived Usefulness	0.939	Reliable
Perceived Ease of Use	0.920	Reliable
Facilitating Conditions	0.904	Reliable
Experience	0.923	Reliable
Online Learning Intention	0.919	Reliable
Lecturer supports	0.914	Reliable

Normal distribution testing (see Table 3) was performed based on George and Mallery (2010), this also showed the results of Skewness and kurtosis values in the range ± 2 obtained in this study were considered acceptable with normal distribution conditions.

Table 3. Normal Distribution Testing

Items	Skewness	Kurtosis
Self-Efficacy		
SE 1	0.319	-.587
SE 2	0.223	-.570
SE 3	0.035	-.170
Perceived Usefulness		
PU 1	0.351	-.424
PU 2	0.251	-.513
PU 3	0.273	-.395
Perceived Ease of Use		
PEU 1	0.436	0.035
PEU 2	0.403	-0.252
PEU 3	0.624	-0.099
Facilitating Conditions		
FC 1	0.504	-0.091
FC 2	0.486	0.175
FC 3	0.344	0.145
Experience		
EX 1	0.284	-0.310
EX 2	0.193	-0.097
EX 3	0.260	-0.028
Online Learning Intention		
OL 1	0.332	-0.309
OL 2	0.233	-0.057
OL 3	0.342	0.095
Lecturer supports		
LS 1	0.442	-0.994
LS 2	0.276	-0.951
LS 3	0.124	-0.855

Table 4 shows the mean score value of the items along with one sample t-test. The test value of 2.5 with average means for all items is 2.5 above.

Table 4. t-test Results in terms of Students Acceptance

Aspects	Items	Mean	Construct	Test Value	Sig (2-tailed)	Overall mean	Std. deviation
	SE 1	3.538					0.826
Self-	SE 2	3.523					0.833
Efficacy	SE 3	3.343					0.947
			SE	2.5	0.000**	3.468	0.784
	PU 1	3.087					
Perceived	PU 2	3.102					
Usefulness	PU 3	3.128					
			PU	2.5	0.000**	3.106	0.065
	PEU 1	2.974					
Perceived	PEU 2	3.154					
Ease of Use	PEU 3	3.051					
			PEU	2.5	0.000**	3.059	0.848
	FC 1	3.317					
Facilitating	FC 2	3.389					
Conditions	FC 3	3.323					
			FC	2.5	0.000**	3.343	0.786
	EX 1	3.036					
	EX 2	3.041					
Experience	EX 3	3.056					
			EX	2.5	0.000**	3.044	0.908
	OL 1	2.892					
Online	OL 2	2.964					
Learning	OL 3	3.097					
Intention			OL	2.5	0.000**	2.984	0.902
	LS 1	3.636					
Lecturer	LS 2	3.651					
supports	LS 3	3.728					
			LS	2.5	0.000**	3.672	0.810

Self-efficacy

In terms of self-efficacy, the overall mean score obtained is 3.468 with a p-value of 0.000, indicating that students have a positive experience with e-learning, and that online art learning is well-accepted by students at Universiti Malaysia Sabah. Essentially, art students have high levels of academic self-efficacy, which motivates them to do their best in art learning activities.

Perceived Usefulness

Usability is a key indicator for determining student acceptance of online education. Students agree that online learning is convenient to use (Overall Mean = 3.106) and significantly (p-value = 0.000), showing that e-learning improves art class productivity and enables students to enhance their performance in a variety of art course environments.

Perceived Ease of Use

Learners of art seem more in agreement with regards to the ease of use of platform applications and online learning. The majority of art students (Overall Mean = 3.059, p-value = 0.000) stated that it was not difficult to acquire new concepts and skills online. Thusly, this user-friendly online learning environment would encourage academics and students to be more flexible in their resource development, management, and acquisition, as well as to participate more actively in arts learning activities. They also indicate that operating an online platform is not a significant barrier to participation in online learning.

