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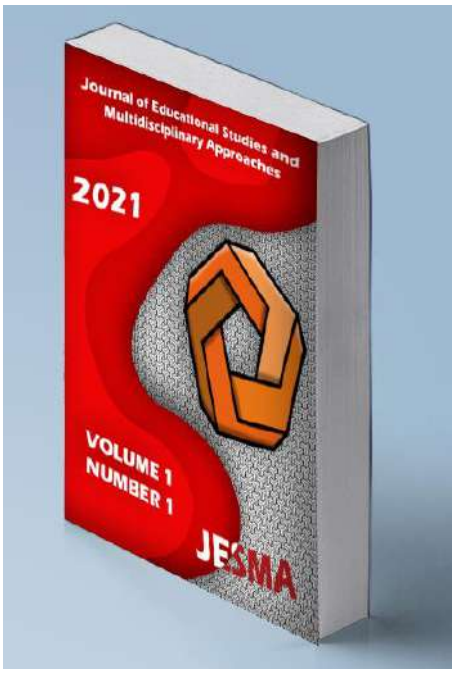
Table of Contents



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Concepts and Issues in Public Health: Culture, Psychology, and the Ecological Approach

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Concepts and Issues in Public Health: Culture, Psychology, and the Ecological Approach

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ABSTRACT

An ecological approach focuses on both population-level and individual-level determinants of health and interventions. It considers issues that are community-based and not just individually focused. It highlights people's interactions with their physical and sociocultural environments. This article discusses the purposes, shortcomings, and extensions of the ecological approach to public health to be more inclusive of interpersonal characteristics, education, and ultimately upstream solutions to correcting health inequities among disenfranchised communities. Briefs are discussed regarding the concepts of health psychology, victim blaming, geography, culture, and cooperate responsibility - and the impact of those concepts on the adoption and adherence of pro-active health campaigns.

Keywords: Health education, public policy, upstream approaches, root causes, health inequity

Introduction:

Successful interventions aimed at modifying individual behaviors include taxing tobacco, clean air laws, more mass media campaigns – all of which were built on one another to reverse the epidemic. I advocate that this approach needs to be instituted for physical activity and healthy food options, and in many ways, it has – no junk food in school vending machines; school lunch reform; a proposed soda tax; limiting marketing of unhealthy foods on children TV networks, and other mass media campaigns aimed at increasing physical activity. Some of these are great approaches but they still "restrict freedom" in the views of some. While removing deep fryers and soda from vending machines in Philadelphia and has seen some success in reducing the occurrence of childhood obesity, there are some that oppose the action. It is in this way that the culture of health conflicts with the culture of freedom.

Highlighting health as a cultural norm in the United States is essential and comprises the attitudes and expectations for health, a sense of community, and civic engagement (Mockenhaupt & Woodrum, 2015). Developing a culture of health includes enabling a broader understanding of how one person's health affects the health of a family, a neighbor, a coworker, or the overall community. A society with a culture of health not only believes that every person, no matter who they are, has the chance to lead a healthy life. However, I contend that the cultural norm for Americans is possessing personal freedom more often than it is community health. What is normal is freedom; not restriction. Many Americans believe opting 'healthy' is to deny what they really desire.

Distributions of money, power, and resources shape social determinants of health, the focus of most related work is on the conditions in which people are born, grow, live, work, and age, and only more recently on the processes that determine these conditions (Golden et al., 2015). Recognizing the interplay among individuals, groups, and their proximal and distal social environment is paramount for affecting the culture of health. Unfortunately, in their allegiance to the status quo, powerful elites often resist upstream policies and programs that redistribute wealth and power (Freudenberg et al., 2015). An honest culture of health requires that our nation improve the built environment and physical conditions, social and economic environments, and policy, governance, and investments that prioritize health and support access to opportunities for healthy living and high-quality health care for everyone (Mockenhaupt & Woodrum, 2015) *above* their personal capitalist enterprises. To that end, I take some issue with the perspectives of Freudenberg and colleagues (2015) in their lack of incooperating other socio-political theoretical models into their views. The authors claim to focus on underlying social problems rather than individual "downstream" issues, but in actuality, what these authors appear have an issue with is Capitalism. A Foucauldian perspective on these issues of health and access would illuminate the dangers of Capitalism's intersection with health and society, thus adding explanation to how these issues "are" and "become". Unequal distribution of wealth and power across race, class, and gender produces the differences in living conditions that are "upstream" drivers of health inequalities, but I challenge that merely raising the minimum wage and preventing mortgage foreclosures will have a lasting impact on positive health practices without observing how these Capitalistic enterprises are constructed to limit the acquisition of power for the people, thus impact behaviors and health practices.

The purpose of this article is to emphasize the importance of identifying the multiple congruent goals of health professionals, and how those goals focus one toward their role in the profession. An additional purpose is to echo the call to discover, translate, and apply evidence-based research in the practice of our transformative approach to health as a way to build bridges between our practice and the community. Furthermore, the elements and issues discussed in this article have an opportunity to play a role in shaping a culture of health for which health professionals must advocate.

The Ecological Model

An ecological approach towards understanding and correcting public health concerns focuses on both population-level and individual-level determinants of health and interventions. It considers issues that are community-based and not just individually focused (National Association of Student Personnel Administrators [NASPA], 2004, p. 3). The ecological perspective of addressing major concerns in public heath as the interaction between, and interdependence of, factors within and across all levels of a health problem. It highlights people's interactions with their physical and sociocultural environments. Because significant and dynamic interrelationships exist among these different levels of health determinants, interventions are most likely to be effective when they address determinants at all levels. Historically, the health field has focused on individual-level health determinants and interventions (U.S. Department of Health and Human Services, 2008, para. 18), which may be highly flawed.

In the ecological model health status and behavior are the outcomes of interest (McLeroy, Bibeau, Steckler & Glanz, 1988, p. 355) and viewed as being determined by the following: *Public policy* [local, state, national, and global laws and policies]; *Community* [relationships among organizations, institutions, and informational networks within defined boundaries]; *Institutional factors* [social institutions with organizational characteristics and formal (and informal) rules and regulations for operations]; *Interpersonal processes and primary groups* [formal and informal social networks and social support systems, including family, work group, and friendship networks]; and *Intrapersonal factors* [characteristics of the individual such as knowledge, attitudes, behavior, self-concept, skills, and developmental history] (McLeroy, e al., 1988). *Intrapersonal factors* include gender, religious identity, racial/ethnic identity, sexual orientation, economic status, financial resources, values, goals, expectations, age, genetics, resiliency, coping skills, time management skills, health literacy and accessing health care skills, stigma of accessing counseling services (McLeroy, e al., 1988).

Public policy, as a public health concept, is an interesting one. Public policies include those that allocate resources to establish and maintain a coalition that serves a mediating structure connecting individuals and the larger social environment to create a healthy community. Other policies include those that restrict behavior such as tobacco use in public spaces and alcohol sales and consumption and those that provide behavioral incentives, both positive and negative, such as increased taxes on cigarettes and alcohol. Many other additional policies relate to violence, social injustice, green policies, foreign affairs, the economy, global warming (McLeroy, e al., 1988). Traditional approaches to public health and the health initiative may have been flawed. A great focus has been on manipulating public policy towards healthy behavior and as punitive deterrents to undesirable health behavior, but to only a limited amount of success.

A modern body of research in public health has been successful in demonstrating why the novel *ecological* approach to health and wellness is necessary to encourage wellness and foster permanent lifestyle and behavioral modification towards desirable health behaviors and the limit of undesirable, risk-taking behavior. Furthermore, the ecological approach is important in order to develop an understanding of *root causes* of inequities and discriminations [as highlighted by characteristics within the *Intrapersonal factors* paradigm], which lead to unhealthy behaviors or conditions in which individuals struggle to prosper. A traditional definition of the ecological perspective in public health implies reciprocal causation between the individual and the environment from micro- to macro-levels (McLeroy, Bineau, Stechkler, & Glanz, 1988); for example, the *host-agent-environment* model of ecology in public health. Whereas the ecological model, as described by Minkler (1999), is composed of intra- and inter-personal factors, community and organizational factors, public policies which are *interdependent* levels of analysis to be considered. This conception is much more appropriate for a modern and holistic public health perspective. Individual's developmental histories and their social support systems; the organizational structures and process that can positively or negatively affect health behavior; community networks and power structures; and both the content of our public policies and the role of participation, advocacy, and other process in their formation all are key components of a broad ecological perspective in health.

Root Causes: Upstream and Downstream Approaches

Public health advocates have often argued that public health scholars should address the 'causes of the causes' while also addressing the 'root of the causes'. Literature exploring racial injustice from a public health perspective (i.e. *The Story Behind Ferguson* [Rothstein, 2015] and *Health Equity with Housing Inequalities* [Woods, Shaw-Ridley & Woods, 2014]) echo this argument. Using the socio-cultural conditions of the St. Louis suburb as a case study, should we health professionals search upstream for solely the root of the causes, ignoring all subsequent causes, failing to address downstream needs brought on by the Root cause, we would not find a tangible object upon which to institute change – rather, we would face an ideology [racism] as the target for change. Ferguson came to be deeply segregated (predominantly black), deeply impoverished, and undereducated by way of racist policies of the federal, state, and local governments. The end result was "de facto" segregation. The belief that segregation is the result of accident, income difference, private discrimination, or the unintended result of race-neutral policy – is mythical. Rather it is deliberate segregation, brought on by policy (Rothstein, 2015; Woods et al., 2014). Sadly, there is nothing unique about racial history in Ferguson – many municipalities in the US operate(d) in the same manner. But if public health officials and professionals aimed solely at defeating the ideal of racism (upstream approach) in effort to improve the health and wellbeing of communities under the effect of institutionalized racism, they would be missing important opportunities to improve present-day conditions for the effected populations along the way (using downstream approaches). Years and decades will pass before measurable improvements to racially divided communities could be felt, yet the citizens living under such present-day conditions could still feel the benefit of micro-level improvements (e.g. installing playgrounds in a segregated community to encourage physical activity; passing legislation to ban the sale of liquor and firearms in living communities; institute re-training programs for police forces, et cetera). I recognize that simply building parks, sidewalks, and cosmetic changes to low socio-economic and minority neighborhoods are superficial improvements, fails to illuminate the macro-problems. It is, in fact, why health professionals must continue to swim upstream, discover and address root causes (Braveman & Gottlieb, 2014), so we may attack the problem [ideological racism and the tangible consequences] from both sides.

The relationships between social factors and health are easily identified, but not simply explained. Half of all deaths in the United States can be attributed to behavior. Naturally, health behaviors are shape by social factors – income, education, employment (Braveman & Gottlieb, 2014). It is accepted that potentially avoidable factors associated with lower educational status account for half of United States adult deaths per year. This indicates a connection between social factors and health. Some connections to social factors and health are more direct (e.g. lead ingestion in substandard housing, pollutants in less affluent neighborhoods, et cetera). Additional socio-economic connections include exposure to violence in low socio-economic neighborhoods increase the likelihood that youth will perpetuate violence, exposure to alcoholism in youth increases likelihood of misuse of alcohol in adulthood (Woods et al., 2014). Some connections are less direct (e.g. poor neighborhoods have fewer recreational facilities potentially attributing to the adoption of a sedentary lifestyle of neighborhood youth; chronic childhood stress leading to drug use, and the domino effect thereafter).

Findings: Education as a Mid-Stream Solution

There are noteworthy challenges to studying upstream socio-economic and other factors' effect on health. For instance, these conditions cannot be observed through traditional experimentation. Additionally, there is a long lag time for any health benefits to be expressed (Braveman & Gottlieb, 2014). Because of these reasons, identifying long-term successful interventions to causes and root causes has been challenging. I believe one *mid-stream* intervention for promoting and achieving goals in public health is to address the disparity in education among disenfranchised populations. Education is a strong predictor of health, so reducing K-12 school dropouts should be a priority for health professionals – most notably in minority groups who tend to be less healthy and experience a higher dropout rate. Freudenberg and Ruglis (2007) identified several health-related reasons for drop outs: pregnancy, psychological, emotional, and behavioral problems, and mental illness. A more developed

education leads to higher paying jobs. More income translates to house in safer neighborhoods, healthier food, better medical care and access to better health insurance, among many other health-related benefits. Achieving a more developed, further reaching education could save more lives than advances in medicine (Freudenberg & Ruglis, 2007). Many interventions aimed at addressing health-related dropouts have been limitedly successful. I echo sentiments advocating for increased focus on reducing dropout rates – the expectation being a measurably positive effect on community-wide, public health and wellness.

The Role of Psychology in Health Promotion

McLeroy and colleagues (1988) suggest it is "regrettable" that dominant contributions to the literature on intervention in health have been from psychology. Is it "regrettable" because these behavioral change theories (rooted in psychology) regarding health would be merely at the individual level rather than the population level? I agree that the concentration of behavioral science application would be better serving if renewed focus was on its application in the organizational, institutional, environmental, and economic domains – this would promote macro-level improvements to behaviors and conditions. But in order to initiate motivation for individuals to act towards or against ideals greater than themselves, they should also recognize the effects of behavioral change on the micro-level, which I believe can be demonstrated through psychological behavior change theories.

***Victim Blaming*.** Ignoring root causes and the impact societal factors have in an individual's health is a prerequisite for victim blaming. Psychological behavior theories are misapplied when put to public health (McLeroy et al., 1988). When applying psychological theories to specific health behaviors, the result is an incorporation of multiple process and influences. This is problematic from a public health perspective because the focus is on how to change individuals rather than alter the social environment (Braveman & Gottlieb, 2014). Even when the aim is prevention of undesired behavior rather than treatment, what is missing is recognizing the importance of the source of influence and social groups to which individuals belong. Social networks affect the access and acceptability to information and behaviors; for example, professional and organizational membership. Organizational/professional context provides an inventory for financial and social benefits, provide context for sedentary lifestyle, or hazardous tasks. It may also provide opportunity for physical activity and positive social relationships, as well. One of the purposes of health promotion in the workplace is to change "cooperate culture". This is observable in many locations such as *Google* and other industry firms that extend lunch breaks to allow for exercise/offer gym memberships as benefits. I recommend these befits in the pursuit of improved health be extended to include more industries.

Already identified by Rothstein (2015) and Woods and colleagues (2014), community factors are supremely important in shaping the social relationship between an individual and health. In addition to a physical aggregate of individuals in a geographical location, *community* may refer to the psychological sense of community, political entity, functional spatial unit, or unit of patterned social interaction. The socially constructed power structures within community are what drive the political action of the community; the disadvantaged tend to have softest voice and can affect the least amount of change. The end result of ignoring such social phenomena is a tendency to blame the victim for their health status, rather than to explain the root of their behavior.

Geography, Community, and Food

The geographical location of a community is very important for eating habits. Geographic location *used* to dictate the readiness of certain foods and resources. For example, before the advent of refrigerated trucks and mass-transit of food resources, Americans used to be privileged to only foods which were geographically available (corn and wheat in the Mid-west; beans, squash, and sweet potatoes in the East). Now it is not uncommon to see (in any grocery store) bananas and other tropical fruits for sale in the month of January. How can this be? Bananas are not native to any American region in the dead of

winter. Picture the geographical location growing bananas in January and consider the cost [fuel and transportation cost, the economic cost, and the carbon-footprint Burdon] to bring it across the Globe to a southern United States grocery store. This act is an environmental burden in numerous ways. This is a relatively new phenomenon. Over thousands of years humans have evolved to be able to obtain the most amounts of nutrients from their native growing regions – in harmony with the regions' seasons. Certainly, culture can influence the selection of foods community-by-community, but no more than what the region will provide in the first place. Picture traditional *Italian* food, *Japanese* food, *Mexican* food; each of these types of food are products of what their soil and climate are capable of providing. Now picture "American" food. Is traditional American food fast-food? I suggest this may be the case, because our culture of instant gratification, paired with a lack of long-term geographical and cultural history with the continent, has removed our need or ability to develop a culture of food unique to America. Instead of developing the evolutionary trait of absorbing the nutrients provided by our specific growing regions in the United States, we "cherry pick" desired foods from any place on the map whenever we would like them – often times from outside our region, out of season, and typically of the fast-food variety. What are the hidden costs – to our physical environment, to our finances, to our health?

This is no accident; we have been trained to behave this way concerning our food decisions. The food industry is designed, not to nourish people, but for profit (Stucker & Nestle, 2012). At the very same time billions are hungry and malnourished, billions are overweight - let that sink in. This is because *Big Food* seeks first to serve itself before serving the people. A shift from traditional diets to Western diets (processed foods, novelty foods and, fast-food) is a key agent in the prevalence of obesity and non-communicable diseases. Insufficient nutrients and excess calories from cheap, non-nutrition foods lead to obesity (Dorfman et al., 2012). There is a peculiar relationship between junk food, soda consumption and the use of tobacco and alcohol world-wide. Soft drinks and tobacco are among the most profitable industries in the world. Where there is high consumption of alcohol and tobacco there is also a high consumption of soft drinks and unhealthy food commodities, but these correlations do not predict economic development. Obviously, like the over consumption of processed food, alcohol and tobacco are also leading contributors for chronic diseases. Public health professionals have been very successful in reducing the exposure to alcohol and tobacco. Stuckler and Nestle (2012) cite an example of how Brazilian policy was able to reduce the use of tobacco. Using this example as a case study, one could claim that domestic policy might be *critical* for exposure to junk foods. Additionally, free-trade agreements could be adjusted to increase the price of international commodities, thus reducing their likelihood of being purchased. Some public health scholars have advocated for taxing unhealthy consumer items [fast food, soda, et cetera] for years – although other research suggest the barrier of increased cost does not detour behavior, rather it acts as a defacto 'sin' tax on users. Nevertheless, the spirit of any policy aimed at detouring unhealthy behaviors would provide a secondary benefit of environmental health consideration. To further reduce the exposure and selection of poor food choices, striking a partnership with physical activity promotion, cooperate responsibility, and legislative policy towards accessibility would likely go a long way. Lastly, although they are less profitable, the food industry must market healthier food.

Corporate Social Responsibility: "It's Marketing, not Philanthropy…"

I was pleased to read the soft-drink industry took one on the nose after a thinly-vailed attempt to increase sales disguised as a corporate social responsibility campaign caused public health official to roll their eyes. Before the soda companies attempted a similar strategy, the tobacco industry used corporate social responsibility as a means to focus responsibility on consumers rather than on the corporation, bolster the companies' and their products' popularity, and to prevent regulation (Dorfman, Cheyne, Friedman, Wadud, & Gottlieb, 2012). Big Tobacco's message, "tobacco is wacko if you're a teen" was perceived to be employing reverse psychology to actually encourage teen smoking. Eventually the youth smoking prevention programs were dropped. In response to health concerns about their products, soda companies have also launched corporate social responsibility initiatives. Unlike tobacco corporate social responsibility campaigns, soda company corporate social responsibility campaigns explicitly aim to

increase sales, including among young people. Public health officials must continue to pressure policy makers to make the consumption of unhealthy beverage options less exposed and less available for young people and consumers. Warning labels and additional taxes on tobacco and alcohol products has been met with some success. Similar measures for soft drinks and novelty foods may have similar results.

Conclusion

Individual behaviors are still the highest cause of morbidity (Minkler, 1999). Naturally, in the modern United States we take a uniquely American approach to the concept of individuals being responsible for their health. We believe in the American dream; that we all are capable and able to be successful, so this notion is extrapolated to health practices - which is very problematic. Freedom is very valuable to Americans: the freedom (and right) to act and do what we would like. It is downright *American* to exercise our right to drink and smoke, to go to strip clubs, and to gamble. However, from observing "American freedom" through a public health lens, we see our model of freedom has limitations: (a) it comes with the responsibility to make wise health choices; (b) it blames the victim; (c) it holds the less affluent and disenfranchised equally responsible for their health as the affluent and privileged population. I hold the view that the "American Culture of Health" is directly opposed by American culture.

In conclusion, neglecting the extent to which public health is affected by socially constructed dynamics is problematic in the following ways: (a) any benefits of downstream innovations felt will not be far reaching; (b) the socially deviant and socially disenfranchised (drug users, elderly, delinquent adolescents, the isolated) will not be adequately addressed; (c) any behavior change benefits will not be permanent, and; (d) any benefits felt will not last for individuals in fluid social and/or economic conditions. Public health professionals and health and wellness advocates may find success by seeking to find and solve the socially-constructed root problems, while also engaging in downstream interventions. The goal for health professionals should be to put ourselves out of business – this undoubtably will not come to fruition, because public health officials are in an uphill battle with the public.