Facilitating Conditions

Reliable facilitation conditions are essential for sustaining the quality of online art education. A sizable proportion of art students (Overall Mean = 3.343, p-value = 0.000) asserted their agreement to receive effective technical assistance to ensure that online learning persists during the academic semester. Consequently, support systems from institutions, organisations, and the platform's technical 'assistance' all assist in reducing art students' ambiguity when confronted with technology.

Experience

Positive responses from students about their online learning experience (Overall Mean = 3.044, p-value = 0.000) showed that the majority of art students were able to engage in and gain valuable experience with online art learning activities and assessments. Correspondingly, the students' descriptions of enjoyment, relaxation, and satisfaction indicate that learning art online can be a pleasurable experience during pandemics. These results suggest that, although the transfer of art education to online learning was successful during pandemics, strategies for increasing student engagement and decreasing student exhaustion should be implemented to ensure the long-term effectiveness of online art education.

Online Learning Intention

Recently, students determined that online learning was the optimal method for teaching and learning on during pandemic (Overall Mean = 2.984, p-value = 0.000). As an outcome, a well-thought-out transition is a smart strategy for ensuring the long-term viability of online art education and learning. Furthermore, they plan to use the online learning system for future educational programs. These results suggest that, given sufficient time and space, art students will gradually adjust to online learning. Additionally, students suggested that various approaches (hybrid) could be applied to the study of the visual arts in the future. However, the ease of learning approaches equivalent to the content of art education must be considered, particularly fine art, digital art, design art, architecture, and multimedia. The optimal benefits obtained by students during their art learning experience are examined, and ultimately, the suitability and efficacy of the pedagogical approach on their own learning is determined.

Lecturer Supports

The majority (Overall Mean = 3.672, p-value = 0.000) of lecturers openly support online instruction. Students benefit from art lecturers when they search for and process information online. Art educators have offered extensive guidance to assist students in successfully using the online learning platform. Attitudes and leadership of lecturers also contribute to students' readiness for online learning. In general, art lecturers acquire the skills and mentoring necessary to facilitate successful online learning and to improve students' online experience and satisfaction.

Overall Arts Online Learning Acceptance between Areas

Based on Table 5 and Figure 1, ANOVA test results show that there are non-significant different between the areas and perceived usefulness (F= (1,193) = 0.027, p = 0.598); perceived ease of use (F= (1,193) = 0.069, p = 0.794); facilitating conditions (F= (1,193) = 0.085, p = 0.771); experience (F= (1,193) = 0.012, p = 0.914); online learning intention (F= (1,193) = 0.061, p = 0.806) and lecturer supports (F= (1,193) = 0.086, p = 0.770). This indicates that there were no differences in between of rural students and urban students in the level of majority aspects of overall Learning Art Online Acceptance (LAOA).

Table 5. t-test showing Differences between Student Acceptance and Areas

Aspects	**Area**	***SS***	***df***	***MS***	***F* ratio**	***P* value**
Self-Efficacy	Between Groups	3.971	1	3.971	6.638	**0.011***
	Within Groups	115.473	193	0.598		
	Total	119.444	194			
Perceived Usefulness	Between Groups	0.233	1	0.233	0.027	0.598
	Within Groups	161.799	193	0.838		
	Total	162.032	194			
Perceived Ease of Use	Between Groups	0.050	1	0.050	0.069	0.794
	Within Groups	139.586	193	0.723		
	Total	139.635	194			
Facilitating Conditions	Between Groups	0.053	1	0.053	0.085	0.771
	Within Groups	119.926	193	0.621		
	Total	119.979	194			
Experience	Between	0.010	1	0.010	0.012	0.914

Aspects	Area	*SS*	*df*	*MS*	*F* ratio	*P* value
	Groups					
	Within Groups	160.272	193	0.830		
	Total	160.281	194			
Online Learning Intention	Between Groups	0.050	1	0.050	0.061	0.806
	Within Groups	157.793	193	0.818		
	Total	157.843	194			
Lecturer supports	Between Groups	0.057	1	0.057	0.086	0.770
	Within Groups	127.383	193	0.660		
	Total	127.439	194			

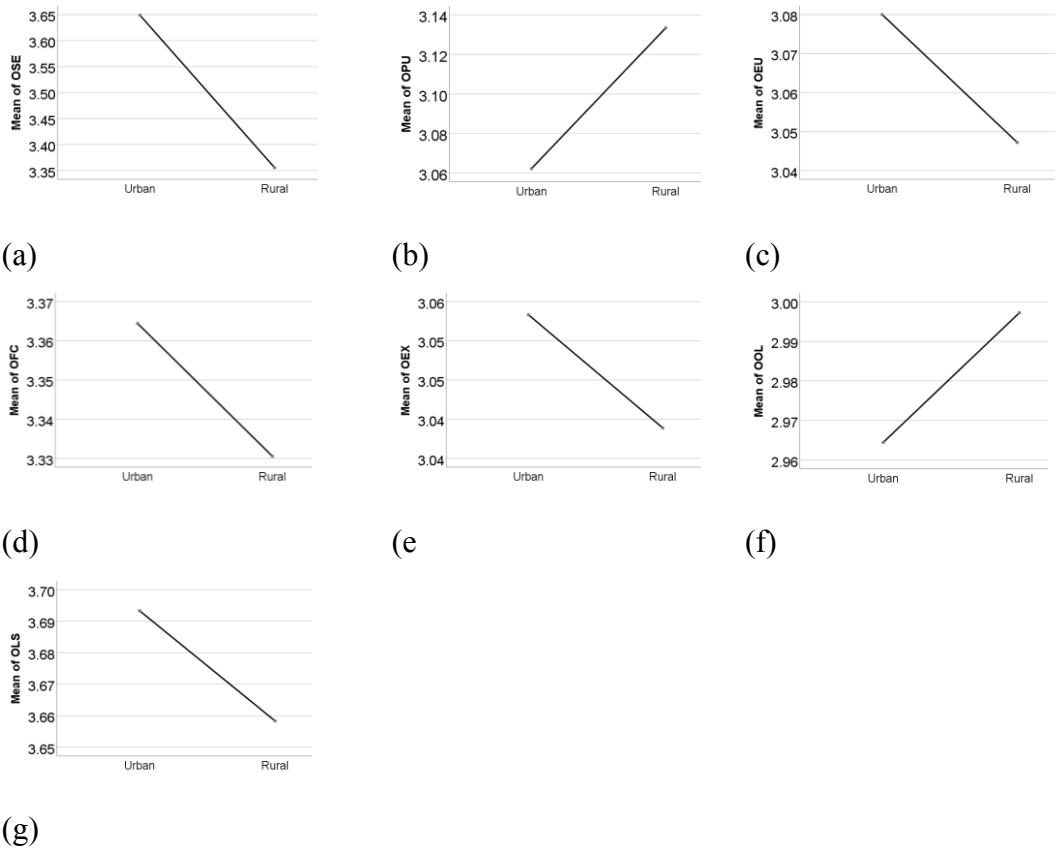

Figure 1. Mean Score Diffrences between Student Acceptance and Areas

However, there was a significant effect of areas on student's self- efficacy in online learning, (F = 1, 193) = 6.638, p = 0.011). Analysis result showed that urban area (M = 3.649) students having more high degree of confidence compared to rural area (M = 3.356, Fig. 2a) students. Significant differences in self-efficacy between urban and rural students indicate that environmental factors have an impact on student acceptance of online art education. According to Mahyuddin et al. (2006) and Choong (2020b), home environment plays a significant role in stimulating interest, which contributes to students' growth of self-efficacy. Rural students' feedback outcomes, self-efficacy, and progress with self-directed learning, as well as online visual arts learning outcomes, are all related. This significant factor is often linked to rural students' ICT knowledge and skills. According to Abu Samah et al. (2009), rural communities lack ICT knowledge and skills, especially in the use of computers, as a result of a lack of information about the benefits of ICT and a lack of accessible internet services. This corroborates and supports Thinakaran et al. (2018)'s finding that students from rural areas have computer self-efficacy levels between 40% and 49%, which are inadequate to instill confidence and competence in ICT literacy among rural students. Finally, in view of the mentioned environment, rural students need proficiency mastery of their higher self in order to improve their skills.