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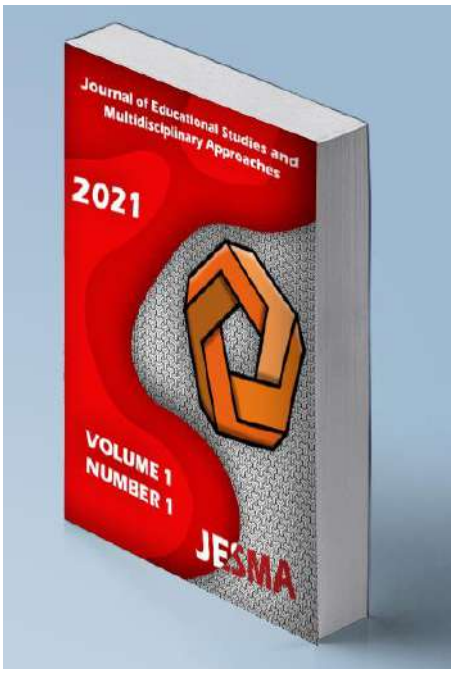

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Contactless Higher Education: A SWOT Analysis of Emergency Remote Teaching and Learning during COVID-19

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Contactless Higher Education: A SWOT Analysis of Emergency Remote Teaching and Learning during COVID-19

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ABSTRACT

The COVID-19 pandemic forced many higher education institutions to suddenly pause in-person teaching and learning in favor of Emergency Remote Teaching and Learning (ERTL). Strict social distancing measures required institutions to offer courses, programs, and services without any direct contact between students, faculty, and staff; higher education created a *contactless* teaching and learning environment. This exploratory study analyses various applications of ERTL through a systematic literature review using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. The results from the review of the literature are presented through a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis for students, faculty, and the institutions.

Keywords: Contactless, higher education, SWOT analysis, emergency remote teaching and learning

Introduction

The immediate impact of the COVID-19 pandemic on higher education was drastic, but the question remains whether the many changes will persist into the future. In particular, will the sudden shift in 2020 to Emergency Remote Teaching and Learning (ERTL) transform higher education? Clearly, COVID-19 has already become one of the greatest disruptions to the higher education landscape and can be considered as an educational *punctuated equilibrium* event. The global health crisis has affected almost all facets of teaching and learning, and the crisis has in effect lead to the "the biggest distance-learning experiment in history" (Kamenetz, 2020). The abrupt impact, as well as the potential future impact, on higher learning warrant careful study of the benefits and drawbacks of ERTL.

The phrase Emergency Remote Teaching and Learning is used in the literature to describe a rapid and unplanned need to shift what would normally be face-to-face teaching to online teaching. This "emergency" online teaching is distinct from online teaching, which has an established pedagogy with characteristics of being planned, deliberate in course design and, in essence, always designed to be delivered online (Bozkurt & Sharma, 2020). ERTL thus describes the sudden move and quick adaptation of content *planned* for face-to-face delivery to a remote online delivery due to an "event" such as a natural disaster or during a global pandemic. Once the "event" is over, it is expected that teaching activities will revert back to the intended face-to-face mode. This "quick adaptation" is seen across all facets of teaching, from course design through assessment (Shisley, 2020). The COVID-19 global pandemic thus caused swift and necessary action to be taken by management and teaching staff at higher education institutions in order to facilitate the delivery of remote teaching to students who could no longer be in the classroom, rather than representing a planned, deliberate switch to long-term online teaching (Vlachopoulos, 2020).

Due to the speed of change, ERTL has revealed a need for teaching staff to proactively engage in self-learning to get a grasp on the fundamentals of how to best teach online (Langford & Damsa, 2020; Hodges, Moore, Lockee, Trust & Bond, 2020). This is important since teaching staff report that they are not feeling confident in implementing remote teaching due to the lack of opportunities to access professional development and dedicated time to build confidence in the use of digital learning tools (Mohmmed, Khidhir, Nazeer & Vijayan, 2020; Flores & Gago, 2020). However, the move to ERTL may also have created a "culture-change moment" (Watermayer et al., 2020) as unprepared academics struggled to work out how to quickly, efficiently, and fluently use educational technology, such as Learning Management Systems, online resources, and digital tools to teach, assess, and engage students in an unfamiliar environment, with, often, initial minimal support.

The abruptness of the move to Emergency Remote Teaching and Learning has not only affected universities and educators, but also impacted students across the globe. It has been reported that "more than 1.5 billion students" had been prevented from attending physical education environments as a direct result of the pandemic (Bae & Chang, 2020; Strauss, 2020). In fact, all the services traditionally offered by higher education institutions have been affected, leading to a new off-campus experience that can be contrasted with the traditional on-campus experience. Again, what began as a required temporary shift towards online education is now poised to have a lasting impact on the future of higher education. The immediate necessity for *contactless* environments and a new off-campus experience, with potential strengths and weaknesses, may now provide both opportunities and threats to faculty, students, and entire institutions of higher learning.

In order to explore the strengths, weaknesses, as well as potential opportunities and threats, this study conducted a thorough review of the literature addressing issues related to the application of Emergency Remote Teaching and Learning. The systematic literature review, using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines, initially identified 520 articles, from which a total of 22 articles were retained after quality assessment. The review revealed important themes that are presented through a Strength, Weaknesses, Opportunities, and Threats (SWOT) analysis for students, faculty, and the institutions.

Methods and Materials

Research Question

The study explores the general impact that the switch to Emergency Remote Teaching and Learning (ERTL) during the COVID-19 pandemic had on the experience of students, faculty, and higher education institutions. In particular, what strengths, weaknesses, opportunities, and threats do Emergency Remote Teaching and Learning (ERTL) and an off-campus experience have compared to an on-campus experience?

Procedures

Data collected from the literature were compared by adopting a thematic analysis approach. Once themes were generated, they were collectively brought together and analyzed using a Strength, Weakness, Opportunity, Threat (SWOT) framework. Disagreements between the reviewers were resolved through discussion.

Search Strategy

A systematic literature review was undertaken to address the above research question, using a Preferred Reporting Items for Systematic Reviews (PRISMA) approach (Figure 1), as advocated by Moher et al. (2009). PRISMA provides a standard methodology that uses a comprehensive 27-item guideline checklist. Articles in English published between December 2019 and September 2020 were searched in the following electronic databases: ERIC, Education Research Abstracts Online (ERA), JSTOR, MERLOT, Scopus and Google Scholar. Various combinations of the following keywords were used (boolean operators "AND" and "OR" were also used to separate the keywords): "university off-campus experience COVID 19," "Emergency Remote Teaching," "global crisis emergency remote teaching," "teaching during pandemics," "Emergency Remote Teaching COVID 19 campus experience," "off-campus experience COVID," Distance Education COVID 19."

Selection of Studies

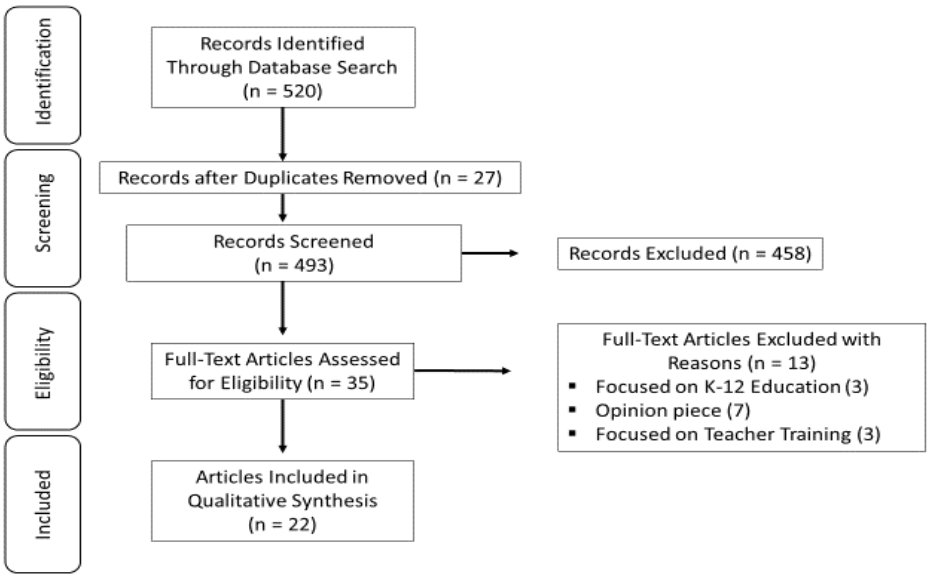
All studies (randomized and non-randomized) describing both ERTL and any off-campus experience in Higher Education (at undergraduate and postgraduate levels) during COVID-19 were included regardless of methodology, context, or discipline (including reviews). The articles were initially screened by title, then by abstract, and finally by text. Duplicates were removed using EndNote. Articles were excluded for the following six reasons: full-text unavailability, text published before the set review dates, non-peer-revised Op-Eds, text in languages other than English, text not specifically on emergency remote teaching and learning or off-campus experience during COVID-19, and context being in primary or secondary education.

Data Extraction and Quality Assessment

Data extraction was conducted by the first author and then checked by two additional co-authors. Information was extracted using a form containing the following items: author, study design, inclusion/exclusion criteria, aim, and time-period in which the study was conducted (December 2019-September 2020), setting of the study/region, assessment instruments, outcomes, and conclusions. All final quality assessments were done in duplicate and independently. Disagreements were resolved through discussion and consultation with all authors. The Mixed Methods Appraisal Tool (MMAT) was used to assess the eligibility of studies for inclusion in the review (Hong et al., 2018). The MMAT is designed for systematic reviews that include qualitative, quantitative, and mixed-methods studies. Each included study was rated in the appropriate category of criteria as either "Yes," "No" or "Cannot tell," as shown in Appendix 1.

After database screening and removal of duplicates, 493 articles were found which were considered relevant. Of these, a total of 458 studies were excluded following an assessment based on the eligibility criteria. Of the 458 eliminated studies, 123 articles were excluded because the title, keywords, or abstract did not contain the themes relevant to this study. Another 100 were excluded due to no full text being available. An additional 116 articles were excluded as they did not have Emergency Remote Teaching and Learning or off-campus experience as an independent variable. Finally, 35 articles were excluded if texts were published before the review dates, 15 were excluded because they were Op-Eds, 5 were duplicates of included studies, and 3 were in a language other than English. The remaining 35 articles were then assessed for eligibility and 6 additional articles were excluded for the following reasons: three that focused on K-12 education, seven were descriptive opinion (academic) pieces in Higher Education with no clear outcome or application of ERTL and three focused on teacher training, but not specifically for emergency remote teaching.

Figure 1. PRISMA four-phase flow diagram



In the end, a total of 22 articles formed the dataset that was used to explore the research question of what strengths, weaknesses, opportunities, and threats do Emergency Remote Teaching and Learning and an off-campus experience have compared to an on-campus experience?

Ethical Considerations

As the authors of this article did a systematic qualitative review of the literature, Human Research Ethics committee approval / Institutional Review Board approval were not sought. The authors acknowledge however their own assumptions and biases. To minimize search bias for instance, the authors only included published research that had undergone a peer-review process. The reader should bear in mind however that the scope of this exploratory study was limited in terms of time, size and context.

Findings

Before conducting the SWOT analysis on the information contained in the 22 included studies, the study used open coding in a grounded theory method in order to categorize the information into meaningful words or short phrases. The results from the open coding are provided in Table 1.

The emerging themes from the data included: flexibility, student performance, varied impact on different types of students, accessibility, complexity, levels of preparedness, emotional impact/mental health, assessment, innovation, workload, and professional development.

Table 1. Results from an open coding, emerging themes

Citation	Date	Title of article	Setting	Source	Themes
Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020).	2020	The difference between emergency remote teaching and online learning	United States	*Educause Review*	▪ Flexibility ▪ Stigma associated with online learning and teaching ▪ Impact on learning due to speed of change ▪ UDL principles ▪ Different levels of investment ▪ Different levels of infrastructure ▪ Effective online education ▪ Emergency remote learning and teaching
Bozkurt, A., & Sharma, R. C. (2020).	2020	Emergency remote teaching in a time of global crisis due to Corona Virus pandemic	Turkey	*Asian Journal of Distance Education*	▪ Interruption of education ▪ Education institutions were unprepared and vulnerable ▪ Complexity ▪ Pedagogy of care ▪ Concern for equity groups ▪ Emergency remote learning and teaching
Alvarez, A. J. (2020).	2020	The phenomenon of learning at a distance through emergency remote teaching amidst the pandemic crisis.	Philippines	*Asian Journal of Distance Education*	▪ Impact of ERLT on the student experience ▪ Different levels of infrastructure and access to technology ▪ Pedagogy of care ▪ Emotional support
Whittle, C., Tiwari, S., Yan, S., & Williams, J. (2020).	2020	Emergency remote teaching environment: A conceptual framework for responsive online teaching in crises.	United States	*Information and Learning Sciences*	▪ Focus on method rather than leaning goal ▪ Online learning facilitated increased learner agency ▪ Emergency remote learning and teaching environments ▪ Assessment and evaluation
Mohmmed, A. O., Khidhir, B. A., Nazeer, A., & Vijayan, V. J. (2020).	2020	Emergency remote teaching during coronavirus pandemic: the current trend and future directive at	Oman	*Innovative Infrastructure Solutions*	▪ Reliable, fast response to crisis ▪ Unequal access to digital technology and internet ▪ Opportunity for staff upskilling

		Middle East College Oman.			
Soria, K. M., Horgos, B., Chirikov, I., & Jones-White, D. (2020).	2020	First-generation students' experiences during the COVID-19 pandemic.	United States	*University of Minnesota Digital Conservancy*	▪ Negative impacts of COVID ▪ Financial hardship impacts on students ▪ Unequal access to digital technology ▪ Impacts on mental health of students ▪ Housing insecurity
Gallagher, H. L., Doherty, A. Z., & Obonyo, M. (2020).	2020	International student experiences in Queensland during COVID-19.	Australia	*International Social Work*	▪ Crisis intervention approach ▪ Impact on international students ▪ Pedagogy of care
Regehr, C., & Goel, V. (2020).	2020	Managing COVID-19 in a large urban research-intensive university.	Canada	*Journal of Loss and Trauma*	▪ Disruption to learning and teaching ▪ Sharing of resources ▪ Increased collegiality amongst teaching staff ▪ New opportunities for student employment ▪ Safety of students ▪ Academic uncertainty and continuity
Raaper, R., & Brown, C. (2020).	2020	The Covid-19 pandemic and the dissolution of the university campus: Implications for student support practice.	United Kingdom	*Journal of Professional Capital and Community*	▪ Network capital ▪ Unequal access to digital technology ▪ Changing nature of student support services ▪ International students ▪ Students' routine
Vielma, K., & Brey, E. M. (2020).	2020	Using evaluative data to assess virtual learning experiences for students during COVID-19.	United States	*Biomedical Engineering Education*	▪ Experience of non-typical students ▪ Flexibility in online course design and delivery ▪ Changes to assessment ▪ Modes of delivery ▪ Pedagogy of care
George, M. L. (2020).	2020	Effective teaching and examination strategies for undergraduate learning during COVID-19 school restrictions.	Trinidad and Tobago	*Journal of Educational Technology Systems*	▪ Adaption to online teaching ▪ Modes of delivery ▪ Student performance ▪ Online course evaluations
Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., ... & Lam, S. (2020).	2020	COVID-19: 20 countries' higher education intra-period digital pedagogy responses.	20 countries	*Journal of Applied Learning & Teaching*	▪ Rapid transition to online teaching ▪ Equity ▪ Preparedness of universities to handle change

					▪ Logistic challenges for international students
Johnson, N., Veletsianos, G., & Seaman, J. (2020).	2020	US faculty and administrators' experiences and approaches in the early weeks of the COVID-19 pandemic.	United States	*Online Learning*	▪ Impact of disruption on staff ▪ Preparedness of universities to handle change ▪ Rapid transition to online teaching ▪ Rapid upskilling of staff to online teaching ▪ Adaption to online teaching
Cheng, S. Y., Wang, C. J., Shen, A. C. T., & Chang, S. C. (2020).	2020	How to safely reopen colleges and universities during COVID-19: Experiences from Taiwan.	Taiwan	*Annals of Internal Medicine.*	▪ Strategies for safe opening of campus ▪ Policy lessons from COVID-19
Aucejo, E. M., French, J., Araya, M. P. U., & Zafar, B. (2020).	2020	The impact of COVID-19 on student experiences and expectations: Evidence from a survey.	United States	*Journal of Public Economics*	▪ Negative side effects of COVID-19 on student experience ▪ Impact on students ▪ Disruption ▪ Student response to online learning
Marsicano, C., Felten, K., Toledo, L., & Buitendorp, M. (2020).	2020	Tracking campus responses to the COVID-19 pandemic.	United States	*APSA Preprints.*	▪ Academic responses to COVID-19 ▪ Online instruction
Sokhulu, L. H. (2020).	2020	Students' experiences of using digital technologies to address their personal research needs during the COVID-19 lockdown.	South Africa	*African Identities*	▪ Adaptation to online research/study ▪ Digital literacies ▪ Supporting the professional identity in online learning and teaching ▪ Student socialization
Assunção Flores, M., & Gago, M. (2020).	2020	Teacher education in times of COVID-19 pandemic in Portugal: National, institutional and pedagogical responses.	Portugal	*Journal of Education for Teaching*	▪ Rapid transition to online teaching ▪ Emergency Remote Learning and Teaching ▪ Innovation in teaching ▪ Opportunities for mentoring
Wotto, M. (2020).	2020	The future high education distance learning in Canada, the United States, and France: Insights from before COVID-19 secondary data analysis.	Canada, United States, France	*Journal of Educational Technology Systems*	▪ Quality of online teaching ▪ Rapid transition to online learning ▪ Digital learning ▪ MOOCs

Donitsa-Schmidt, S., & Ramot, R. (2020).	2020	Opportunities and challenges: Teacher education in Israel in the Covid-19 pandemic.	Israel	*Journal of Education for Teaching*	▪ Rapid transition to online learning ▪ Uncertainty ▪ Upskilling teaching staff ▪ Pedagogy guidelines for online teaching ▪ Peer learning
Huang, R., Tlili, A., Chang, T. W., Zhang, X., Nascimbeni, F., & Burgos, D. (2020).	2020	Disrupted classes, undisrupted learning during COVID-19 outbreak in China: Application of open educational practices and resources.	China	*Smart Learning Environments*	▪ Open educational resources ▪ Rapid transition to online learning ▪ Upskilling teaching staff ▪ Guidelines for students
Pather, N., Blyth, P., Chapman, J. A., Dayal, M. R., Flack, N. A., Fogg, Q. A., ... & Morley, J. W. (2020).	2020	Forced disruption of anatomy education in Australia and New Zealand: An acute response to the Covid-19 pandemic.	Australia, New Zealand	*Anatomical sciences education*	▪ Rapid transition to online learning ▪ Changing role of teaching staff ▪ Increased workload ▪ Equity and access ▪ Curriculum and assessment design ▪ Pedagogy of care

Discussion

The sudden adoption of Emergency Remote Teaching and Learning posed a number of challenges to three key higher education stakeholders: students, faculty, and the institution as a whole. Although the impact on the various stakeholders were often similar, each group was affected by the switch to ERTL slightly differently. However, the results from the SWOT analysis (Table 2), based on the 22 included studies, suggest that there are opportunities to learn from the rapid transition to online teaching and learning that the COVID-19 pandemic required. As mentioned earlier, the global health crisis provided an unprecedented "distance-learning experiment" (Kamenetz, 2020) and it is important to not waste this learning opportunity. The need for a sustainable process which enables flexibility in design, use, support, and access is integral in order to continually promote opportunities and counteract prominent and persisting threats and weaknesses. These issues are discussed in the SWOT analysis section.

Table 2. SWOT Matrix

STRENGTHS	
Students	1. Flexibility 2. Student performance (Many students adapt properly to this online context)
Faculty	1. Transition to ERTL has been frantic, but effective 2. Increased sharing of experience and collegiality 3. Development of several low technology solutions to support online instruction
Institution	1. Online instruction (Firm decisions of universities to develop online courses). 2. MOOCs (Many universities implemented MOOCs to adapt to the new context) 3. Guidelines for students (Universities developed and implemented guidelines to help students adapt to this online context)

WEAKNESSES	
Students	1. Technical issues encountered almost on a daily basis 2. Technology was largely inaccessible 3. A lack of interaction may have affected student motivation and retention 4. First-generation students' lack of adequate study spaces free from distractions and lack of technology to attend virtual classes at scheduled times 5. Financial and emotional distress 6. Lack of emotional support
Faculty	1. Unfamiliarity with the technological tools and online pedagogy 2. Unfamiliarity with Emergency Remote Teaching and Learning 3. Challenges to adapt labs and hands-on learning activities to online environments 4. Online course evaluations (Difficult to implement online course evaluations)
Institution	1. Unpreparedness 2. Emergency Remote Teaching Environments (Some universities face logistic challenges when implementing ERTL) 3. International students (Lack of efficient measures to help international students) 4. Logistic challenges for international students 5. Assessment and evaluation (Difficult to implement new evaluation systems for programs)
OPPORTUNITIES	
Students	1. Flexibility for those with work/family responsibilities 2. Access to lecture-captured platforms 3. Opportunities for mentoring 4. Use of new teaching methods 5. Students' routine (Students can implement new schedules and timings)
Faculty	1. Changing role of teaching staff 2. Capacity building and upskilling of teaching staff 3. Opportunities for mentoring and peer learning 4. Pedagogy of care 5. Increased opportunities for networking 6. More inclusive learning environments
Institution	1. Opportunity for innovation, the development of "best practice" in online pedagogy, opportunity to grow their institutional online teaching capabilities 2. Effective online education 3. Opportunities to share resources with other institutions 4. Opportunities to better support faculty members
THREATS	
Students	1. Isolation from spiritual, social and practical supports 2. Emotional support 3. Higher rates of mental health disorders/increased rates of anxiety 4. Financial hardship 5. Housing insecurity
Faculty	1. Increased workload
Institution	1. Infrastructure and investment disparities 2. Student safety (Difficulties to implement internal process for protecting students' safety) 3. Academic uncertainty and continuity

SWOT Analysis

Students: Strengths and Weaknesses

Students identified the flexibility of remote teaching and learning as a major strength (Hodges et al., 2020; Vielma & Brey, 2020; Crawford et al., 2020). Online teaching enabled students to engage with

lectures and course materials asynchronously, without the need to commute, which had the benefits of increased flexibility to fit study around other commitments such as part-time work and caring responsibilities (Mohmmed et al., 2020; Vielma & Brey, 2020). Additionally, as teaching staff worked rapidly to place learning online, students also reported benefits of being able to view resources multiple times, at their own pace, such as re-watching a lecture or concepts video (Hodges et al., 2020; Crawford et al., 2020; Vielma & Brey, 2020) which helped students retain information. For doctoral students, a strength of online learning was an increased feeling of convenience of working from home and not needing to travel to campus and the ability to connect with supervisors via video and increased socialization via the use of digital tools (Sokhulu, 2020).