Overall Arts Online Learning Acceptance between Genders

From the Table 6 dan Figure 2, there are non-significant differences between the male and female students in several aspects of learning art online acceptance. The aspects include perceived usefulness (F= (1,193) = 0.753, p = 0.387); perceived ease of use (F= (1,193) = 0.571, p = 0.451), experience (F= (1,193) = 2.560, p = 0.111); online learning intention (F= (1,193) =0.006, p = 0.937) and lecturer supports (F= (1,193) =3.297, p = 0.071). In contrast, in terms of self- efficacy, there was a significant effect of gender on online art learning (F= (1,193) =4.116, p = 0.044). The comparisons showed that females have higher self-efficacy (M = 3.541) in the computer skills compared to male students (M = 3.292). As a consequence, analysis shows that there are significant differences between the male and female students' perceptions in terms of facilitating conditions (F= (1,193) =0.006, p = 0.937). In this study, it was found that females (M = 3.415) have higher proficiency and self-regulated learning for seeking help from others in completed their tasks compared to male students (M = 3.169).

Table 6. t-test showing Differences between Student Acceptance and Genders

Aspects	**Gender**	***SS***	***df***	***MS***	***F* ratio**	***P* value**
Self-Efficacy	Between Groups	2.494	1	2.494	4.116	**0.044***
	Within Groups	116.950	193	0.606		
	Total	119.444	194			
Perceived Usefulness	Between Groups	0.630	1	0.630	0.753	0.387
	Within Groups	161.402	193	0.836		
	Total	162.032	194			
Perceived Ease of Use	Between Groups	0.412	1	0.412	0.571	0.451
	Within Groups	139.223	193	0.721		
	Total	139.635	194			
Facilitating Conditions	Between Groups	2.439	1	2.439	4.004	**0.047***
	Within Groups	117.541	193	0.609		
	Total	119.979	194			
Experience	Between Groups	2.098	1	2.098	2.560	0.111
	Within Groups	158.183	193	0.820		
	Total	160.281	194			
Online Learning Intention	Between Groups	.005	1	0.005	0.006	0.937
	Within Groups	157.838	193	0.818		
	Total	157.843	194			

Aspects	Gender	*SS*	*df*	*MS*	*F* ratio	*P* value
Lecturer supports	Between Groups	2.141	1	2.141	3.297	0.071
	Within Groups	125.299	193	0.649		
	Total	127.439	194			

Gender differences in self-efficacy among undergraduate students have been recorded clearly. These statistically significant differences indicate that women have a higher degree of academic self-efficacy than men do online. Additionally, the results suggest that female students are more capable and receptive to online art education than male students. In the Malaysian context, female students show higher self-efficacy than male students (Chokkalingam et al., 2016; Ibrahim and Tan, 2020). This may be because women are born with a greater capacity for self-motivation, which fosters an intellectual level of self-esteem (Chokkalingam et al., 2016).