The most prominent and unanimous weaknesses were related to technology inaccessibility (Gallagher et al., 2020), technical issues encountered almost on a daily basis to attend online classes synchronously and the lack of direct interaction with peers and teachers which may have affected motivation levels and retention. The lack of quiet spaces to study at home during confinement was also highlighted by Soria et al. (2020). Finally, with universities and shops shutdowns, many international students were in financial distress, left without any income, often generated by part-time jobs on campus or in the community.

Faculty: Strengths and Weaknesses

Teaching staff felt that the transition to ERTL was done hastily; effectively, but in a rather frantic manner. Adaptation to an online environment was challenging for many, as switching all courses, teaching material, and programs online in a matter of days was daunting. The golden opportunity to upskill in the principles of Universal Design for Learning (UDL), which is common to online learning, and alternative ways of assessing in an online environment was welcomed by academic staff, as it helped enhanced experience for all learners (Hodges et al., 2020).

For teaching staff, the *contactless* teaching experience brought about weaknesses related to increased workload, unfamiliarity with technology, loss of academic networks and direct interaction with students, and a steep learning curve of how to best engage students in their learning to avoid the "cameras off" phenomena (Assunção Flores & Gago, 2020). Experiential learning, labs, experiments and other forms of hands-on learning were seen as difficult to replicate online (Johnson, Veletsianos & Seaman, 2020; Aucejo et al., 2020; Assunção Flores & Gago, 2020; Donitsa-Schmidt & Ramot, 2020; Pather et al., 2020; Vielma & Brey, 2020). Further reflective work would need to be done to ensure that this form of teaching and learning can be transitioned to an online environment more successfully.

University: Strengths and Weaknesses

On a positive note, the rapid switch to ERTL has provided universities with an unprecedented incentive to upskill staff and to launch well-thought, professionally-designed online courses and potentially Massive Open Online Courses (MOOCs). It also seems to have reignited keen interest in the learning and teaching literature. One of the key weaknesses across the reviewed literature was the initial unpreparedness of the universities to deal with the magnitude of the COVID-19 pandemic. Weaknesses identified in the literature would need to be addressed by universities if a long-term *contactless* model of learning and teaching is adopted. The largest area to address is the disparity in resources in order to ensure that students are neither struggling, feeling isolated, nor disadvantaged by a lack of access to technology, laptops and wireless internet access (Hodges et al., 2020; Crawford et al., 2020; Assunção Flores & Gago 2020; Pather et al., 2020) as all services that range from enrollment to mental health consultations are provided online. To combat these weaknesses and for the *contactless* university to succeed, equity issues must be seriously taken into consideration and addressed (Bozkurt & Sharma, 2020; Vielma & Brey, 2020; Crawford et al., 2020). It would be wise for universities to invest in an online learning infrastructure and develop ways to check-in with students to avoid frustration and

demotivation, particularly first-generation students (Soria et al., 2020; Vielma & Brey, 2020), international students, or those from disadvantaged and/or minority groups, the groups most vulnerable to falling behind. Soria et al. (2020) indicated for instance that the "lack of adequate study spaces and lack of technology" were key hurdles for first-generation students, preventing them from adapting to and completing their online courses.

Students: Opportunities and Threats

ERTL has been an opportunity for many non-traditional students, particularly those with work and family responsibilities, as it allowed them to spend more quality time with their family and decide and devise their own study schedules. Threats that may impede the move towards a *contactless* university include: the stigma that an online education is of lower quality when compared to face-to face (Hodges et al., 2020), students being less likely to choose online when there is a face-to-face learning option (Acuejo et al., 2020) and that it takes a lot of time and financial resources to build a sustainable, online teaching model. A "good practice" model for online teaching and learning would also lessen the confusion and anxiety felt by students (Regher & Goel, 2020; Johnson et al., 2020; Aucejo et al., 2020; Donitsa-Schmidt & Ramot, 2020). It will also be important to reduce the threat to issues of academic integrity and online exams by implementing processes that build trust (Plather et al., 2020) and confidence among students and academic staff.

Another major threat, as reported by Aucejo et al. (2020) is that "lower-income students" were "55% more likely than their higher-income peers to have delayed graduation due to COVID-19," which will have a significant (economic) impact on their future lifetime earnings and their ability to enter the workforce or repay their debt. Finally, according to Gallagher et al. (2020) a significant number of "students felt isolated from spiritual, social and practical supports" as churches, mosques and other places of worship were closed due to strict confinement measures, thus increasing their levels of solitude, stress, anxiety and frustration.

Faculty: Opportunities and Threats

The strengths identified in online learning, as experienced during COVID-19, provide opportunities for upskilling and practicing a new way of learning and teaching. A major theme from the literature was the emergence of a "pedagogy of care" (Bozkurt & Sharma, 2020; Alvarez, 2020; Gallagher et al., 2020; Vielma & Brey, 2020; Johnson et al., 2020; Pather et al., 2020). An increased awareness of students' individual needs has the opportunity to produce a more inclusive learning environment. The increased use and familiarity with online communication tools such as Zoom, Teams, and Skype has the opportunity to facilitate increased professional networking and collaboration (Regher & Goel 2020; Crawford et al., 2020; Donitsa-Schmidt & Ramot, 2020).

Another opportunity lays in the idea that teaching resources could be shared between universities as a "resource commons," allowing teaching staff to focus on teaching rather than the time-consuming task of creating new resources (Huang et al., 2020). As comfort with using online tools increases, there are opportunities for students and teachers to learn and upskill from each other (Mohmmed et al., 2020) and for teaching staff to build their professional skillset (Sokhulu, 2020, Huang et al. 2020). Teaching staff would need to be supported in understanding how to effectively use online teaching technology and in developing resources so that they do not feel the threat of an increased workload, spending all their time developing resources rather than teaching (Assunção Flores & Gago, 2020) and engaging students.

University: Opportunities and Threats

There are opportunities for the university to offer financial support to students through employing students as assistants to assist staff with online learning (Regher & Goel, 2020), this also has the benefit of bridging the resource gap and provides students with valuable work experiences (Regher & Goel

2020; Soria et al., 2020). In contrast, the focus on quickly implementing ERTL may have distracted institutions from providing additional pastoral care to students, particularly to those most isolated or vulnerable.

The overall experience of Emergency Remote Teaching and Learning during the COVID-19 pandemic has produced an opportunity for innovation (Assunção Flores & Gago, 2020; Huang et al., 2020; Pather et al., 2020), the development of "best practice" in online pedagogy (Crawford et al., 2020; Huang et al., 2020), and for universities to grow their online teaching capabilities (Crawford et al., 2020; Johnson et al., 2020). Crawford et al. (2020) noted, however, that "not all universities" had the appropriate "resources or academic capabilities or capacity to transition to online delivery" (p.11). Moreover, one of the missing links was, according to Soria et al. (2020), the scarcity of off-campus mental health help during crises' times. They advocated active work "to eliminate some of the barriers to students' ability to seek mental health resources" during lockdowns.

Conclusion and Future Directions

This article explored the application of Emergency Remote Teaching and Learning and *contactless* experiences during COVID-19. The findings of this study indicate a number of important and transformational implications for future practice. They suggest several courses of action. First, in order to address the emergent theme of *dread of deskilling* and *de-professionalization* among academic staff, indicated in the findings of a survey of faculty teaching online in the United Kingdom, the United States and the EU during the COVID-19 (Watermeyer et al., 2020), and move beyond what Ubell (2020) described as a "first-aid approach" (para.15), we propose to (a) develop targeted systematic interventions aimed at developing academic staff digital competencies and encouraging upskilling (Santandreu Calonge & Shah, 2016; Santandreu Calonge, Shah, Riggs & Connor, 2019; Huang et al., 2020) in, for instance, learning design for online environments. In addition, (b) design well-thought, comprehensive continuing professional development programs on ERTL for academic and professional staff, whose aim will be to foster adaptability to uncertainty, develop digital empathy and restraint (Selwyn, 2020), explore new pedagogical approaches that include culturally-responsive teaching practices, and improve resiliency, as well as learning-agility. Gregory et al. (2020) argued that "teachers of the future" ought to be "adequately prepared to teach in on-line and blended contexts," crucial skills which were "not addressed in many initial teacher education programs" (para.11), as recently shown in an Economist Intelligence Unit report on future-ready teaching (early-career and student teachers), only 38% felt their training has equipped them to use digital technology (Green, 2020, p.5).

Second, the adoption of a more people-centric institutional change approach and a reconsideration of university systems, preparedness plans and continuity planning procedures (often planned for face-to-face interactions) should be considered in a fully *contactless* environment, advocating what Alexander (2020) described as a "future-oriented mindset… the practice and imagination that strategic foresight provides, along with a willingness to thoughtfully experiment, in order to shoot the rapids that loom before us" (p.4).

Third, the creation of a sustainable robust (online) system-resilient educational ecosystem, as well as a learning and teaching risk management architecture and stronger support and pastoral care structures for local and international students, as well as faculty is also advocated. As argued by Devinney and Dowling (2020), the crisis might offer an impetus for change, the pandemic could well be a once-a-generation opportunity for "visionaries and risk-takers" to implement "real, meaningful change" (para.2).

Finally, inequitable access to education is not a new phenomenon, but in the wake of the COVID-19 experience inequalities in access to education have unfortunately resurfaced, been strengthened and amplified, as highlighted by the reviewed literature. When reflecting on remote learning policies, it has been reported that on a global scale, "3 out of 4 students who cannot be reached…come from rural areas

and/or belong to the poorest households" (UNICEF, 2020). Groups of higher education bodies in the UK (such as JISC) have for instance indicated that "digital poverty" was a major issue, that tens of thousands of university students "were ignored" by the government, which could result in a "lost generation". These hurdles and increased "distancing" will inevitably "lead to inferior educational outcomes or disengagement" (Shah & Santandreu Calonge, 2019, p.2). Due to such circumstances, flexibility in the design, development, strategies, and policies towards Emergency Remote Teaching and Learning are essential to allow greater levels of inclusion and access for *all* students, but especially those deemed vulnerable. As a means to alleviate such inequalities, the future of education development should "not rely on any single remote learning channel" (UNICEF, 2020). Rather, the direction of processes in ERTL should be expansive and flexible enough to address diversities surrounding the circumstances of students and thus their needs towards accessible remote *contactless* education.

Limitations

A significant limitation to this study was the scarce number of published articles on this very topic due to ERTL during COVID-19 being, still, an emergent issue. This led to additional limitations such as: lack of access to institutional SWOT analyses for comparison purposes, the practical time constraints of the literature review period (December 2019-September 2020), as the authors wanted to assess the initial response from tertiary institutions.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Author contributions

All authors contributed to the study conception, design and writing. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Appendix 1. Quality evaluation of included studies using the mixed methods appraisal tool (Hong et al. 2018 version)

	Qualitative Studies					**Randomized Controlled Trials**					**Non-Randomized Trials**					**Quantitative Descriptive Studies**					**Mixed Methods**				
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020).																Y	Y	Y	Y	Y					
Bozkurt, A., & Sharma, R. C. (2020).																Y	Y	Y	Y	Y					
Alvarez, A. J. (2020).	Y	Y	Y	Y	Y						N	Y	C	C	Y										
Whittle, C., Tiwari, S., Yan, S., & Williams, J. (2020).	Y	Y	Y	Y	Y						N	Y	Y	C	Y										
Mohmmed, A. O., Khidhir, B. A., Nazeer, A., & Vijayan, V. J. (2020).	Y	Y	Y	Y	Y											Y	Y	Y	Y	C					
Soria, K. M., Horgos, B., Chirikov, I., & Jones-White, D. (2020).	Y	Y	Y	Y	Y																Y	Y	Y	Y	Y
Gallagher, H. L., Doherty, A. Z., & Obonyo, M. (2020).	Y	N	C	N	N																				
Regehr, C., & Goel, V. (2020).	Y	Y	Y	Y	C																				
Raaper, R., & Brown, C. (2020).	Y	C	C	Y	C																				
Vielma, K., & Brey, E. M. (2020).	Y	Y	Y	Y	Y											Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
George, M. L. (2020).	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y											Y	Y	Y	Y	Y
Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., ... & Lam, S. (2020).	Y	Y	Y	Y	Y											Y	Y	Y	Y	Y					
Johnson, N., Veletsianos, G., & Seaman, J. (2020).	Y	Y	Y	Y	Y											Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cheng, S. Y., Wang, C. J., Shen,	Y	C	C	Y	C																				

A. C. T., & Chang, S. C. (2020).																				
Aucejo, E. M., French, J., Araya, M. P. U., & Zafar, B. (2020).	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y					
Marsicano, C., Felten, K., Toledo, L., & Buitendorp, M. (2020).	Y	Y	Y	Y	Y											Y	Y	Y	Y	Y
Sokhulu, L. H. (2020).	Y	Y	Y	Y	Y															
Assunção Flores, M., & Gago, M. (2020).	Y	Y	Y	Y	Y															
Wotto, M. (2020).	Y	Y	Y	Y	Y															
Donitsa-Schmidt, S., & Ramot, R. (2020).	Y	C	C	Y	C															
Huang, R., Tlili, A., Chang, T. W., Zhang, X., Nascimbeni, F., & Burgos, D. (2020).	Y	Y	Y	Y	Y															
Pather, N., Blyth, P., Chapman, J. A., Dayal, M. R., Flack, N. A., Fogg, Q. A., ... & Morley, J. W. (2020).	Y	Y	Y	Y	Y															

Y = yes; N = no; C = cannot tell

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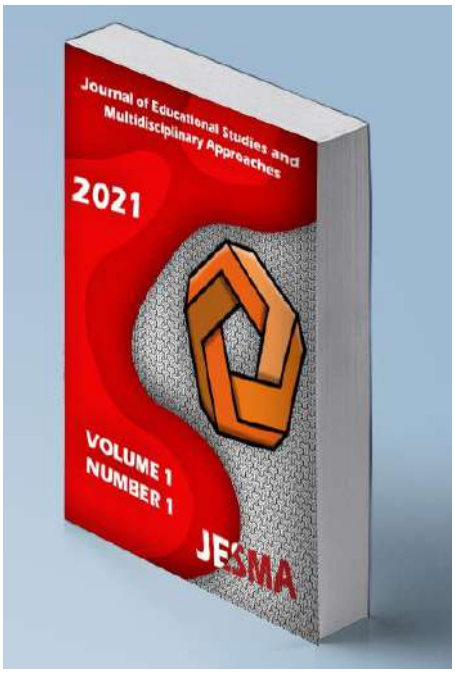
Dr. Pablo Medina Aguerrebere: Holds a PhD in Corporate Communication (University of Navarra, Spain). He is Assistant Professor at Canadian University Dubai (UAE). His main research interest is corporate communication in health organizations.



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Evidence-Based, Empirically Supported, or Scientifically Unsupported? An Overview of the Research to Practice Gap in Early Childhood Special Education

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Evidence-Based, Empirically Supported, or Scientifically Unsupported? An Overview of the Research to Practice Gap in Early Childhood Special Education

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ABSTRACT
Valid research is crucial for evaluating the effects of utilized practices, strategies, and interventions on learners with exceptionalities. In the United States, for the past several decades, considerable research and policies have focused on developing evidence-based practices (EBPs), evidence-informed programs, and other research-supported initiatives that intend to produce better outcomes for children with disabilities. However, past and current efforts to translate, transport, and close the research to practice gap have not successfully disseminated the growing list of evidence-based interventions, strategies, and programs routinely into practice. The gap between research and practice is particularly problematic in special education and early childhood special education (ECSE). Children and students with disabilities require highly effective instruction to reach their potential. This conceptual review paper provides an overview of EBPs in ECSE and elaborates on the research to practice gap and the related issues. The paper discusses the identification, implementation, and dissemination of EBPs that have been regarded as the challenges the field of ECSE faces in closing the research to practice gap. Finally, implications and recommendations for future research, practice, and policy are discussed.

Keywords: Evidence-based practices, special education, early childhood special education, research to practice gap

Introduction

Emerging from medicine in the early 1990s (Sackett et al., 1996), evidence-based practices (EBPs) in education refer to the practices supported by high-quality research and result in meaningful positive outcomes. In special education, EBPs intend to focus on the most effective practices that positively impact the developmental and educational achievement of children and students with disabilities (Cook & Odom, 2013). Although EBPs are needed in all areas of education, special education research has dedicated a substantial amount of attention and focus on identifying and implementing EBPs for children and students with disabilities. The adoption of EBPs for students with disabilities is a step in the right direction to ensure that teachers and practitioners use research supported strategies and interventions based on the individual child or student's needs and make informed decisions that have high chances of achieving positive educational and developmental outcomes for which there is scientific evidence that they work, as opposed to only anecdotal evidence for their effectiveness (Reichow, 2016). Implementing EBPs in special education can increase the likelihood of positive outcomes and increase accountability because there are data to back up selecting a practice or program, which in turn facilitates support from administrators, parents, and others, resulting in less wasted time (Cook et al., 2016). Implementation of EBPs also results in fewer wasted resources because educators start with an effective practice or program and are not forced to find one that works through trial and error, increase the likelihood of being responsive to an individual child or student's needs and increase the chances of convincing students to try it because there is evidence that it works. The overall rationale for evidence-based practices is to close the research to practice gap by highlighting the role of scientifically based research (Cook & Odom, 2013). In the United States (U.S.), past legislation (e.g., Individuals With Disabilities Education Act, 2004; No Child Left Behind, 2002) emphasizes scientific, valid research for training and instruction in special education and require teachers and practitioners to use, to the greatest extent possible, practices and programs that are grounded in scientifically based research.

In early childhood special education (ECSE), the evidence-based movement focuses on identifying effective interventions, practices, and strategies that can generate positive outcomes for children who have or are at risk for developmental disabilities/delays (Cook & Odom, 2013). The main advantages of using EBPs in ECSE include an increased likelihood of positive outcomes and social change, an increased chance of being responsive to family needs, and increased accountability and support from administrators, parents, and other stakeholders. The increase in accountability results in an increase in efficiency by choosing a practice shown to be effective rather than implementing a practice that might work through trial and error (Snyder et al., 2015). In the U.S., some leading organizations have articulated recommended practices to improve educational and developmental outcomes for children with disabilities (Copple & Bredekamp, 2009; DEC, 2014). Division for Early Childhood (DEC) of Council for Exceptional Children (CEC) is the largest organization in the U.S. that promotes policies and advances evidence-based practices to support families and enhance the optimal development of young children (0-8) with disabilities. DEC developed recommended practices in early intervention (EI) and ECSE to ensure that children with disabilities, their families, and the workforce who support them have access to valid, scientific practices that result in better outcomes (Barton & Smith, 2015; DEC, 2014). This paper aims to provide an overview of EBPs in ECSE and elaborate on the challenges and issues that the field is currently facing to implement EBPs in educational settings effectively. The paper also includes practical implications for policy, research, and practice that can increase the effective implementation of EBPs and thus reduce the research-to-practice gap.

Defining Evidence-Based Practices and Related Terms

EBPs are defined differently in different disciplines. In education, EBPs refer to practices supported by multiple, high-quality research studies that can demonstrate a meaningful positive impact on achievement of positive developmental, educational and behavioral outcomes (Cook et al., 2016). The evidence-based strategies, techniques, and skills have been proven to work through experimental research studies or large-scale field studies. EBPs are identified through a process often referred to as

an evidence-based review process (Reichow, 2016). While various agencies and organizations use different names to specify the most rigorously tested programs, they share similar criteria for these programs. In particular, practices that are theory-based and have been experimentally tested using randomized controlled trials and reported in peer-reviewed journals are viewed as most rigorous. Other criteria may include replication in different settings and implementation with a high degree of integrity to the original model. Table 1(adapted from Reichow, 2016) outlines the primary quality indicators in the evidence-based review process. In special education, the What Works Clearinghouse, and the CEC's Standards for evidence-based practices require all evidence-based practices to meet all the quality indicators outlined in Table 1.

Table 1. Primary Quality Indicators

Group design	Single-subject experimental design	A high-quality rating is awarded to a study that
Participant characteristics	Participant Characteristics	Includes participants' age, gender, diagnosis, interventionists' characteristics
Independent Variable (IV)	Independent Variable	Defines I.V.s with replicable precision
Comparison Condition (1)	Dependent variable (DV) (2)	1.Defines the conditions for the comparison group with replicable precision 2.Defines the DV with operational precision
Dependent variable (1)	Baseline condition (2)	1.Defines the DV with operational precision 2. Encompasses at least three measurement points, appear through visual analysis to be stable, have no trend or a counter-therapeutic trend, have conditions that are operationally defined with replicable precision
Link between research question and data analysis (1)	Visual analysis: (2)	1. Data analysis is strongly linked to the research questions and uses correct units of measure 2. Have data that are stable (level or trend), contain less than 25% overlap of data, show a significant shift in level or trend between adjacent conditions that coincide with the implementation or removal of the IV.
Statistical analysis (1)	Experimental control (2)	1.Proper statistical analyses are conducted with adequate power and sample size (n > 10) for each statistical measure 2. Contains at least three demonstrations of the experimental effect, occurring at three different points in time and changes in the D.V.s, vary with the manipulation of the IV in all instances of replication.

Note. Adapted from Reichow, B. (2016). Evidence-Based Practice in the Context of Early Childhood Special Education. In *Handbook of Early Childhood Special Education*. Springer International Publishing.

Research to Practice Gap in Early Childhood Special Education

The research to practice gap refers to instances where research struggles to apply to practical contexts such as the classrooms and other educational settings. Some of the most prominent areas where the gap might occur are when research is too theoretical to have any practical application and when research gets misinterpreted and applied wrong (Dunst & Trivette, 2009; Hebbeler et al., 2012; Strain, 2018).

There are terms such as research-based practices, best practices, promising practices, and recommended practices that are sometimes used synonymously along EBPs, creating confusion about the differences between the terms. Research-based practices refer to data-based, research-supported, or empirically validated practices that imply endorsement of an intervention, strategy, or instructional technique by loose research support (Snyder et al., 2015). Best and recommended practices are mainly promoted as best or recommended based on tradition, expert opinion, theory, and moral values, regardless of whether they are validated empirically or having reliable research support (Cook et al., 2016). Promising practices are those for which there is considerable evidence or expert consensus but are not yet supported by the most substantial scientific evidence. Some characteristics of promising practices include: the research design does not demonstrate that the practice led to improved outcomes, studies indicate that the practice might be effective in producing desired outcomes, research studies might have mixed-results on the practice's effectiveness on desired outcomes, and insufficient number of studies conducted to demonstrate the efficacy (Reichow, 2016). Therefore, the difference between EBPs and the associating terms should be considered when referring to the practice as evidence-based. Despite the development of many EBPs and the existing need in the field of ECSE to specify what works for whom under what conditions, there is still a significant gap in translating research findings to the everyday practices in everyday settings and classrooms. Few EBPs have been implemented and sustained by practitioners in schools and educational settings, that might be attributed to many proximal factors, including inadequate practitioner training, a poor fit between treatment requirements and existing organizational structures, insufficient administrative support, and practitioner resistance to change (Snyder et al., 2015). There have been numerous attempts to bridge the research to practice gap (Moster & Crockett, 1999-2000; Snyder et al., 2015). However, there is not enough evidence suggesting that the gap has been meaningfully reduced and is argued to be mainly associated with identification, implementation, and dissemination of EBPs (e.g., US Department of Education (2021); Cook & Odom, 2013; Dunst et al., 2013; Harn et al., 2013; Snyder et al., 2015).

Identification

In special education, EBPs were developed due to the concerns about the poor performance of children and students on assessment procedures and shifted the focus of research to justify to what extent research studies were scientifically based (Buysse et al., 2006; Snyder et al., 2015). The Institute for Education Sciences (IES) in the U.S. has invested considerable effort in developing practice guides and intervention reports to assist the field in identifying evidence-based practices, strategies, and interventions (e.g., Mayer, 2011; Thurlow et al., 2010). EBPs generally include quality indicators related to research design, methodological quality, quantity of supporting research, and magnitude of effect size. However, reasonable differences of opinion exist regarding exactly how much and what type of research support is necessary for a practice to be considered evidence-based (Copple & Bredekamp, 2009; Slavin, 2008).

Different organizations (e.g., Council for Exceptional Children, What Works Clearing House) utilize various approaches to identify EBPs in education and related disciplines, each with specific criteria for a practice to be considered evidence-based (Mayer, 2011; Slavin, 2008; Strain, 2018). Despite the general affinity for the concept of EBPs, as Odom et al. (2005) suggested, the difficulty of identifying EBPs lies in the details (e.g., how many studies must support an EBP? What should research designs be considered? What are quality indicators necessary for trustworthy research? What effects must a practice have to be considered an EBP? and impacts many details involved with implementing EBPs).

At one level, the lack of uniform procedure in identifying EBPs might add to the complexity of identifying the EBPs and determining their effectiveness. Such differences may also create confusion and frustration among practitioners and educators who deal with practices that are considered evidence-based by one organization and not another (Odom et al., 2005). For example, Direct Instruction is reported by the Best Evidence Encyclopedia (n.d.) to be a program with solid evidence of effectiveness (its highest category) for struggling readers. In contrast, it is considered to be a promising (but not proven practice) by the Promising Practices Network (n.d.) and is reported to have no discernible effects by the What Works Clearing House (WWC) (2007). Also, there is still the assumption that other

effective practices have not been subjected to rigorous research or have been inadequately researched (Cook et al., 2016; Strain, 2018). This leaves the educators hesitant to utilize the practices that do not have evidence support but proved to work for an individual child or when an evidence-based intervention is inconsistent with the goals and objectives of a child or student's instructional plan (Thurlow et al., 2010). Please see Table 2 for an outline of the level of evidence for established and promising EBPs.

Table 2. Criteria for Interventions to be Considered EBP

Level of Evidence	The criterion for research to support a practice
Established	• Five SSED studies of strong research report strength with a total sample size of at least 15 participants across studies conducted by at least three research teams in three different geographic locations • Ten SSED studies of adequate research report strength with a total sample size of at least 30 different participants across studies conducted by at least three research teams in three different geographic locations • Two group design studies of strong research report strength conducted in different geographic locations • Four group design studies of at least adequate research report strength conducted in at least two different research teams • One group design study of strong research report strength and three SSED studies of strong research report strength with at least eight different participants • Two group design studies of at least adequate research report strength and six SSED studies of at least 8 participants
Promising	• Five SSED studies of at least adequate research report strength with a total sample size of at least 16 different participants across studies conducted by at least two research teams in two different geographic locations • Two group design studies of at least adequate research report strength • One group research report of at least adequate research report strength rating and at least three SSED studies of at least adequate strength rating with at least 8 participants

*SSED: Single-subject experimental design.
Note. Adapted from Reichow, B. (2016). Evidence-Based Practice in the Context of Early Childhood Special Education. In *Handbook of Early Childhood Special Education*. Springer International Publishing.

DEC recommended practices were developed out of the recognized division between research and practice (Copple & Bredekamp, 2009; DEC, 2014). The practices are organized into eight topic areas that are expected to be viewed holistically, including leadership, assessment, environment, family, instruction, interaction, teaming and collaboration, and transition. The eight topic areas aim to facilitate children's access and participation in inclusive settings and natural environments and assist teachers and practitioners about the most effective ways to improve young children's development and learning outcomes, birth through five years. A significant revision of the DEC recommended practices began in late 2010, and DEC published the most current recommended practices in 2014. Since their development, the DEC recommended practices have been a frequently used tool for providing education and training for practitioners who work with young children with disabilities and their families and provided them with the skills and knowledge they need to create positive intervention programs.
The term "recommended practice" is used instead of evidence-based practices to realize that all practices will not be appropriate for all children and that the practices are likely to change as the knowledge base evolves in the field (Reichow, 2016). Buysse et al. (2006) highlighted two critical differences between EBPs and the recommended practices. First, EBPs are identified through an ongoing process of incorporating different steps that include formulating a guiding question, evidence retrieval, evidence appraisal, intervention selection, performance monitoring, and data-based decision making. Simultaneously, although the recommended practices are based on research knowledge, not all practices would meet the standards or criteria to be designated as evidence-based. Second, EBPs make individualized recommendations for individual children, whereas the recommended practices provide global guidance about what works for most children. Even though DEC

recommended practices are not a set of practices that have been deemed evidence-based, they do guide best practices in many areas and have been a beneficial guiding tool for practitioners who work with young children with disabilities and their families (Odom et al., 2005; Reichow, 2016).

Implementation

The effectiveness of EBPs is bounded by the quality, reach, and implementation. The recent emphasis on EBPs in special education is encouraging and necessary. However, identifying EBPs is insufficient without supporting their implementation and use in practice settings (Odom, 2009). Implementation is the critical link between research and practice (Cook & Odom, 2013; Dunst et al., 2013; Harn et al., 2013). Implementation of EBPs involves a myriad of complex and interrelated steps such as the relevance of the practice to the target environment, efficiency and practicality of the practice, available time, knowledge of EBPs and skills among the users, and the institutional context (Tseng, 2012). This has been addressed through the emerging field of implementation science by focusing on promoting end-users' (e.g., teachers, practitioners, or families) access, understanding, and utilization of EBPs (Eccles, & Mittman, 2006). According to Kelly and Perkins (2012), implementation science includes an understanding of the processes, procedures, and conditions that promote or impede the utilization of evidence-based strategies, interventions, and practices in everyday practice settings. Eccles et al. (2009) also refer to implementation research as the "scientific study of methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice (p.32)." According to Fixsen et al. (2013), the simple formula below represents the critical correlation of research efficacy and practice implementation in achieving positive outcomes:
Effective intervention × effective implementation = improved outcomes

This formula aligns well with an earlier conceptualization of implementation science by Glasgow et al. (2000), who developed REAIM framework. This framework represents multiple dimensions of implementation in determining the real-world impact of practice, including Reach-the proportion of the target population reached by a practice, Efficacy-the success rate of practice when implemented appropriately, Adoption-the balance of targeted settings that adopt the practice implementation, the proportion of interventionists who implement the practice with fidelity in real-world settings, and Maintenance-proportion of organizations (e.g., schools) and interventionists (e.g., teachers) who maintain implementation of the practice over time.

Fixsen et al. (2005) argue that to implement EBPs with fidelity, multi-level strategies are needed to succeed. The authors highlighted seven core implementation components that can impact improvement in practitioners' and end-users' behavior related to the implementation of EBPs. The seven core elements include staff selection, preservice and in-service training, ongoing consultation and coaching, staff evaluation, program evaluation, facilitative administrative support, and systems interventions (i.e., strategies to work with external systems to ensure the availability of the financial, organizational, and human resources required to support the work of the practitioners) (p. 29). These core components are critical to identifying and addressing obstacles to implementation and save the practitioners and end-users from the paradox of non-evidence-based implementation of evidence-based programs (Drake, Gorman, & Torrey; as cited in Fixsen et al., 2005).

Fidelity**.** The other very important factor within implementation science is fidelity. Fidelity refers to how a practice or practice model is delivered as intended by the researchers or developers. This is also commonly referred to as treatment integrity, procedural fidelity, intervention integrity, procedural reliability, or procedural adherence. High fidelity in the implementation of EBPs produces superior outcomes (Sharp et al., 2020). Generally, to implement a practice or program with fidelity, it is recommended to understand how to implement the EBP as intended, gather and organize the resources necessary for the implementation and adhere to the implementation procedures of the practice or program (Fixsen et al., 2005).

In ECSE, the lack of emphasis on implementation fidelity is more concerning in home visiting programs and practices (Azzi-Lessing, 2011). Home visiting program models include methods and procedures expected to promote parents' adoption of intervention practices with their children in their natural environment (Korfmacher et al., 2008). However, the absence of intentionally targeted training to promote practitioners' use of the home visiting practices and models are intended results in the large numbers of home visioning practices that are not implemented with fidelity (Hebbeler et al., 2012;

Odom, 2009). For example, in a study by Dunst et al. (2014), the authors reported that only half of the home visitors engaged parents in home visiting practices that included capacity-building characteristics as intended. Such findings result in the fact that if the practitioners are not implementing the home visiting practices with fidelity, parents should not be expected to use the home-based early intervention practices with fidelity.

Dissemination

There have been significant advances in ECSE in defining and establishing guidelines for identifying EBPs (Cook et al., 2016). However, communicating the research findings on EBPs to teachers, parents, and other stakeholders in meaningful and valuable ways has been the researchers' concerns in special education and ECSE (Cook, Cook, & Landrum, 2013). The research's ultimate goal is to develop knowledge to improve practice (Cook & Odom, 2013). If practitioners don't see the research implications, they will not utilize the research, and consequently, no practice improvement occurs. The audience for current research in the field is often other researchers rather than end-users such as teachers, practitioners, and families. Besides, most research findings are disseminated in a non-teacher/practitioner-friendly way or via traditional and passive methods (e.g., journal articles, research briefs) that are not often utilized by the practitioners who implement these practices (Thurlow et al., 2010). The traditional approaches and venues for the dissemination of research findings usually target like-minded researchers and scholars. These dissemination venues make it difficult for people closer to practice to connect with the result, comprehend, and quickly focus on the utility and feasibility of the practices. This might be one reason why many teachers and practitioners obtain most of what they need from the Internet in general, not specifically through valid and proven databases (Cook et al., 2013; Thurlow et al., 2010).

Also, the lack of teachers' and practitioners' informed opinions during the EBP review process imposes another missing piece. Educators and practitioners were left to sort through research that was not explicitly written for them in the past. In recent years, accessible and helpful resources have emerged to help educators narrow down their search for scientifically supported practices (e.g., What Works Clearing House (WWC), RTI Action Network, Best Evidence Encyclopedia). Even though these resources provide a better way to narrow down information on the numerous available practices, strategies, and interventions, they do not include practitioners and educators' reflection and judgment about the value, outcomes, and feasibility of those interventions and practices. There need to be opportunities for practitioners and teachers to include their informed opinions or professional judgment about the effectiveness of EBPs (Cook, 2014; Thurlow et al., 2010). Unless disseminating research is addressed in ways that are end user-friendly, the EBPs won't have the intended impact on achieving positive outcomes (Russo-Campisi, 2017). For instance, in ECSE, although the DEC recommended practices have been a helpful resource for practitioners, lack of dissemination due to a different mindset between researchers and practitioners has hindered effective widespread utilization of these practices.

Implications for Practice

Existing difficulties with identifying, implementing, and disseminating EBPS are not just an issue with educators, practitioners, and families. It is also a lack of understanding of the researchers and policymakers' part on making research more accessible and meaningful for classrooms outside of a controlled research setting (e.g., Mandell et al., 2013; Strain, 2018). Just because a practice has been identified as evidence-based does not necessarily mean that many teachers and practitioners will use it as designed over time. Although it is vital to determine which practices are evidence-based, it is just as crucial that researchers choose whether teachers and practitioners find EBPs acceptable, which aspects of EBPs teachers find problematic, and how they successfully adapt EBPs to work in their classroom and practice settings. To address these issues, there needs to be more investment in the trustworthiness, usability, and accessibility of EBPs. Through trustworthiness, the field needs to improve the confidence teachers, and practitioners can have in EBPs and their connections between the EBPs' conclusions and their job realities. Usability can enhance the practicality of the EBPs' findings for professionals closer to practice, and accessibility can facilitate making the findings of EBPs available in ways that are more convenient to families, teachers, and practitioners.

However, the trustworthiness, usability, and accessibility of EBPs cannot result in positive outcomes if the end-users and primary research stakeholders (teachers, practitioners, and families of children with disabilities) are absent during the process. This highlights the need for an effective partnership with people closer to practice. To invest more in trustworthiness, usability, and accessibility, the field needs to include these primary stakeholders as partners when deciding and conducting research. It seems that they are missing at the table when such decisions are being made. They are not well-informed about the implications and connections of the conducted research and EBPs to the realities of their profession and/or life. The field needs to make EBPs more relevant to the needs of end-users and people closer to practices who are implementing and/or utilizing these practices in an everyday setting and prove that the demands and achieved outcomes for implementation and use of these practices are feasible and reasonable.

Considering that research findings are more available to teachers and professionals during their preservice preparation and not so often when they are in service, losing to follow up with the practicing teachers and professionals is an area of concern that the field needs to address. In-service teachers and professionals need to have ready access to trustworthy information through multiple resources and professional development experiences. Accessibility has to include more than just the different distribution avenues like journal articles, presentations, etc. It should be offered through routes that are teacher/practitioner friendly. Those avenues might include local workshops, summits, and professional development activities and academies to disseminate the findings of EBPs and provide implementation support and resources to teachers and practitioners in an understandable manner. Addressing questions that are grounded in practice, involving practitioners and teachers in the evidence-based practices review process, collaborating with practitioners to establish the feasibility of implementation and focusing on interventions and practices that are efficient and manageable to implement, broadening the context for successful research demonstrations in everyday practice settings, and increasing interest in doing action research, center-based and school-based research provides an excellent basis for efforts to improve the perceived and actual usability of research. Such an effort would also enhance teachers' and practitioners' connection with the research outcomes and research findings' values.

If teacher and practitioner researches become a part of the profession, they can become more aware and conscious about their practices and build on their trust and acceptance of broader research that is being conducted in the field, use their research and reflections better to inform their practice in a cycle of continuous improvement and use teacher research to uncover explanations to their questions about the best way to improve implementation of EBPs that will result in positive outcomes for learners. Reflection on one's experience is an essential method of improving and building professional knowledge. It can result in a workforce that can critically influence the future of quality early childhood education. However, considering the EC profession's realities (e.g., low pay, burnout, high turnover, and attrition), there is a need for massive investment and incentives. Besides, teachers and practitioners often do not have much space and flexibility to modify interventions without compromising the integrity of the practice. Implementation of EBPs may also require that many teachers and practitioners change their instructional routines and adopt new techniques, a transformation many will find challenging. Such limitations usually result in the obstacles, and constraints teachers and practitioners face when implementing EBPs in the classroom and practice settings (Russo-Campisi, 2017).

The contradictions between fidelity of implementation and individualized instruction for students with disabilities have also been a barrier in special education. This issue can be solved by replacing the assumption that EBPs must be implemented with fidelity with the idea that educators have space and authority to make modifications and accommodations for students based on individual needs and available resources. Using the potential framework outlined by Fixsen et al. (2013), researchers, teachers, and practitioners could work together to design interventions that apply to the classroom based on available resources and training. Professional organizations should inventory of EBPs available to their members, including implementation toolkits, explicit descriptions, and modeling of how the practice(s) should be implemented (Snyder et al., 2015). Policies and systems should also be developed to ensure that ECSE teachers and practitioners have access to research-based, job-embedded supports, consultation, and coaching for high-fidelity implementation of effective practices and eliminating implementation obstacles (Korfmacher et al., 2008).

Research has found that teachers are more likely to adopt and sustain effective practices when

supports include ongoing professional development, feedback on the implementation of the practice, collaborative support of others implementing the practices, and student outcome data to assess and demonstrate the impact of the practice (e.g., Rush & Shelden, 2011; Snyder et al., 2015). To yield desirable child outcomes in ECSE, the field must continue to identify efficient and practical components for improvements in the identification of EBPs, the dissemination of EBPs, and the use of EBPs in everyday settings. Therefore, developing methods for increasing the utilization of these EBPs should be embraced and strengthened.

Primary support that underlies implementation is professional development. Enlightened approaches to professional development offer great promise for translating effective practices from the research settings to the classrooms, homes, and communities (Odom, 2009). Surveys, observational research, and qualitative interviews with teachers and practitioners are great avenues to provide this critical information. When designing professional development activities, it is essential to consider how implementation science can be best utilized to help ensure achieving optimal outcomes (Reichow, 2016). EBPs are not guaranteed to work for everyone and do not result in optimal outcomes for all children and students. Even when implemented with fidelity and over time, EBPs have relatively low rates of non-responders. Therefore, when selecting practices to be used in ECSE programs, teachers and practitioners must validate each practice's effectiveness according to the population they work with (Reichow, 2016).

Implications for Future Research

Implementation science plays a pivotal role in translating the promise of EBPs into positive outcomes for children with disabilities. These practices' potential benefit depends heavily on the quality, reach, and maintenance of implementation (Cook et al., 2013). Researchers need to continue to build relationships with teachers and practitioners in various settings and value the real-life experiences of professionals closer to practice (practice-based evidence) regarding what works in the classrooms and practice settings. The research-to-practice gap cannot be eliminated without considering and working through the differences between researchers' and teachers' experiences and practices. All voices must be valued and heard and represented in the literature to improve the identification, implementation, and dissemination of EBPs in the field of ECSE.

Future studies should also seek to understand how empirical and theoretical knowledge and literature outside of special education offer relevant insight into the effective implementation and dissemination of EBPs in ECSE and the field of special education in general (Cook & Odom, 2013). Such understanding can determine whether implementation and dissemination strategies that are shown to be effective in other fields with different populations also work in ECSE and special education to adapt and refine the existing strategy and optimize their effectiveness (Cook et al., 2013).