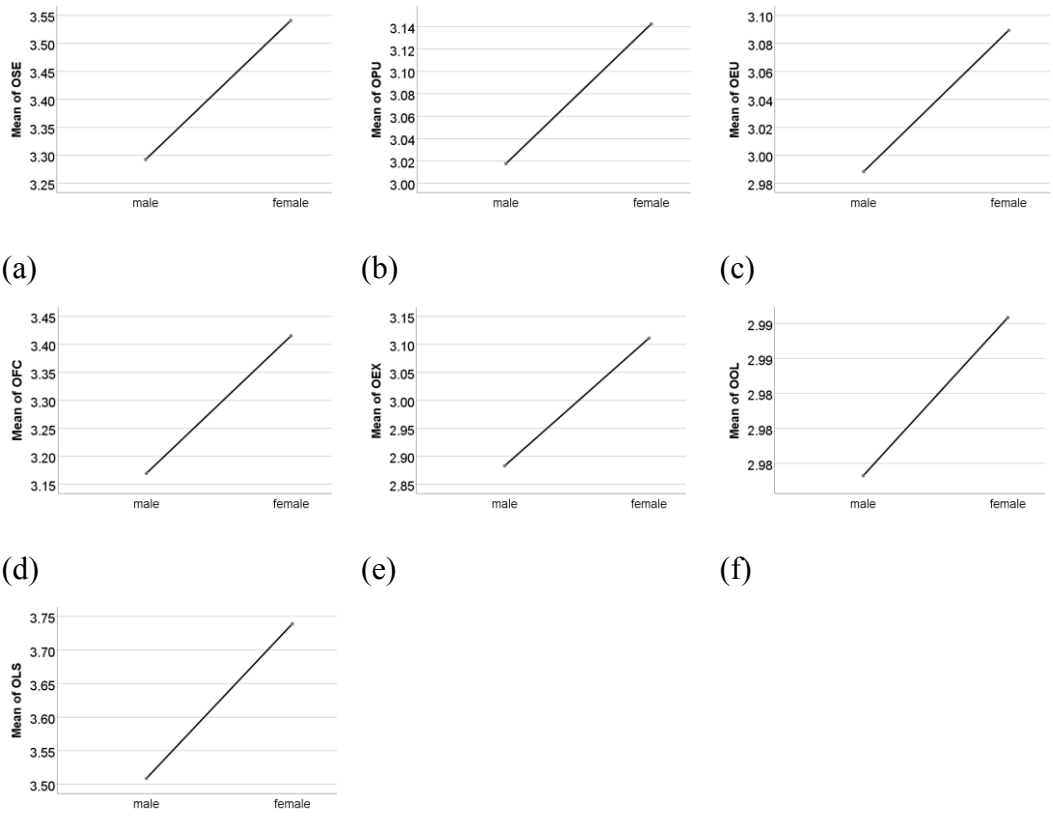

Figure 2. Mean Score Diffrences between Student Acceptance and Genders

This positive relationship supports the notion that students who have a strong sense of self-efficacy will have significant strengths and abilities to study online for art and design, which will lead towards excellent performance in art academics. This also shows that the movement from conventional to virtual learning has little effects on those who are persistent, assertive, and hopeful about their ability to sustain a high level of visual arts achievement. Beside that, parents, academics, the education sector, and institutions must continue to implement further initiatives and strategies to foster attitudes that aid in the development of self-efficacy in local students.

The discussion is then extended to examine the effect of gender on students' perceptions of the facilitation situation. Gender effects had a differential impact on students' behavioral intentions about technology use, with female students becoming more receptive to the use of virtual communication. Differences in students' perceptions of institutional support and resources may be explained by the perception that female students (Venkatesh et al., 2005; Dang et al., 2016; Ambarwati et al., 2020) are more dependent on external support factors (availability of support services and resource facilities. situation) when it comes to online learning and the use of emerging technologies. However, when it comes to using technological advances, males are more reliant on their own efforts (Hennig-Thurau et al., 2002; Chan et al., 2010). This also implies that having enough opportunities will increase female students' willingness to participate in virtual visual arts classrooms.

In this sense, women's natural characteristics often contribute significantly to gender differences, with women being more likely to have high levels of sociality (Burger et al. 2010), which include active participation in academic societies, high levels of involvement in campus life, and high levels of support for each other. As a result, female students are more likely to follow and use online art education because they are adapted to receiving assistance from their environment, peers, lecturers, and facilities in overcoming distance learning challenges and difficulties.

Conclusion, Recommendations, and Future Works

While there are a number of difficulties for institutions, educators, and stakeholders in relation to online education as a result of the COVID-19 pandemic, with strategies in place and e-learning initiatives introduced abruptly. In main, online learning and its variants were a

solution to art education courses during the COVID-19 outbreak at Universiti Malaysia Sabah in Malaysia. This has ensured continuity of education for Sabah's diverse population of visual arts students. The findings indicate that visual arts students are adaptable to distance education. Although the majority of students are satisfied with the university's course management, instructors, educational technology, and facilities, however, some improvements should be made to maximize online teaching and learning for arts education.