Implications for Future Policy

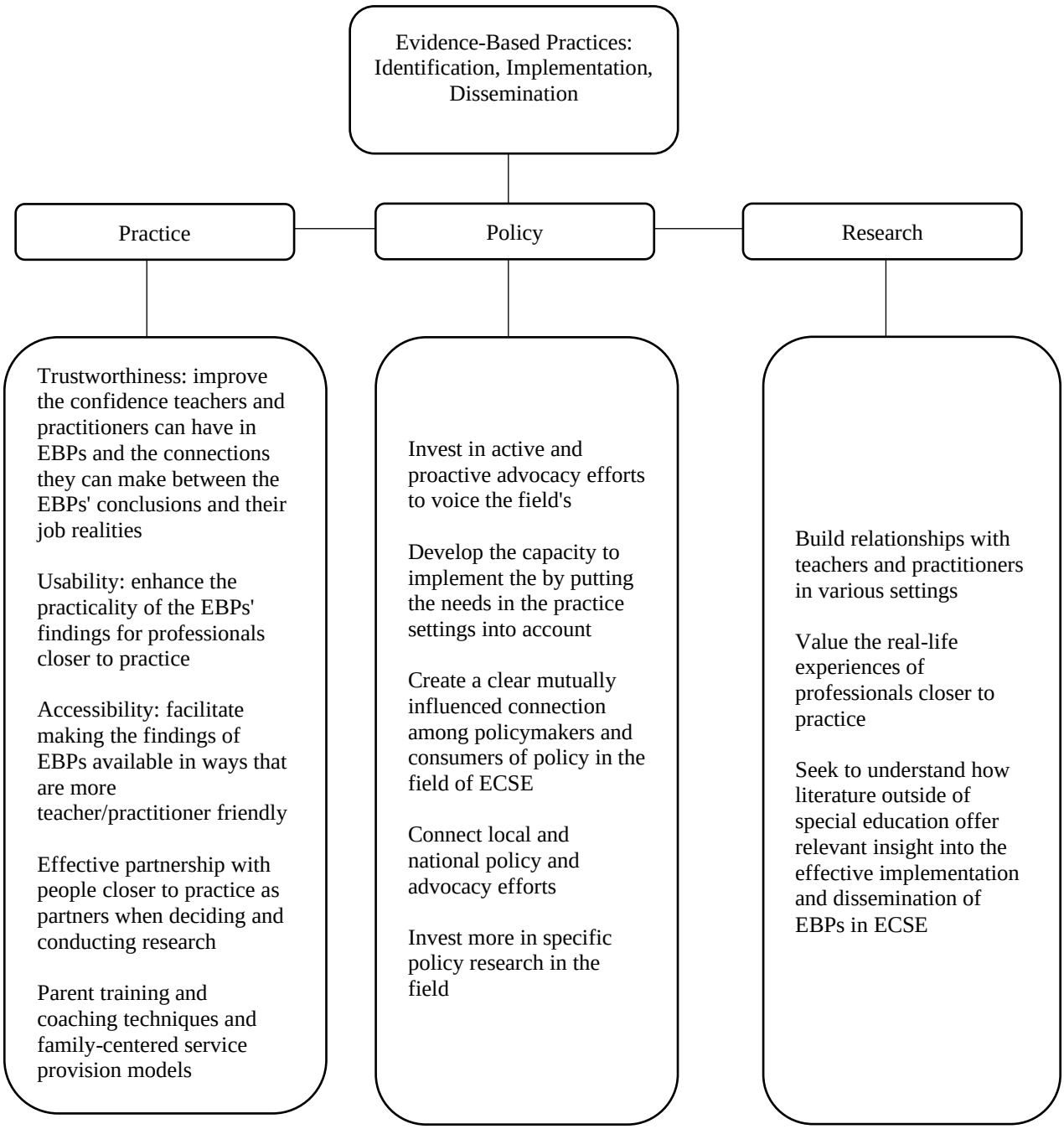
What has been discussed so far in terms of identification, implementation, and dissemination of EBPS highlights the importance of backward mapping and how that can make a meaningful contribution to fundamental changes needed in the field. Backward mapping will require active and proactive advocacy efforts to voice the field's needs regarding EBPs that result in positive outcomes for children with disabilities and encourage local and federal policymakers to rethink their decisions before they settle on a course of action.

Policymakers should fund evidence-based programs and need to invest in developing the capacity to implement the programs properly. Policy decisions in the field should put the needs in the practice settings into account. This can be achieved by providing program-level professionals opportunities to voice their opinions. The closer one is to the source of the problem, the greater is one's ability to influence it. The problem-solving capacity of complex systems depends not on hierarchical control but on maximizing discretion at the point where the problem is most immediate. This needs a clear, mutually influenced connection among policymakers and consumers of policy in the field of ECSE. Developing such a capacity would require educational settings to ensure that teachers and practitioners have the necessary support and training to implement EBPs and have ongoing

communication and collaboration with policymakers to discuss the outcomes and the need for further help.

It is also important to connect local and national policy and advocacy efforts and consciously develop policies that have high potentials to impact the field at the practice level. Such connection can be enhanced through allied organizations and committees that work as liaisons between practitioners, teachers, researchers, and policymakers to bridge research and practice gaps. Also, the field should invest more in specific policy research in the field. One of the contributions of research is to impact policy. Creating a targeted research line that investigates questions in need of urgent policy actions can help collect data to advocate for changes in the policy and, consequently, in practice. Please refer to Figure 1 for a summary of the implications.

Figure 1. Implications for Effective Identification, Implementation, and Dissemination of EBPs



Conclusion

This paper provided an overview of the EBPs in ECSE and addressed related issues and problems in identifying, implementing, and disseminating these practices. Moving toward achieving the goals of evidence-based ECSE may depend on the foundation of clear understanding, communication, and effective implementation and dissemination of science. As the gap between research and practice still exists, it becomes clear that bridging the research to the practice gap is a complex issue with many contributing factors. Although the field of ECSE has made considerable progress over the last decade and continues to translate evidence-based research into practice, a more open and informative discussion between researchers, policymakers, and practice level professionals is needed to ensure that all stakeholders are well-informed to direct the future steps toward the more efficient translation of EBPs into everyday practice settings.

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The Privatization of Education in Turkey from the 2000s: Between Educational Policies and Strategies of Local Actors

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The Privatization of Education in Turkey from the 2000s: Between Educational Policies and Strategies of Local Actors

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ABSTRACT

The privatization of education has become a global trend where many countries started to adopt this practice. That situation is also the case for Turkey, where over the past 20 years' private schools increased sharply at all levels of education. This article aims to understand the main reasons for the development of private schools in Turkey from the 2000s.This study, conducted when the Covid-19 pandemic broke out, has been devoted to the Covid-19 impact on private schools. This section aims to give a general overview of this impact and to perceive if this trend toward the privatization of education is going to be strongly broken.This study has a basis on an analysis of various scientific articles published in various academic journals, a review of critical studies on educational policies and educational sciences, international journal of educational development, dealing with the themes of privatization, privatization in education, and other subjects that have a direct and indirect relationship with our central theme. In addition, due to a lack of research in this area, to establish the general situation regarding the impact of Covid-19 on private schools, a small quantitative survey of an association of private schools was carried out. According to the result of the study, the first private schools in Turkey have a historical foundation However, the increase in the number of private schools over the past 20 years explains three main factors: (1) State policy and the incentives from international organizations; (2) Increase in the middle class and change in parental choice; (3) Difficulty in providing quality public education. Regarding the impact of the pandemic, the private schools most affected are said to be boutique schools because of the online education that imposed during this period. Regarding the impact of the pandemic, the most affected private schools would be the so-called "boutique schools" types because of the distance education that imposed during this period.

Keywords: Privatization, education system, Turkey, policies, organization international, quality, private schools, family

Introduction

Privatization has become a global trend. practiced in many countries, and this is in all sectors of activity. Privatization, which refers to "the transfer of activities, assets, and responsibilities from government/public institutions and organizations to private individuals and agencies" (Belfield & Levin, 2002, p. 19), is seen by many governments as a strategic solution, particularly to financing problems.

This practice does not spare the education sector. Indeed, as Belfield and Levin (2003) point out that "in many developing countries, the privatization of education has indeed brought about an increase in the share of private financing, sometimes at the basic education level" (p.11).

We see two distinct concepts; one is "privatization in education," and the other is "privatization of education." The first means privatization of an "endogenous" nature, which "involves the importing of ideas, techniques, and practices from the private sector in order to make the public sector more like business and more business-like» (Ball & Youdell, 2007, p.8).On the other hand, the second explains a privatization of an "exogenous" nature which "involves the opening up of public education services to private sector participation on a for-profit basis and using the private sector to design, manage or deliver aspects of public education" (Ball & Youdell, 2007, p.9).

However, the issue of privatization of/in education should be seen in a broader sense. Indeed, it engages a whole debate around several notions, such as the role and function of states and private and social actors in the education system. Moreover, it also raises questions about the public or private good, for example, whether education should be a public good or a private good. The practice of privatization in education brings changes in roles and responsibilities, which lead to a reshaping of education governance.

In addition, the privatization of education procreates value changes in the system. For many authors, the privatization of education leans towards more economic values, seen as a commercialization of education. Indeed, as also indicated by Altinok and Lakhal (2005), there is "a disembodiment of the educational sphere, passing from the social sphere to the strictly economic sphere" (p. 189). This situation is seen by many as an obstacle to the right to education and equality.

In this context, Locatelli (2018) stated "the need to recreate a space for democratic participation." Thus, Daviet (2016) proposes a new notion which is the "common good" as a "response to the challenges posed by the evolution of the global context and the transformations of the educational and intellectual landscape," in order to adopt "a humanist and holistic education." (p.2) Because the "principle of education as a public good [...] does not take into account the social, cultural and ethical dimensions of education" (p.8). This study aims to understand the main reasons for the development of private schools in Turkey during the last 20 years. Various socio-economic, political, and global factors can be discerned as an outcome of this phenomenon. This research will also help to understand the complex role of the state in the education system and the involvement of various actors in education, especially private actors. Moreover, it can shed light on the broad debate in the field of the privatization of education.

In this study, we will first outline the study's methodology and then explain the results by grouping under six themes in which we will enumerate the main factors that the research has defined as the reasons for the expansion of private schools. Moreover, with the current situation caused by the Covid-19 pandemic, which has hit everyone, we have tried to understand in general the impact that has caused in private schools.

Methodology

The objective of this study is to identify the different factors that are the main causes of the increase of private schools during the last 20 years in Turkey. In addition, since this study was carried out at the time of the outbreak of the Covid-19 pandemic, a small quantitative survey was carried out in order to give a general overview of the impact of Covid-19 and to perceive whether this trend towards privatization of education is going to be severely broken.

Table 1. Number of selected publications by years

Publications	Number	Year
Turkish	53	1989-2020
French	23	1999-2019
English	9	2001-2016

The study includes an analysis of various scientific articles and books published in various academic journals, journals of critical studies on educational policies, and educational sciences, international journal of educational development, dealing with the themes of privatization, liberalization, privatization in education, and other topics that are directly and indirectly related to our central theme. Many of these articles take the context of Turkey and, others have a more general approach.

Approximately we used 85 articles for this literature review. The main findings from the analysis of these articles have been organized coherently under six significant themes.

Approximately 85 articles from different. studies; qualitative, longitudinal, prospective, were studied for this literature review. The main findings from the analysis of these articles have been organized coherently under six meaningful themes.

Table 2. Researching articles process

Languages for the article	Key Word	Search Engines
Turkish	Eğitim sistemi, özelleştirme, eğitimde özelleştirme, eğitim politikaları, özel okullar, eğitimde kalite, uluslararası kuruluşlar	Google, Google Scholar, ResearchGate
French	la privatisation de l'éducation, la mondialisation de l'éducation, les politiques éducatives, la qualité de l'éducation, les écoles privées, des organisations internationales	Google, Google Scholar, ResearchGate, Institute of Education Sciences (Eric),
English	Privatization in education, liberalization, organization international, education policy, types of privatizations, private schools	

Table 3. Inclusion and Exclusion criteria

Inclusion criteria	Peer reviewed articles from 1989-2020
	English, French and Turkish language
	Focus on the privatization in education globally
	Focus on the privatization in education in Turkey
	Review literature methods
	Data on the private schools in Turkey
	Quantitative methodology
Exclusion criteria	Not original Data
	Privatization in higher education
	Focus of study does not answer research question

Collect general information regarding the impact of the Covid-19

For lack of research and data in this area, to provide a general overview of the impact of the Covid-19 pandemic on private schools, we have carried out a small quantitative online questionnaire developed on Google Form and consisted of 4 questions. The link of the questionnaire was sent to an association of private schools, and we received 66 responses in return. 78.8% of respondents were teachers, and 24.2% were administrators in the private school. The purpose of this survey is to collect general information to perceive the impact of Covid-19 in private educational institutions. Thorough research on this topic is not intended as part of this study.

Results

Studies on the history of private and public education

The history of private schools in Turkey dates back to the 1850s, before creating the Turkish Republic. At that time, private schools governed by the law of 1856 known as “Islahat Fermanı” in the period of Tanzimat (Küçükçayır & Cemaloğlu, 2017) that refers to the era of reforms in the Ottoman Empire between 1839 and 1876, were intended for minorities and foreigners living in the country. Cultural and religious reasons have been an essential factor in the establishment of these private schools. According to Uygun (2003), the latter has made an important contribution to innovation and improvement of the quality of Turkish education. Moreover, it is thanks to these schools that Turkish private education initially developed. In addition, wealthy families at the time provided their children with private lessons. Therefore, little by little, the need for private schools emerged in Turkey.

The Ministry of Education was established in 1857 during the last years of the Ottoman Empire. On the one hand, its objective was to maintain control over public and private education services so that they did not inculcate values contrary to the national interest and, on the other hand, to ensure that the education was carefully and thoughtfully. In 1876, freedom of education was introduced under the called “Kanun-i Esasi” law. Under this law, private schools were free to operate their activities, but the state ensures its supervision (Uygun, 2003).

It is interesting to note that the first Turkish private school named "Galatasaray Sultanisi" (Galatasaray High School) opens with state support in 1868 (Küçükçayır & Cemaloğlu, 2017); this was due to the new demand for quality education, as public schools could not meet this demand (Şimşek, 2014). As a result, wealthy families preferred foreign private schools for the education of their children.

Also, it is interesting to observe that the emergence of private schools in Turkey corresponds to a period of political instability and the decline of the Ottoman Empire. Moreover, there was a strong political

will to modernize Turkey through education with Western-style institutions. Thus, opening up to European-style education was supposed to improve the quality of education and modernize Turkey.

After creating the Republic, the first and most crucial period concerning private schools was in the 1980s. Indeed, from this date, the Turkish government established laws on private education such as Laws 1739 and 222, articles 27 and 42. These rules came due to the Constitution of 1982, and the opening and establishment of private schools were authorized. However, following point 42 of the 1982 Constitution, primary education in Turkey has been defined as a public right from which every child should benefit free of charge (Bakioğlu & Sarıkaya, 2015).

The second significant period goes back to the late 1990s and early 2000s marked by economic liberalization. In 1999, the coalition government of three political parties amended the 47th article of the constitution to adopt a privatization approach in the 1982 constitution (Angın & Bedirhanoğlu, 2013). Subsequently, the ruling Justice and Development Party (AKP) continued this pro-privatization trend, and in 2001 the privatization program in Turkey accelerated (Zaifer, 2015). Indeed, it is only from 2001 onwards that we gradually noticed the opening of private schools throughout Turkey. The rapid economic growth that the country experienced in 2004 affected the rise of the middle class, which consequently increased the demand for private schools.

Development and growth of private schools

Private schools have grown in size and mainly from 2010, with the number of private schools multiplying in all levels of education. Indeed, the number of private schools in Turkey has increased 27 times in 31 years. The table below illustrates this increase from 2010 to 2017. At the primary level, the number of private schools was 26 in 1980; this number increased by about 34 times to reach 898 in 2010. At the same time, the number of students enrolled in private schools has also increased. Between 2010 and 2017, the number of students enrolled in private elementary schools increased from 267,294 to 501,111 (Baryam, 2018).

Table 4. Number of private schools in Turkey

School years	Primary and secondary school		Technical and vocational school
2010/2011	898		24
2011/2012	931		45
2012/2013	992	904	126
2013/2014	1071	972	426
2014/2015	1205	1111	429
2015/2016	1389	1555	419
2016/2017	1274	1414	368
2018/2019	1808	2060	413

Source: MEB statistics (2017/2018 and 2018/2019)

The number of private schools and the number of students enrolled in them continue to overgrow at all levels of education. Moreover, the latest statistics from the Turkish Ministry of Education for 2018-2019 confirm this situation (National Education Statistics, Formal Education 2018/'19). Indeed, in the school year 2018-2019 the total number of private schools is 12,809 and the number of students studying in private schools is 1,440,577 for all school levels (p.41).

The table below shows the latest figures for private schools for the 2019-2020 school period. The total number of private schools is 13 870, and the number of students studying in private schools is 1 468 198. As a percentage of the total private schools is 20.2%, and the number of students enrolled is 8.8 %.

Table 5. Figures of private schools for the 2019-2020 school period

Level of Education	School/ Institution	Number of students
Total of Private Education Institutions (Formal Education)	13 870	1 468 198
Pre-Primary Education	5 655	289 213
Primary School	1982	274 018
Lower Secondary School	2351	347 495
Upper Secondary School	3882	557 472
General Secondary Education	3 481	448 554
Vocational and Technical Secondary Education	401	108 918

National Education Statistics, Formal Education 2019/'20

Types of school in Turkey

In the country, the different types of private school can be categorized into four groups as follows: Turkish private schools, minority private schools (schools founded by the Greek, Armenian and Jewish minorities under the Lausanne Convention), foreign private schools (schools founded by American, German, French and Italian citizens) and international schools only for international students (Dağ, 2015). These educational institutions are directed and managed by private groups or individuals from Turkey or abroad. and they can be either non-profit foundations or profit-oriented companies.

Among Turkish private schools, we notice different characteristics: those that offer the possibility of learning foreign languages, those with a religious tendency, those that give more opportunities for social, cultural, and sports activities, and finally, those that offer modern infrastructures with technological equipment amongst others (Açıkalın, 1989).

The public sector also offers different schools at the secondary and high schools levels, such as Anatolian high schools, science high schools, and social science schools (Ugyun, 2003). There are also religious secondary schools called "Imam Hatip", which are essential to the educational system. These high schools are based on Islamic education, and some parents prefer these schools to give their children an Islamic education. On the other hand, the public sector does not offer any divergence within its schools at the primary level.

In the Ministry of Education, there is currently a department called the Directorate of Private Educational Institutions (Özel Öğretim Kurumları Genel Müdürlüğü) which is responsible for monitoring and controlling private institutions (Tunç, 2006). The latter are obliged to follow the curriculum dictated by the Ministry of Education. Within this framework, there are exceptions for minority and international private schools. However, according to article 6 of the Private Education Law number 5580, schools can adopt different curricula provided they obtain the approval of the Ministry (Ilgar, 2014). Thus, Turkish private schools do not have much freedom concerning to the official curriculum.

Forms of privatization in education

Bellei states that "educational privatization is not a single policy but a family of policies" (as cited in Chevaillier & Pons, 2019, p. 32). We note that in Turkey, there are several forms of privatization implemented in education. Indeed, various forms of privatization are stated by different authors such as Pedro et al. (2015), Akman (2017), Adamson and Galloway (2019), Ball and Youdell (2007), Verger and Moschetti (2016), and Belfield and Levin (2003). Here, we will just mention the most practiced forms in the Turkish educational system.

Pedro et al. (2015) discuss three modes of privatization: the outsourcing of certain public services, the introduction of market-based or other self-regulatory instruments of governance, and the provision of schooling by private organizations.

The outsourcing and provision of schooling by private organizations are among the most common forms of privatization in the country. For example, in the former case cleaning services, canteens, and transportation of students are contracted out. The private sector provides transportation from school to home for students living far from school, and parents pay the cost of such transportation.

In addition, the goal of increasing the share of private education is included in the 2015-2019 strategic plan of the Ministry of National Education and the 65th government program (governed by the Justice and Development Party AKP). It states that "the share of the private sector in all levels of education will be increased" (Akman, 2017). As a result, several incentives have been given directly or indirectly to private institutions in various forms such as allocating public land to private companies, tax exemption, interest subsidies and vouchers.

As in most national contexts, in Turkey also, the dynamics of education privatization are pretty complex. Several actors such as families, various associations in education, trade unions, private school associations, teachers, universities, and others play an essential role in this educational context. Moreover, with the development of education privatization, private actors are beginning to have significant involvement in several aspects of education, for example in elaborating policies. Indeed, as Bolay pointed out, private educational institutions will be required to put in place policies in the areas of curriculum development, educational management, supervision, and evaluation (as cited in Kulaksızoğlu et al., 1999). Therefore, privatization leads to a decrease in government responsibility (Bayram, 2018). Thus the private sector assumes the role of responding to parents' demands by offering various educational institutions, such as foreign language, social activities, providing modern and technological equipment with new teaching practices.

The stakes of privatization

After the closure of complementary education centers in 2015, the school market in Turkey has gained new space. Indeed, "the Turkish government has abolished the complementary education centers by transforming them into private schools" (Garipağaoğlu, 2016). These centers were private establishments that prepared students for the national university entrance examination at the end of the secondary year. On the one hand, this fact has affected parents' choices and, on the other hand, the increase in private schools (Altun Aslan, 2019).

Moreover, on the one hand, the Turkish system encourages the private sector and, on the other hand, the need to increase the quality of public schools is also evident. Thus, there is a contradiction in the attitude of the state. Indeed, the state supports its competitors while at the same time needing to improve its public schools; this appears to be a paradox (Canerik, 2017). Hiz (2010) points out that the state allocates specific financial and material resources for private schools, while for public schools it provides an insufficient budget (Bakiroğlu & Sarıkaya, 2015).

Therefore, the main reasons given by some authors as arguments in favor of privatizing education in Turkey are financial resources for the state, to provide freedom of choice for parents, and to increase the quality of education. On the other hand, however, the privatization of education is also seen, on the one hand, as an impact on the increase of social inequalities (Levin, 2001; Özdemir, 2011; Sayılan, 2006; Kalaycı, 2002) and, on the other hand, it creates the danger of the commodification and commercialization of education. Indeed, Rizvi (2016) indicates that "something has changed in the vocabulary of privatization: it now seems to be linked to a neoliberal doctrine in which educational reform conceives increasingly in market terms" (p.7).

Moreover, education is a fundamental human right, and international declarations such as those of Incheon in 2015 testify to this. With privatization, the conception of education is drifting towards economic values. According to Şahin (2002), by transferring education to the private sector, education becomes a privilege for a minority who has money, creating a two-tier system, contrary to the principles of populism of the republic and human rights.

Main factors explaining the expansion of private schools

We observe three main factors that explain the growth of private schools in Turkey. We can classify these factors at two levels: the macro- level and the micro- level (Murpy, 1996, as cited in Akman, 2017). The first level is more related to economic and global causes, including the local and international economic context, the incentives of international organizations, and state policy. The second level, the micro- level, is more related to causes comprising parental choice and the quality of education.

State policy and the incentives from international organizations

In Turkey, education policies are mainly guided by the Five-Year Development Plans prepared by the State Planning Organization (Asri, 2015). Various international and national actors also play an essential role in changing these policies (Asri, 2015).

The economic and social context is still evolving with globalization and market liberalization. "Indeed, as Polat (2013), Yarnardağ, and Süslü (2002) point out, the influence of the dominance of economic markets by neoliberalism also has an impact on the Turkish education system.

In addition, international organizations have played and continue to play a considerable role in spreading privatization by influencing countries' educational policies. Indeed, international organizations, in particular the World Bank, the WTO, and the IMF, have played and continue to play a considerable role in spreading privatization by influencing countries' education policies.

According to Özdemir and Beltekin (2012), this is also the case for Turkey. They point out that particularly in the last 30 years, the IMF and the World Bank have played directly or indirectly an important role in the changes in education in Turkey through conditional credits paid to education projects. Indeed, "over the last three decades, the policies of the IMF and the World Bank have had a significant impact on the transformation of education" (p.52).

Turkey has started to receive conditional credits from the World Bank for the education sector since 1971 through various projects such as the "Education Project" in 1971, the "National Education Development Project" in 1990, the "Basic Education Project" in 1998, and the "Basic Education Project II" in 2002. These projects had two main objectives, one is visible in the agreements, was to improve the quality of education by improving subjects such as school buildings, teaching materials and teacher training. The second objective less visible in the agreements, hidden between the lines, was to "decentralize education, especially the financial autonomy and independence of schools, and, in the words of the Bank, to disseminate "educational management". (Özdemir & Beltekin, 2012) This concept, which appeared in 1970, brought with it a set of methods, ideals and concepts from the private sector" (Ball & Youdell, 2007, p. 21). Thus, Ball and Youdell (2007) tell us about a trend towards privatization of the education sector hidden by a language camouflaged with the term "educational reform" or "modernization."

In addition, Akkari and Payet (2010), Mazières (2012), and Santiago (2012) emphasize the globalization or homogenization of education through the actions of international organizations.
Furthermore, the economic situation of the country may lead to a tendency towards privatization. As mentioned by Bakiroğlu and Sarıkaya (2015) regarding the problem of financing education to reduce public spending on education, the government is moving towards privatization of education.

In Turkey, the system is somewhat centralized and the government mainly carries out expenditure on education. Relating data from the Turkish Ministry of Education in 2016, the government finances 74.2% of spending in the education sector. Indeed, rising education costs, inefficient teaching staff, inefficient use of resources, rising external debt, and increasing public spending make it challenging to finance education (Güngör & Göksu, 2013). Some authors, such as Ölçüm (1992), believe that privatization is a solution to Turkey's educational problems, stating that "privatization should give importance and the state's obligation to finance education should be reduced" (p.8).

In addition, education was used to inculcate the ideology of the political parties that were in government to shape society (Akyeşilmen, 2015). On the one hand, the Turkish system encourages the private sector, and on the other hand, the need to increase the quality of public schools is evident. Thus, there is a contradiction in the attitude of the state. Indeed, the state supports its competitors while at the same time needing to improve its public schools, and this appears to be a paradox (Canerik, 2017). Hiz (2010) points out that the state allocates specific financial and material resources for private schools, while for public schools it grants an insufficient budget (Bakiroğlu & Sarıkaya, 2015).

Increase in middle class and change in parental choice

In Turkey, from the 1980s onwards, with the liberal reforms, "many households experienced a significant improvement in their income and a consequent change in their lifestyle" (Danis et al., 2019, p.3).

As a result, the families' demands for their children's education have changed considerably over the last few decades. "Private supply may be the only recourse in the face of rising demand for education" (Belfield & Levin, 2003, p.34). Indeed, this is also the case in Turkey. According to Uygun (2003), families send their children to private schools because evaluation is better than public schools.

Thus, the privatization of education also allows families to choose the education they want for their children (Yirci & Kocabaş, 2013). With privatization, schools can adapt more quickly and easily to the wishes and expectations of students and teachers more flexibly and more efficiently.
Teaching a foreign language is one of the main reasons parents choose a private school for their children (Açıkalın, 1989). Furthermore, research shows that parents who opt for a private school do so mainly to the possibilities offered by these schools in terms of sports and social facilities, and the success rate of their students in passing the university exam (Erdoğan, 2002).

In addition, the private school market offers a wide range of school choices in terms of both price and quality that meet the demands of various family profiles. Indeed, there are well-priced private schools that are affordable for many middle-income families and upscale schools for more affluent families. One of the most important criteria when choosing a school is the school environment. Indeed, the most important reasons for parents' preference are the adequacy of the social and physical facilities of the school, the safety of the school, full-time education, the proximity of the school to the home, the quality of the shuttle service, and the environment where the child feels happy (Nartgün & Kaya, 2016).

Difficulty in providing quality public education and transfer of students to the private sector

Governments in Turkey have always faced several problems in the field of education. In addition, the rapid increase in the number of students in Turkey (Çelik, 2015) further affects the quality of education. According to Eyüboğlu (2002), private schools offer better education. Privatization may therefore be a possible way for the state to increase the quality of education (Yirci & Kocabaş, 2013; Ak Küçükçayır & Cemaloğlu, 2017).

Bolay identifies three main reasons for the development of private schools; the inability of public schools to cope with population growth, the decline in the quality of public schools, and parental demand for better education. (as cited in Kulaksızoğlu et al., 1999).

As a result, the government faces a particular difficulty in providing quality education, faces many problems, such as overcrowded classrooms in many public schools. As a result, "private schools also help governments by reducing excessive class sizes in public schools" (Dağ, 2015, p.195). According to Çokgezen and Terzi (2008), the performance of teachers and students in public schools is lower than in private schools.

Moreover, school performance also appears to be an essential element in the quality of education (Lauwerier et al., 2013; Sayed, 1997; Bergmann, 1996; UNESCO, 2007; Adams, 1993). Indeed, the Turkish education system is based on test exams that students have to pass several times to be able to study in a good school as and have the right to enter university. Thus, academic performance measures the capacity to pass these exams. Çelik (2015) notes that in 2013, %25 of students did not answer a question correctly on the exam. Thus, this shows that students leave high school with gaps.

In addition, external factors outside the school in determining the quality of education 66% (Yıldırım, 2012). Family characteristics play a greater role in school performance than school characteristics (Bakioğlu & Sarıkaya, 2015).

Overview Impact of Covid-19 on Private Schools

With the outbreak of the Covid-19 pandemic in March 2020 in Turkey, the education sector has also been affected. To deal with this pandemic, the government has decided to close schools by continuing distance education at all levels of education. All schools, including private schools, had to apply this regulation.

According to the survey, most people responded that private schools had been negatively affected due to the switch to distance education. Many parents have deregistered their children to place them in public schools. In addition, for the 2020-2021 school year, some private schools did not receive new registrations. Thus, 27% of respondents estimated that more than 2000 students have been transferred to public schools. 20% of respondents estimated that between 500 and 1000 highs went into the public. The 29.2% estimated that less than 100 students passed in the audience. We do not have exact numbers on this but we see how many transfers have been.

In addition, 43.8% of respondents indicated that they had known 10 to 50 private schools that closed during. the pandemic. On the other hand, 35.9% of respondents have known less than ten private schools which terminate their functions.

Respondents indicated that the private schools most affected were the small schools known as "boutique schools" because they encountered funding difficulties to pay the rents and salaries of their staff. On the other hand, we also have the people who participated in the survey who indicated that private schools were not affected in this period.

Finally, we can infer that the move to distance education affected private schools during the pandemic. Indeed, students in private schools were unable to use their school's infrastructure. In addition, parents had much more responsibility for teaching their children during this time at home. In addition, the Turkish National Ministry of Education established reasonably practical distance education system through different platforms such as TV, Digital Education Platform (EBA), which were accessible to all students without exception.

It seems that once the pandemic is over and students return to their classroom and school again, the growth trend of private schools will continue.

Discussion

The privatization of education allows families to choose the education they want for their children. Nevertheless, this choice can be made only among private schools where wealthy families can access it. Thus, wealthy families have more of this choice opportunity than low-income families. Indeed, we cannot speak of freedom of choice for the latter because the public sector does not give this opportunity. In the public sector, parents must enroll their child in a school located in their neighborhood.

Furthermore, according to Sarıer (2010), family income causes a problem regarding equal opportunities in education. In addition, inequality of access to quality education also arises. Ak Küçükçayır and Cemaloğlu (2017) advise investing in the quality of education to prevent income inequality from causing unequal access to quality education. According to Akman (2017) "in a sense, public education can seem like a variable producing poverty" (p.347).
But, on the other hand, children from less well-off families can access a private school through a scholarship. Indeed, private schools offer scholarships to students who score very high on the scholarship exam conducted by private schools. That can give students from. low-income families the opportunity to study in a private school. However, these scholarship exams are open to all students regardless of their social level.

In addition, the Turkish government encourages privatization in education by implementing incentive systems. Indeed, the study voucher, which strongly encourages the private sector put into practice in 2014. The study voucher named in Turkish “eğitim teşviki” is a practice that consists of supporting some parents who have enrolled their child in a private school by granting them a small sum as a contribution to school fees. Parents who want to receive this financial support must first enroll their child in a private school of their choice and sign a payment agreement with the chosen school. Parents then apply for the study voucher through the school. The conditions for obtaining this voucher are not very clear. Low-income parents are said to have the opportunity to receive it. However, in practice, we observe that this is not the case. In addition, even if they obtained this voucher, many low-income families, will not be able to afford the rest of the private school fees because the sum of the voucher only covers a small part of the total cost registration sum.

On the other hand, many public schools do not receive enough budget to pay their daily expenses. Indeed, the leaders of public schools have a minimal budget to cover the costs of their school. Thus, they take the initiative to find financial resources such as collecting donations in different forms. Parents, therefore, feel obligated to contribute so that their child can have a learning environment with a minimum of educational tools in the classroom. Hoşgörür and Arslan (2014) underline this aspect well in their research carried out with public schools, indicating that “lacking sufficient resources they (school leaders) had to create additional resources to keep the school alive” (p 11). On the other hand, Akman (2017) points out that the registration fees and donations that public schools request also show one of the business aspects of education.

Moreover, when we speak of private schools, the work situation of teachers practicing in these schools must also be addressed. Cerev and Coşkun (2020), who have researched the field, point out that the most critical. Teachers face working in private schools are their salary rights, such as working for low wages and insufficient job security. The basis of this problem relies upon the fact that private schools mainly provide education services with a commercial approach to make a profit, which has an impact on teachers’ working conditions. Thus, many teachers prefer to work in the public sector (Cerev & Coşkun, 2020).

Turkey said in its Education Vision 2023 that support would provide to finance educational institutions through collaborations with the private sector and civil society. The aim is to diversify the modes of financing in the field of education. Thus, we see a willingness to increase collaboration with the private sector to obtain funded support. It will be interesting to analyze the form of this collaboration. Nevertheless, we can deduce that the private sector’s role in education will increase in the years to

come. Thus, it is very likely that a change of role and responsibility will occur at the state level in the future. Thus, it remains to be observed and analyzed.

Conclusion

Through this study, we found three main factors that explain the lack of extension of private schools in Turkey: (1) International organizations and the global socio-economic context have their role in the growth of private schools. Furthermore, (2) private schools are seen as an effective means of increasing the quality of education that the public sector has difficulty providing. In addition, (3) the increase in the middle class has prompted changes in the parents' choices, increasingly demanding a better quality education appropriate for their child. Thus, the privatization of education also allows parents the opportunity to choose the education they want for their children (Erdoğan 2002; Ölçüm 1992).

Turkey's population is more than 73 million, of which about 29% are under 15 years old. Education is the cornerstone of a society and plays a colossal role in the country's development and for the well-being of individuals. Turkey is a country with a young and growing population, so providing quality education to this young generation is paramount. Private schools can be seen as a solution to meet the demand for quality education that Turkish families increasingly demand their children. However, an empirical study is needed to see whether private schools meet the demands of families and whether they do not create new challenges. According to Altun Aslan (2019), "the propagation of private schools has made issues of quality and efficiency in education controversial" (p.274).

In addition, like other emerging countries such as Brazil and Indonesia, Turkey has experienced substantial growth in the private education sector. The literature review analyzed here shows that the country's experience with privatization goes back a long way with the birth of modern Turkey. However, the forms of privatization of the last two decades are specific. On the one hand, there is a massification of privatization and private schools outside the elite circle. On the other hand, many actors intervene to impel this private offensive in education, such as the state, international organizations, and entrepreneurs.

Furthermore, Turkey's Education Vision 2023, which aims to develop collaboration with the private sector, will give more responsibilities and roles to private actors in the education area.

Thus, it is likely that privatization has spurred the diversification of the educational offer in the country. However, literature remains divided privatization contributes to increasing the quality of education for all in the country. Territorial and social inequalities remain massive.

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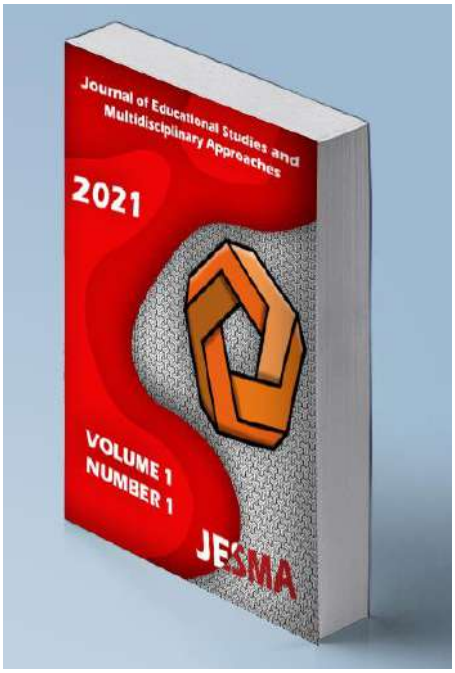

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Metacognition, Macrocognition and Moral Reasoning in Collaborative Team Decision-Making: Implications for Healthcare Education

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Metacognition, Macrocognition and Moral Reasoning in Collaborative Team Decision-Making: Implications for Healthcare Education

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ABSTRACT

Interprofessional education improves clinical practice by facilitating student practitioners' understanding of other provider roles, collaborative attitudes, and team behaviors. However, there is a paucity of research examining cognitive processes and mechanisms involved in collaborative decision-making in the interprofessional field. The purpose of this study was to assess the role of metacognition and macrocognition in communication and decision-making across individual and collaborative teams. 392 first-year graduate healthcare students representing eight disciplines read a vignette from the Defining Issues Test (DIT) of moral judgement and rated their moral decisions individually and as an interprofessional team. Mixed methods were utilized. Paired samples *t*-tests showed significant differences between individual and group scores for all six questions. Exploratory Factor Analysis identified three latent factors of the DIT: Accountability, Law, and Empathy. Mediation analyses found the relationship between Accountability and Empathy factors was accounted for by the Law factor. A Thematic Analysis supported these findings. Changes from perceived vulnerable accountability stem from metacognitive systems and psychological safety buffered by protection within the same system and grounded in medical law. This allows crucial communication and team cohesiveness in interprofessional teams, facilitating an ethical shared mental model that may benefit patient outcomes.

Keywords: Collaboration; decision-making; macrocognition; metacognition; moral reasoning

Introduction

Healthcare is an increasingly collaborative, interprofessional field and, as such, it is essential for healthcare professionals to collaborate and communicate with those from other health professions to assure the best practice for patient outcomes. Interprofessional education (IPE) should be considered as a means of improving clinical practice by developing an understanding of other healthcare roles and developing collaborative attitudes and behaviors (Waltz, 2020). IPE proponents assume that interprofessional practice is strongly associated with improving patient outcomes and managing unmet healthcare needs ((WHO), 2010; Anderson & Bennett, 2020). According to the Interprofessional Education Collaborative (IPEC), two of the core competencies are Teams and Teamwork and Interprofessional Communication (Batteson & Garber, 2019). Collaboration allows for deep discussions where students can compare opinions, debate topics, construct theories and share knowledge (Shukor et al., 2014). In general, the quality of patient care is dependent on the collaborative approach of multiple healthcare professionals making ethical and moral judgements while dealing with complex situations (Schut & Driessen, 2019).

Medical and professional schools are given the task of teaching future healthcare providers the necessary skills to handle difficult patient dilemmas (Madani et al., 2017). Because students are put into places of authority early on in their healthcare careers, their advanced studies must provide them with sufficient support throughout their moral and professional development (Hegazi & Wilson, 2013). Understanding ethical decision-making in teams is essential to the healthcare field because it is increasingly relying on interprofessional healthcare teams to make consequential patient decisions, calling for interprofessional ethics (Chen et al., 2020; Wiles et al., 2016). However, medical education fails to emphasize the skills needed for interprofessionalism during academic preparation, which leads to barriers in clinical practice (Batteson & Garber, 2019).

Despite the evident need for interprofessionalism in healthcare, relationships between healthcare providers from different fields remain conflictual, strained, and variable in commitment to interdisciplinary collaboration (Adamson et al., 2018). Team psychological safety allows interprofessional healthcare teams, composed of individuals from different disciplines, to communicate effectively and collaborate on shared tasks successfully (Edmondson & Lei, 2014). Without team psychological safety, engaging in interprofessional decision-making may be obstructed by low self-esteem, reluctance to discuss sensitive topics, and ignorance to multiple viewpoints.

Although IPE is recognized as important for health professional training and required to be in graduate curricula by most accrediting bodies, not much is known about the cognitive processes that drive effective teaching and learning strategies in the healthcare field and facilitate better outcomes when working in collaborative teams. The paucity of research on these cognitive mechanisms prevents educators from using learning models as frameworks to endorse collaborative behaviors in this context. Robust research on collaborative teams of early healthcare professionals is warranted to pinpoint possible cognitive mechanisms and processes responsible for successful team decision-making and cohesion. This is a critical initial step for IPE as the outcome competencies are more aligned with cognitive and behavioral skills rather than content knowledge.

Metacognition

Flavell (1979) originally defined metacognition as the knowledge about (awareness of one's thinking) and regulation of (the ability to manage one's own thinking processes) cognitive activities in learning processes (Veenman et al., 2006). Since Flavell coined the term "metacognition" in 1979, a large body of research stemmed from his initial idea (Veenman et al., 2006). One of the research fields in which metacognition has flourished is education (Rickey & Stacy, 2000). A review study suggested that metacognition is a powerful predictor of learning (Wang et al., 2015). Furthermore, Hattie (2009) conducted a synthesis of over 800 meta-analyses that related to student achievement and learning approaches and found that metacognitive strategies showed an effect size of .69 which shows a strong relationship between the variables.

Metacognitive strategies –such as self-regulation– are crucial for education, allowing students to guide their learning processes by defining their own goals, monitoring their process, and seeking out

help when needed (Darling-Hammond et al., 2020). Regulation of information allows the student to problem solve, be strategic in their learning approach, and evaluate what they know and what they do not. This regulation is crucial for students to develop higher level thinking competencies. More importantly for healthcare students, having the ability to regulate their knowledge may help them develop the skills necessary to collaborate with colleagues from other healthcare professions. Implementing concepts of metacognition into an education course and assessing its impact would benefit healthcare education research.