Online education must be enhanced, with a particular emphasis on ICT resources for assessment and immediate feedback in fine arts and digital arts practical training. Additionally, educators' roles in this scenario are to be constructive in overcoming the limitations of virtual instruction, promoting successful use of ICT, and fostering a willingness to experiment with new e-platforms in education. After all, educational institutions need a variety of support mechanisms, including the development and enhancement of online learning platforms, the expansion of internet access, and the provision of information services through database systems (online library resources). Students and academic staff should be able to advance their understanding and awareness of multiple aspects of educational technology and online learning operations through e-learning training and orientation programs, which should include lessons on online teaching and learning techniques and related platforms.

Further exploration and investigation of successful pedagogy for online teaching and learning in the visual arts requires an examination of the current program's curriculum structure, project assessment processes, and activity delivery quality. Meanwhile, additional issues related to online learning, such as lecturer perceptions, online mode, collaboration, accessibility, the online environment, and the quality of the graphical interface, must be discussed further to ensure the continued success of current online learning and teaching. On the basis of this additional knowledge, conducting online learning may be advantageous when considering technical problems, virtual environment preparation, engagement, as well as lecturers' and students' attitudes and motivations. This will contribute to the eventual strengthening and advancement of the distance education system, as well as to the enhancement of distance learning's creativity, innovation, and usability in the theoretical and practical fields of visual arts and design.

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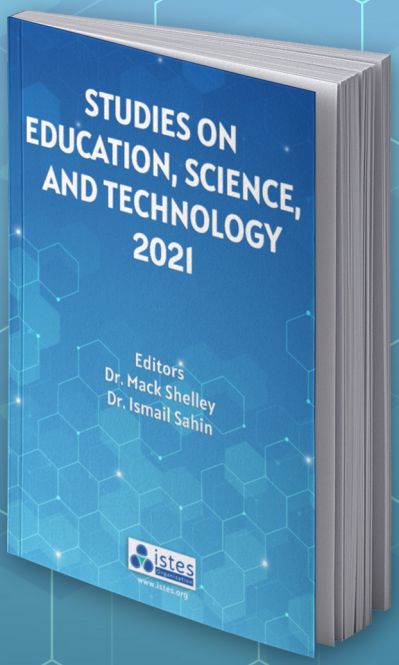
Education, science, and technology disciplines at all levels have never been more important, more exciting, or more crucial for its broader impacts on human society. The need for advanced technical skills is increasingly pressing to address climate change, combat COVID and other diseases, enhance the infrastructural built environment, grow food sources to feed an expanding planetary population, make new scientific discoveries, and interface synergistically with the arts, humanities, and social sciences. Teachers/instructors/mentors/professors need to be proficient in the best ways to convey knowledge and motivate the next generations of productive and engaged citizens of an increasingly diverse planet on which its human inhabitants must learn to confront and surmount increasingly difficult challenges to survival and prosperity. Students need to be focused on honing their learning skills and adapting to an ever-evolving global economy demanding always higher levels of technical proficiency. Students also need to be free to pursue any and all areas of interest without interference from cultural, political, ideological, or faith-imposed limitations. Policymakers need to provide the financial and human resources to fuel the engine of education, and they must create the maximum possible latitude for both those who teach and those who learn to pursue science, technology, engineering, and mathematics to their limits. This book contributes to addressing these needs and to suggesting potential solutions from multiple global perspectives. Adaptability of instructional methods, relevance of instructional content to students' lived experiences, and sensitivity to the mental and physical demands imposed on students must be hallmarks of education. The book is divided into three sections related to studies on education, science, and technology. Each section includes three chapters. The chapter's contributors are from the following countries: the United States, Germany, Greece, Indonesia, the United Kingdom, Russia, and Malaysia. This diversity brings an international perspective to the book.



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