Metacognitive regulation underpins a range of teaching approaches, all of which were identified as having a high impact on student learning (Hattie, 2009). Research suggests that teaching metacognitive principles promotes students' academic achievements (Bransford et al., 2014). This demonstrates that a focus on metacognition is a valuable component in education. It is argued that a standard component of the taught curriculum in any school of education should be developing sound metacognitive strategies in student learning experiences (Bransford et al., 2014). Metacognition is not only important to, but rather central in formal learning. In order to produce high quality, successful students, educators must utilize metacognition as a learning framework to inspire reflective and advanced thinking. Thus, it is evident that metacognition is a critical skill that must be targeted and taught in the education system.

Macrocognition

Macrocognition is an approach to developing new knowledge among interprofessional team members (O'Hara et al., 2018). Macrocognition research focuses on cognitive processing, goal-oriented action, and how cognition adapts to complexity (Ward et al., 2017). There are five functions of macrocognition: sensemaking, re-planning, detecting problems, deciding, and coordinating (Patterson et al., 2020), all of which are essential for effectively working in interprofessional teams. Teams tend to distribute macrocognitive functions in various ways among members (Wagner et al., 2019). During critical decision-making, 60% of macrocognition consists of sensemaking, anticipation, and communication processes (Lin et al., 2019). To further examine critical decision-making in teams, researchers should consider macrocognition as a framework. Previous research has found a lack of macrocognition in clinicians, leading to inaccurate understanding of patient situations (Islam et al., 2016).

Morality

In addition to the metacognitive skills, such as communication and teamwork, needed to arrive upon an accurate diagnosis, processes such as cognitive moral development are essential to the healthcare field. For example, the growth of cognitive moral development enhances clinical reasoning – a required skill for healthcare practitioners – which is crucial to learn during medical education (Min Simpkins et al., 2019). Clinical reasoning combines medical goals of care with ethical judgments, mediated by values and morals (Paes et al., 2019). Likewise, professional identity formation is a fundamental process during the training of healthcare professionals, highlighting the establishment of core values, moral principles, and self-awareness (Holden et al., 2012), all of which are dependent on metacognition. Cognitive moral development, clinical reasoning, and professional identity formation all emphasize the importance of moral decision-making, or morality, which are becoming increasingly used in interprofessional fields. Combining these three core concepts of morality in interprofessional healthcare, this study examined metacognition and macrocognition by administering a test of morality in healthcare students working in interprofessional groups.

Relevance to Healthcare Education

It is known that early healthcare students have difficulties applying conceptual knowledge to clinical cases, that they lack metacognitive awareness, and that higher-level cognitive actions correlate with diagnostic accuracy (Kiesewetter et al., 2016). The Defining Issues Test of Moral Judgement Development (DIT) has been used in studies on individual professions in the healthcare field (i.e., medicine, nursing, dentistry, pharmacy, occupational therapy, physical therapy, veterinary medicine, allied health, and clinical laboratory sciences; (Reale et al., 2018). However, no previous study has used

the DIT as a moral development test in interprofessional groups. The medical and healthcare field is an integrated practice, so to fully understand the collaboration and ethical judgement of practitioners, researchers must look at participants as they work in interprofessional teams. In current medical education, there is a correlation between a regression in moral development and clinical teaching (Hren et al., 2011). Although clearly an important issue, medical education has yet to engage in interprofessional collaboration for the purpose of advancing students' professional identity formation and reducing unnecessary diagnostic errors.

Need and Significance

The purpose of the research was to assess the role that metacognition/macrocognition might play in differences in communication and decision-making between individuals versus in collaborative teams. This paper reports an analysis of pre- and post-test scores using the Defining Issues Test of Moral Judgement Development. The current study addressed several research questions. The first study aim was to identify if individuals scored differently on the DIT when they were in interprofessional teams versus when they were answering the questions on their own. Second, our study tested whether interprofessional teams scored more ethically than when answering as individuals. Our hypothesis was that using a moral reasoning tool, such as the DIT, with interprofessional teams would facilitate macrocognitive learning and group decision-making, differing from regular metacognition. The goal of this analysis was to explore if macrocognition should be at the basis of IPE learning. Implications of the analysis on the importance of collaboration in medical education and interprofessional team science education are discussed.

Methods and Materials

The Defining Issues Test of Moral Judgment Development (DIT) (Rest et al., 1974) is an easy-to-administer test that was developed to assess the understanding and interpretation of moral issues. Although it was initially conceptualized based on Kohlberg's developmental stages (1969), the DIT shifted to a developmental model that sees growth as a gradual shift from lower to more complex conceptions of social and moral cooperation, known as Rest's Four Component Model (Rest, 1983). The Four Component Model identifies four abilities necessary for effective moral functioning: ethical sensitivity, moral judgment, moral motivation, and moral character (Bebeau, 2002). Expanding on Kohlberg's measurement of moral justice, Rest incorporates moral action in the DIT framework, which is considered essential to decision-making (Ellertson et al., 2016).

The DIT examines this model of moral development based on schemas, which organize the information from life events and act as an aid to individuals while they gain novel knowledge (Rest et al., 1999). Used in over 40 countries and across various disciplines, the DIT is the most widely used measure of ethical judgement and moral development. The DIT has been used in multiple studies measuring the association between ethical development, ethical action, and ethical decision-making (Center for the Study of Ethical Development, 2017). The present study is using the DIT to examine decision-making, specifically looking at metacognition and macrocognition to analyze how people make their ethical and moral decisions in healthcare teams. The DIT is scored using four questions ranked in order of importance. These rank scores are summed to represent each moral stage. The answers fall into a three-level model that was designed based on Kohlberg's original six stages of moral development. These three moral schemas are: the Personal Interests schema, the Maintaining Norms schema, and the Postconventional schema (Thoma & Dong, 2014). Each scale score discriminated significantly among age groups ($p < .01$), as did the Principled Morality score (P-Score). The P-score indicates the level of moral reasoning. The validity of the P-score with respect to age group was estimated to be .48 (Martin et al., 1977). The reliability based on test re-tests and internal consistency is high with an estimated .70-.80, meaning that this test is highly reliable in assessing moral reasoning, further validating our results.

Procedure

This study gained approval from the Institutional Review Board (IRB) prior to initiating study procedures. Participants read a vignette based on Lawrence Kohlberg's (1969) semi-structured moral development interview that targets a moral dilemma. The vignette describes a person requesting a lethal dose of medication prescribed by a physician to alleviate her pain in her end-of-life phase, also known as physician-assisted suicide. According to the American Medical Association, physician assisted suicide occurs when a healthcare professional facilitates a patient's death by providing the means or information necessary for a patient to take his or her own life (AMA, 2016). Physician assisted suicide has been debated in the United States for decades ("Physician-assisted suicide: toward a comprehensive understanding. Report of the Task Force on Physician-assisted Suicide of the Society for Health and Human Values," 1995). The vignette was chosen to describe a relevant healthcare dilemma that is proven difficult and fraught with opportunity for error.

> "Mrs. Bennett is 62 years old, and in the last phases of colon cancer. She is in terrible pain and asks the doctor to give her more pain-killer medicine. The doctor has given her the maximum safe dose and is reluctant to increase the dosage because it would probably hasten her death. In a clear and rational mental state, Mrs. Bennett says that she realizes this; but she wants to end her suffering even if it means ending her life. Should the doctor give her an increased dosage?"

After reading the vignette, participants had to initially decide as individuals what course of action the character should take in the moral situation. Next, they were instructed to rate six short-response statements (see Table 1) on a five-point scale ranging from "great importance" to "no importance" (Martin et al., 1977) in making their ethical judgement (Thoma & Dong, 2014). The participants then ranked the four most significant items in order of importance in making their decision. Once the participants finished the individual portion of the DIT, they were placed in interprofessional teams of six to eight people and were instructed to discuss their answers and come up with a consensus on a group answer.

Table 1. *The Six DIT Questions*

Question 1	Isn't her healthcare team obligated by the same laws as everybody else if giving an overdose would be the same as killing her?
Question 2	Does the state have the right to force continued existence on those who don't want to live?
Question 3	Wouldn't the healthcare team feel guilty from giving Mrs. Bennett so much drug that she died?
Question 4	Would the healthcare team show more sympathy for Mrs. Bennett by giving her the medicine or not?
Question 5	Should the healthcare team deny her this option and continue with the current prescription?
Question 6	Should the healthcare team nominate a leader from amongst them best suited to deal with the situation?

*Note***.** Six questions from the DIT, defining issues test of moral development, were given to the students.

Each student then reflected on how and why they came to their conclusion when working as individuals and when working as an interprofessional team by responding to an open-ended question. The open-ended question was required to submit for a grade in the course. The open-ended reflection question was phrased as:

> "Working alone (without discussing with other members of the group), please reflect on the answers you gave earlier as an individual and those that were by agreement of the group. Identify what you see as the similarities and differences."

The open-ended questions were imported and coded in the qualitative program NVivo (March 2020) to structure the analysis. Written responses ranged from a few words to several paragraphs. The responses were coded by one author (MC) into relevant and repetitive themes. Responses were placed into several categories if appropriate. The results were then discussed and debated between the two authors (MC & TB) to come to a consensus. Three themes and subthemes were distinguished with a description, keywords, and common phrases. Common keywords and phrases were displayed with percentages of how common they were addressed. This particular moral issue targets the moral reasoning dilemma of property rights versus value of human life (Martin et al., 1977). Given the health disparities currently experienced by millions of Americans, and the negative impact that social determinants of health have on health outcomes for sub-populations, being able to train pre-licensure health professionals to be able to consider 'the value of human life' collaboratively and fully could improve health outcomes for many communities.

Sampling

392 first-year graduate healthcare students at a medical university in the Midwestern USA participated in the study (male= 44%). Students participated in this study as part of a first-year course on interprofessional healthcare practice. Eight programs were represented: Medicine (31.2%), Psychology (2.3%), Podiatry (16.3%), Pharmacy (9.8%), Physician Assistant (11.7%), Pathology Assistant (5.8%), Physical Therapy (8.3%), Nurse Anesthesia (2.5%), and non-degree students (12.1%).

Ethical Considerations

The quantitative and qualitative data was collected in a scheduled IPE classroom setting and the study was part of the educational activities focusing on IPE teamwork. The participants were given informed consent the prior week and were offered alternative classwork to do if they did not want to undertake the study. Students were informed that they could stop participating at any time and could ask for their data to be removed at any time. All data was kept on the PI's computer that was password protected. Participation in the study resulted in minimal risk to students.

Ethical review board name: Rosalind Franklin University of Medicine and Science
Date of ethics review decision: August 14 the 2019
Ethics assessment document issue number: NHS12-002.

Findings

A paired-samples t-test was conducted on the data and reported a significant difference between individual and group scores $t(385) = 35.1$, $p < 0.001$. Significant differences were also found between the change scores in both the individual and group scores for all six questions.

Exploratory Factor Analysis

Threats to the construct validity of the DIT have been highlighted in previous research (Bailey, 2011). To test for this and to assess if there were differences in loadings between individual and group scores, an EFA was run on the data to assess the construct validity and to explore what underlying

constructs would emerge with this sub-population and context. Additionally, the EFA determined if the scores from the six DIT responses for individuals and the six DIT responses from groups clustered together or in dimensions (see Table 2). Monte-Carlo Parallel Analysis is a simulated EFA that assists researchers in determining how many factors have emerged and is used alongside the Cattell (1966) rule and eigenvalues. A Monte-Carlo Parallel Analysis evidenced a three-factor solution: accountability (individual; metacognition), law (teams; metacognition/macrocognition), empathy (decision-making; macrocognition).

Table 2
Factor Loadings Based on Questions

Factor 1	1. Isn't her healthcare team obligated by the same laws as everybody else if giving an overdose would be the same as killing her?	Individual
	1. Isn't her healthcare team obligated by the same laws as everybody else if giving an overdose would be the same as killing her?	Group
	2**.** Does the state have the right to force continued existence on those who don't want to live?	Individual
	3. Wouldn't the healthcare team feel guilty from giving Mrs. Bennett so much drug that she died?	Individual
	5. Should the healthcare team deny her this option and continue with the current prescription?	Individual
Factor 2	2**.** Does the state have the right to force continued existence on those who don't want to live?	Group
	3. Wouldn't the healthcare team feel guilty from giving Mrs. Bennett so much drug that she died?	Group
	5. Should the healthcare team deny her this option and continue with the current prescription?	Group
Factor 3	4. Would the healthcare team show more sympathy for Mrs. Bennett by giving her the medicine or not?	Individual Group
	6. Should the healthcare team nominate a leader from amongst them best suited to deal with the situation?	Individual Group

The first dimension (Accountability; accounting for 22.3% of the variance in the data set) consisted of five of the items from the DIT. Four out of the five items were from the Individual DIT scores. The highest loading item was question 5 for individual scores: "Should the team deny her (the patient) this option and continue the current prescription?" (.71). The lowest loading item was question 1 for group scores: "Is the team obligated by the same laws as everyone if the overdose kills her?" (.41). Reliability analysis of dimension one reported a Cronbach's Alpha of .66.

The second dimension (Law; accounting for 12.8% of the variance in the data set) consisted of three items from the DIT group scores. The highest loading item was question 5 for group scores: "Should the team deny her (the patient) this option and continue the current prescription?" (.75). The

lowest loading item was question 3 for group scores "Would the team feel guilty about killing the patient with the high dose?" (.73). Reliability analysis of dimension two garnered a Cronbach's Alpha of .67.

The third dimension (Empathy; accounting for 10.5% of the variance in the data set) consisted of four items from the DIT individual and group scores. The highest loading item was question 6 for group scores: "Should team members nominate a leader best suited to deal with this situation?" (.73). The lowest loading item was question 4 for individual scores: "Would the healthcare team show more sympathy for Mrs. Bennett by giving her medication or not?" (.43). Reliability analysis of dimension three garnered a Cronbach's Alpha of .12 (Table 3).

Table 3

Cronbach's Alpha and ICC of factors.

Dimensions	Cronbach's Alpha	Significance	95% CI Lower	95% CI Upper
Accountability	.66	p <.001	.61	.71
Law	.67	p <.001	.61	.73
Empathy	.12	p = .05	.03	.26

Note. Preliminary results of interest on the three dimensions found.

The first factor was accountability, as 4 out of the 5 items were from the individual scores and reflected accountability to Mrs. Bennet's health over her wish to end her suffering. This was reflected in the top loading item "Should the team deny her (the patient) this option and continue the current prescription?" Furthermore, because the first factor included mostly individual items suggests that this factor represents the participants answering metacognitively as individuals without group discussion.

The second factor was Law, which had only group items included in it. The top loading item was the same as the first factor "Should the team deny her (the patient) this option and continue the current prescription?" but was a group item and not an individual on suggesting that the team answered this together having the same concerns as they did as individuals. The other two items reflected state laws around euthanasia and medical overdoses. This factor also suggests that the team is coming together to work as a group.

The third item was Empathy and included both individual and group items. The top loading item was "Would the healthcare team show more sympathy for Mrs. Bennett by giving her medication or not?" which suggests that the group was being empathic of Mrs. Bennet's situation. Furthermore, because the two items in this factor were both individual and group it suggests that the team were able to discuss the issue both metacognitively and macro cognitively as a team. The naming of the factors was also influenced from the results of the qualitative data. The pattern of individual/group items across the three factors was of interest to us so we ran an ANOVA to explore this further.

ANOVA

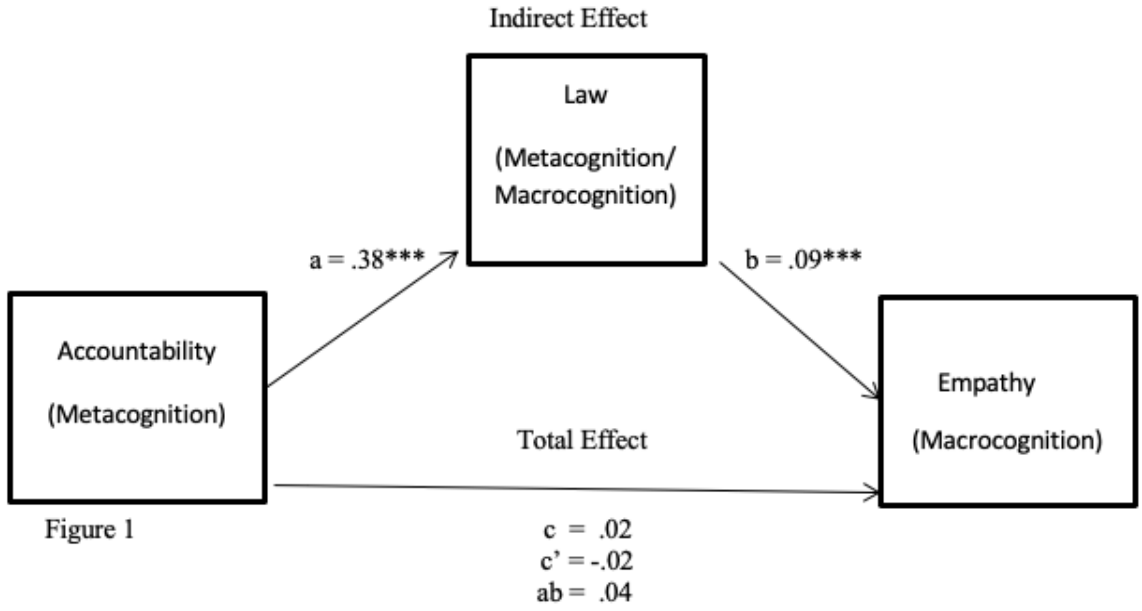
Once three dimensions were found in the results, the relationship was examined between the groups to assess for significant overlap. A one-way analysis of variance was conducted on the factors to ascertain the possible relationship between Accountability, Law, and Empathy. Statistically significant differences were found between all three factors. There was a statistically significant difference between Law, Accountability and Empathy, $F(223, 391) = 5.38$, $p<.001$, with Law having the highest mean (M=3.07), followed by Accountability (M=2.68) and finally Empathy (M=2.52).

Mediation

After finding significant differences between all three dimensions, the factors were examined as a predictive model to assess the order of underlying cognitive processes. A mediation analysis was run on the factors to explore a possible predictive model of collaborative decision-making. The mediation model was run using PROCESS with Accountability as our independent variable as the participants answered the questions by themselves in the first instance and the items under the accountability factor reflected this. Law was our mediator as the items reflected the students working together, and Empathy was our dependent variable as it reflects patient care. This order best reflected our research goals of assessing the change from metacognition to macrocognition to test the mediation, in which a bootstrap confidence interval was examined. The overall model was significant, $F(1, 390)= 40.54$, $p<.001$. The bootstrap confidence interval: [.003, .08] does not include 0, therefore showing significance. This indicates that the relationship between Accountability (metacognition) and Empathy (macrocognition) was mediated by Law (metacognition/macrocognition; Figure 1). Effect sizes are calculated to assess the magnitude of the relationship between variables, which provides more information to the researcher than relying on significance alone. The indirect effect size between Accountability and Law was .38 and considered a medium effect, conversely the indirect effect size of Law on Empathy was small at .09. This suggests that Accountability (metacognition) and Law (metacognition-macrocognition) have a stronger relationship than Law (metacognition-macrocognition) has on Empathy (macrocognition) and teams moving from individual thinking to group thinking happens when shared Accountability occurs.

Figure 1

Mediation Model from Responses



Note. This figure demonstrates the indirect effect as a result of our mediation model.

Qualitative Research Findings

Interprofessional groups filled out forms individually explaining their thought process and how they came to conclusions on the task individually and with a group. Feedback from students was divided into four separate themes: different perspectives, accountability, law, and empathy (see Table 4 in Appendix). The themes from the student responses to the open-ended questions reflected the findings of the path model. Students confirmed that they would be nervous to make moral decisions on their

own but when in groups could share perspectives and knowledge of medical law allowing them to be more empathic to their patients.

Discussion

The purpose of the research was to explore what cognitive mechanisms may be involved in learning behavior, facilitation of collaborative behaviors, and changes in thinking from a meta to macro level among pre-licensure healthcare students. One of the main cognitive mechanisms implicated was the psychological system safety in groups. It was found that law mediated the relationship between accountability and empathy and concluded that psychological safety in groups allows for the understanding of laws and can facilitate the evolution of individual decision-making, diminishing individual accountability, leading to more empathic patient centered care. Once these thought processes are fully explored through research, they can be included in pre-licensure curriculum to ensure proficient learning of collaborative behaviors. Our hypothesis was that metacognition and macrocognition could play a central role in facilitating student learning of collaborative behaviors but there has been a paucity of research examining these processes in this context. Although macrocognition is a fairly new construct, metacognition has been an integral component of mainstream education for over four decades but has not yet been thoroughly examined or included in the IPE and research field. Furthermore, there has been no research on exploring a mediation path model of what mediates the change from thinking as an individual healthcare provider to thinking collaboratively about patient needs.

Result

Three dimensions were discovered: Accountability, Law, and Empathy. These dimensions have all been found to impact clinical decision-making, increasing the relevancy of our findings to medical students. Numerous studies have found that accountability impacts clinical judgments among healthcare providers by motivating them to achieve accuracy, enhancing their biases towards patient diagnoses, such as chronic pain (Chibnall et al., 2014). Additionally, medical institutions are responsible for teaching students the principles of medical ethics, the legal responsibilities of physicians, and the professional aspect of clinical practice (i.e., attitudes and behavior) (Parker et al., 2018). Lastly, the ability to see the world from someone else's perspective and to understand or feel what that person is feeling has been found to be a multi-faceted skill and prized asset to healthcare providers (Ekman & Krasner, 2017).

Results from the study are suggestive of differences in moral reasoning scores in individuals compared to collaborative team decision-making and the possible underlying cognitive constructs involved in metacognition and macrocognition in team decision-making. We found significant differences in DIT scores between individuals and groups, with groups scoring higher (ranked items as more important) on the DIT than individuals. This finding highlights that groups feel more secure, because they perceive to have more psychological system safety (Edmondson & Lei, 2014) working together. This has never been factored into IPE and practice.

Using the DIT as both a stimulus and outcome in this research allowed the DIT to act as a simulated case that can drive serious discussion in interprofessional classroom settings and can act as a proxy for the Values and Ethics competency of the interprofessional domains (IPEC, 2016). The factors that emerged appear to reflect psychological system safety barriers to treatment of patients from an individual level to a group level possibly confirming that interprofessional practice could improve holistic patient outcomes if pre-licensure training included robust cognitive approaches to learning that included metacognitive and macrocognitive components. This would allow not only regulation of information facilitating problem solving in novel situations but also assist in the students to be able to regulate new and old knowledge and develop macrocognitive skills to enable them to successfully develop a shared mental model with their colleagues and fully collaborate and adapt to complex situations to ensure the best outcome for their patients (Ward et al., 2017). The qualitative data supports these findings as the students reported that they felt more secure making decisions for Mrs. Bennet

when in groups rather than individually. Our findings are important because interprofessional practice could best be utilized in addressing population health issues surrounding chronic health conditions and health disparities and the need to focus on the patient's environment (social determinants of health). Healthcare practitioners need to learn how to 'do healthcare' differently to serve those at heightened risk and need and these findings may assist in early training models.

Our findings posit that the change from perceived vulnerable accountability stems from metacognitive system/psychological safety (Edmondson & Lei, 2014) and is buffered by protection within the same system and shared macrocognition grounded in medical law. This allows crucial communication and team cohesiveness in IP teams facilitating an ethical shared mental model that may benefit patient outcomes. Assessing the cognitive processes underlying the evolution of metacognition to macrocognition in a team-based healthcare scenario has not been conducted before. The results of this study have highlighted not only possible cognitive mechanisms that mediate this process but also provide important components that need to be included in the design of future interprofessional team-based educational programs for pre-licensure healthcare students. Research has proven that healthcare students must be trained in metacognitive skills, such as thinking about their thinking processes, reflection on their knowledge and skills; beliefs about personal norms, values, and morals during their graduate education (Wilhelmsson et al., 2012). Our findings show gaps in current healthcare professions education regarding metacognition, macrocognition, and shared decision-making. It is important that pre-licensure healthcare programs provide their students with a solid foundation of metacognitive and macrocognitive skills, essential for every aspect of their future profession.

Limitations and Recommendation

This study took place in a classroom setting, which led to several confounding variables that could not be controlled for, such as classroom distractions, time limitations and a full discussion of the importance of a shared mental model after the study had finished. This study also lacked the ability to assign participants to a control group. In addition, because this project was part of a larger parent study, the prompt was not directly assessing the hypotheses of the current study. Without direct instructions to mention their change in thought process after the group discussion, it was difficult to discern when the change from metacognition changed into macrocognition. Most of the answers addressed whether their group responses were similar or different than their personal responses, however details of these similarities and differences were relatively vague. In other words, the students may have explained their cognitions but did not expound what metacognitive skills they used while deliberating this assignment. In addition, without a more precise prompt, many responses reflected non-complete decisions, such as "we must talk to an ethicist and read the laws."

Future studies need to replicate the research design with a different experimental measure of moral reasoning and decision-making that has wording and instructions more suitable to first-year pre-licensure healthcare students. This study was completed by interprofessional healthcare students who seemed to lack an understanding of the morality task or the relevance of the task to their profession. To better involve the student participants, it could be beneficial for researchers to create a fictional vignette that focuses on an interprofessional patient case. An interprofessional patient case could interest a wider variety of students, including those who may not act as the primary physician in direct patient care. Another future direction for this research is to create a standardized patient video simulation that the participants would view in lieu of reading the vignette from the DIT. This simulation provides for a realistic patient experience, which should increase the relevance of the activity for the students. To test if the moral vignette portrayed by the standardized patient is effective in the moral reasoning of the participants, there could be two groups of student participants, a control group that watches a regular patient simulation video and the experimental group who will watch the moral reasoning simulation video. Future qualitative studies may directly ask for what the final decision should be, requesting a definitive answer. Furthermore, future studies could benefit from multiple choice answers regarding their final decision to provide some guidance in the scope of the task and a basis for their group conversation.

Conclusion

IPE can impact clinical practice by facilitating student practitioners' understanding of other provider roles, collaborative attitudes, and team behaviors. Our results suggest there are differences in individual moral reasoning in comparison to deciding on moral decisions in a collaborative team which seems to be grounded in psychological system safety. Based on our findings, there are underlying cognitive constructs involved in metacognition and macrocognition that are utilized when collaborating within a team and therefore these constructs should be implemented in education courses. These findings are a significant contribution to advances towards understanding team behavior and further developing effective interprofessional healthcare education. Understanding macrocognitive processes in interprofessional teams can help shape and improve medical education by emphasizing the teaching of macrocognitive skills that will facilitate collaboration in healthcare teams.

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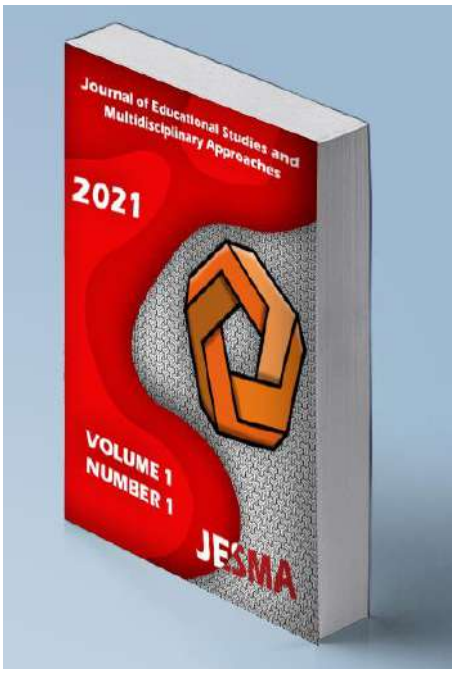

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ABSTRACT

In general, deaf education is a relatively neglected field, which needs attention, if societies want to ensure that schools are inclusive spaces, where learning is accessible. The present paper supports the development of a game-based tangible resource for deaf preschoolers, through co-creation and participatory action research, operationalized by the inclusion of teachers and educators in the process. Two case studies were developed, one quantitative survey and five focus group co-creation sessions, involving Portuguese sign language teachers, special education teachers, and teachers with only hearing students. Twenty-four teachers and educators answered the online survey and 19 participated in the focus groups. The results obtained in this study reinforce the need for more pedagogical materials, accessible for deaf children and can support the discussion around co-creation, participation, and representation as potential strategies to ensure it. The broad discussions raised by teachers and educators about the specificities of the educational needs of deaf children, while reinforcing school as still a disabling environment, can also support this and future approaches around accessibility, through proactive and digital inclusion-driven frameworks.

Keywords: Deaf and hard of hearing, Teaching, Game-based learning, Tangible resources, Preschool.

Introduction

In general, deaf education is a neglected field, which needs attention (Mackenzie & Smith, 2013). According to Smith and Allman (2019), deaf and hard-of-hearing students (DHH) tend to be organized into three different groups: (a) those using sign-based communication; (b) those using listening and spoken language, and (c) those using both sign and speech. Each group presents both similar and particular support needs.

According to data from General Directorate of Education and Science Statistics (*Direção Geral de Estatísticas da Educação e Ciência*; DGEEC), during the school year of 2017/2018, there were 87039 children with Special Educational Needs (SEN) in the Portuguese educational system, of which 3559 were attending preschool, both in private and public institutions. No data specifies how many preschool children need curriculum adaptations in regards to Portuguese Sign Language (*Língua Gestual Portuguesa*; LGP) implementation. Additionally, considering all school years and public schools, there are around 126 teachers of the recruitment group 920, this group specializes in support for children and young people with moderate, severe, or profound deafness, with severe communication and language problems or speech (DGEEC, 2018), and is commonly called the Special Education Teachers' group.

Several studies indicate that DHH children show lower performance in grammatical development as well as in mathematics (González Cuenca et al., 2020; Khwaldeh & Shah, 2010; Marschark et al., 2011; Nunes et al., 2008; Pagliaro & Kritzer, 2010; Sibanda & Tlale, 2019; Smith & Allman, 2020) and academic attainment in general (Edmondson & Howe, 2019; Khairuddin & Miles, 2020; Marschark et al., 2011; Smith & Allman, 2020). In regards to lack of grammatical development, that might happen because some of the DHH children do not have any linguistic and/or vocabulary development, when they start school (González Cuenca et al., 2020; Sibanda & Tlale, 2019). Regarding the low performance in mathematics, this might be due to the severe lack of math signs in LGP, which works as a complex to the acquisition of concepts by deaf children, being estimated that this group is about three and a half years behind hearing children in mathematics achievement (Nunes & Barroco, 2014). Pagliaro and Kritzer (2010) also suggested that this factor could be associated with a restriction that DHH children experience for incidental learning experiences, aligned with other inappropriate, or misguided learning opportunities. Additionally, Marschark et al. (2011) discussed the lack of early experiences with quantitative concepts, the delays in language development, the lack of teacher training, among a large pool of potential factors that promote lower performances in mathematics in DHH children.

In the study carried by Nunes et al. (2008) about deaf children's multiplicative reasoning, in comparison with their hearing peers, the main conclusion was that both groups of children benefited from the applied innovative intervention. Therefore, it is possible to argue that activities that benefit deaf children tend also to benefit their hearing peers, supporting their inclusiveness and transversal position in the curriculum.

DHH children may experience some barriers in the school setting at two levels: macro and micro. Macro-level barriers may include exclusionary governmental policies, stigmatizing attitudes towards deaf people, deaf culture and the usage of sign language, and the scarcity of adequate physical, human, and pedagogical resources. Regarding micro-level barriers, this included the low expectations and overprotection from teachers and peers, the prevalence of auditory learning environments, the lack of teaching materials in sign language, the lack of teachers' training, and the lack of deaf teachers (Munoz-Baell et al., 2011).

Deaf learners are visual learners (Ngobeni et al., 2020), therefore it is important and relevant to foster their inclusion through the integration of videos in the respective sign language (Neves & Sousa, 2019) and pictures in the classrooms (Ngobeni et al., 2020). These pictures, as stated by Ngobeni et al. (2020, p. 4), "should display the movement of the palm and fingers, position of signs and the appropriate facial expressions as displayed by a teacher in the picture".

Sign bilingual education

Sign bilingual education implies equal use of sign and oral language, where oral language is used in writing and reading. Munoz-Baell et al. (2011) add that it is also the materialization of a specific culture, the deaf culture, that acknowledges the distinct qualities of deaf communities as rightful language minorities.

This approach has shown to be an effective and feasible strategy for the inclusion of deaf children in countries where it is well established (Sibanda & Tlale, 2019), mainly when its early introduction is possible (Plaza-Pust, 2005). However, a factor that can contribute to the unsuccessful implementation of sign bilingual education is the late exposure that children sometimes have to sign language, especially relevant when parents and teachers are non-native signers (Sibanda & Tlale, 2019).

Game-based learning

Game-based learning is a methodology that 'takes' the educational potential of video games, serious games, or digital games to foster learners' motivation, helping them to be more involved, being creative, and giving them a more active role (Del Moral Pérez et al., 2018; Lamrani & Abdelwahed, 2020). Aside from its innovative role in the motivational system, it also supports learners in the development of their language and mathematical skills (Lamrani & Abdelwahed, 2020; Tokac et al., 2019). Considering the previously mentioned aspects about the lower performance that DHH children tend to have in language and mathematics, game-based learning may be something to consider when teaching these children. According to Wagner (1990), there are three types of games that can perform a role in language education: (1) games for repetition and memorization, that can support vocabulary training; (2) games for problem-solving, and (3) role-play and scenarios. The last two types of games can be seen as more complex, considering that they imply solving problems, while immersed in a social context (Meyer, 2013).

Using games in education is seen as having a positive impact on the learning process (Hamari et al., 2016). Games can be used in various domains, for example, education (Lamrani & Abdelwahed, 2020), having the potential to activate several cognitive systems, and support emotional induction and rewards systems (McGonigal, 2011). Games can also help in language structuring and reading skills acquisition (Del Moral Pérez et al., 2018). Besides that, games are also seen as crucial to explaining and understanding the world, allowing exploration, experimentation, and consequently learning (Frasca, 2009). In addition, Crookall (2007) stated that the use of games to teach language is encouraged as it fosters inclusion and creativity, and can provide challenge and competition to engage learners in autonomous learning (Meyer, 2013). To this extent, one aspect that game designers of learning material need to consider is the need of having a moment in the game where it is possible to give feedback to learners, as both feedback and teacher intervention are of high importance (Lamrani & Abdelwahed, 2020; Meyer, 2013).

Approach effectiveness

There is a lack of scientific data on the effectiveness of game-based learning approaches in the deaf population, nonetheless, there is evidence that some pedagogical strategies have helped enhance and facilitate learning and skills acquisition (Bouzid et al., 2016). A systematic literature review with a meta-analysis study, carried by Sousa & Costa (2018), concluded that game-based learning interventions are more effective than traditional approaches, usually expository. Moreover, it was

concluded that game-based learning approaches "can increase the learning process outcomes by at least 28%, and perchance by as much as 47% comparing with traditional approaches" (Sousa & Costa, 2018, p. 207).

Tokac et al. (2019) carried out a study where the first research purpose was to understand, when compared to a traditional classroom, what the relative learning effectiveness of game-based interventions on students' performance in mathematics from preschool to 12th grade was. They concluded that “mathematics video games contribute to a higher degree of mathematics achievement compared with traditional instructional methods” (Tokac et al., 2019, p.415).

As previously mentioned, there are several advantages in using game-based learning as an educational approach, mainly, because it helps children to be more motivated to learn, enabling their creativity, through a more active role, that can support the development of their language, mathematical, and memory skills (Avdiu, 2019; Del Moral Pérez et al., 2018; Lamrani & Abdelwahed, 2020; Tokac et al., 2019). Besides this, it also provides a safe environment for learners to experiment and make mistakes (Ortega, 1997). In the specific case of DHH children, it could also assist in the learning of sign language (Shivshwan, Wang, & Pongnumkul, 2016).

Cojocariu & Boghian (2014) enumerated several advantages of game-based learning, including the promotion of a positive attitude towards learning, the potential to support self-constructed learning, and the possibility of involving the entire classroom in an active learning activity. Moreover, this strategy can work as a transdisciplinary approach that allows to transversally work on skills and subjects, enhancing "research, problem-solving, leadership, teamwork, creativity, logic, taking decisions, adaptation, communicative and interaction skills" (Cojocariu & Boghian, 2014, p.641).

Co-creation and participatory action research

The cooperative/participatory paradigm is based on an epistemological position that emphasizes critical subjectivity, integrated with the centrality of co-constructed realities, supported by practices and experiences. In this participatory reality, the tension between objectivity and subjectivity is continuous and characterizes its ontology (Lincoln, Lynham, & Guba, 2018).

Participatory Action Research (PAR) intends to improve the different contexts through practice change-driven actions. This self-reflective inquiry empowers both researchers and participants to foster this change, reflect, and discuss it. Furthermore, it implies the understanding of the historical, cultural, and social context that embeds each phenomenon (Baum, MacDougall, & Smith, 2006), which is, in our research, operationalized with this article, aimed to the exploration of DHH preschooler’s educational context regarding mathematics and gaming. Moreover, PAR is seen as opening communicative spaces, that allow questioning and exploration, that allow the creation of richer and more emancipatory forms of education (Kemmis, 2006).

Broadly, the present research intends to be a variation of a co-creative process, that supports the collaborative construction of game worlds (Acharya & Wardrip-Fruin, 2019). This approach intends to support a player-driven formulation of a game design and game development process that, considering the very specific needs of the target audience, ensures proactive and comprehensive accessibility measures, included in the entire process, instead of only at the end line of it. Such a strategy can also be seen as an operationalization of the social model of accessibility (Fryer, 2021).

In the specific field of children and youth intervention, such participatory paradigms appear aligned with action-research, as relevant in the empowerment of the different stakeholders in the comprehension of the complex reality that embeds them, fostering their civic engagement, critical consciousness, learning, and, overall, educational change (Desai, 2019).

Based on these premises we developed the concept of the Inclusive Glossary of Mathematical Terms (*Glossário Inclusivo de Termos Matemáticos*; GIM) that is both an educational game and an action-research project. Capitalizing on the advantages of interactive media, particularly games in the learning process (de Freitas, 2018), it aims to meet the above-explored needs. The focus groups in case study 2, which will be explored next, were centered around the first conceptual lines of this resource (Figure 1), as a way to develop a co-creation-based, participatory approach to its development. It is a version of the classic memory card game. In our version, the matching cards are not the same to allow a narrative about them, which is very important for children at kindergarten age. The matching is based on the first and last images of an animation video, seen by the children on a screen by inserting the card in an interface, developed in the scope of the project with FabLAB technology. Besides the animation explaining each concept, the videos include the written word and the LGP gesture, materializing the game also as a bilingual glossary. The current version of the game is composed of two sets of cards and respective animations: the numbers between zero and nine and ten actions related to localization terms (e. g. above, below, in front of, behind).

Figure 1. Concept art for GIM interface, cards, and videos.

This is therefore a hybrid game in terms of technology, combining the physical medium of memory cards with digital videos that run on an interface designed from scratch for this project. This interface can be described as an irregular triangular pyramid with a screen and a side slot, which integrates QR code reading technology. The adoption of the tangible is linked to the centrality of touch as a part of experimentation and, consequently, learning in preschoolers (Ardiel & Rankin, 2010), although it brings a load of complexity of execution and dissemination of the game. Given the hypothesis that this game can foster the interaction between deaf and hearing children, it was considered that a purely digital option, with any process of choosing cards on the screen, would be less effective in the promotion of social interaction. Among others, we expect that the cards in physical support, with illustrations of animals and "humanized" numbers, enhance situations of appropriation and exchange, as well as game dynamics with a larger number of children where the screen interface may even be dispensed with by the educator. Although the game is designed as an interface-screen/card/video set, it is expected that the letters per se assume an intrinsic interface value, as a means to stimulate attention, memory, and to exemplify some of the fundamental mathematical concepts that are indispensable to any child.

The hybrid format of this game is aligned with the premise expressed by Poissant (2003), for whom humans are not yet ready to live without shadow, without texture, nor without leaving a trace, highlighting interface as a privileged channel of harmony with the other humans, where touch is fundamental. Considering the preschooler needs in terms of mathematics education, the game approaches two contents: location propositions and numbers from zero to nine.

Considering the lack of pedagogical resources, and how it is operationalized as one of the main barriers to the inclusion of deaf students in the schooling system (Munoz-Baell et al., 2011), the main aim of this project is to ensure the success of GIM, by involving teachers and educators from the creative phase, through a PAR methodology. Therefore, in this specific study, we intended to diagnose the pedagogical needs of teachers of deaf and hearing children regarding the teaching of LGP and mathematics.

To achieve such goals, we explore different, yet complementary case studies. More specifically, case study 1 frames a more quantitative, inquiry-based approach, where a survey was used to understand the audience needs and current practices in game-based and instructional teaching of preschoolers in an integrated perspective, case study 2 materializes a co-creation approach, where stakeholders were asked to participate in ideation focus groups. This research approach happens through a qualitative framing, based on the principles of co-creation, PAR, and media ethnography.

Overall, in the present article, we explore the feasibility of game-based tangible resources in the teaching of deaf preschoolers and their hearing peers, through a quantitative community diagnosis with teachers and educators, aligned with co-creation focus groups that included both SEN and deaf teachers. Therefore, this bilingual education approach, intends also to ensure accessibility and representation of deaf culture, through an evidence-based and participatory strategy.

Methods and Materials

Case study 1

Sampling

This case study adopted a non-probabilistic sample, operationalized through the open dissemination of an online survey to an already built group of partners in the field. This process resulted in a sample of 24 participants, divided into two groups. The first group was composed of education professionals from a regular school (N = 11). The second group was composed of LGP teachers, LGP interpreters working in schools, and special education teachers working with deaf children (N = 13). The second group included deaf people. The existence of two groups intended to ensure an inclusive sample, where deaf professionals' voices were represented. Therefore, a non-probabilistic approach was adopted, through convenience sampling procedure, based on existing contacts with schools, and with groups of professionals working on the field. Participants were between 25 and 60 years old (M = 42.63; SD = 9.29). Gender balance was not possible to ensure based on the professionals that volunteered to participate, and the sample was only composed of females. The group was composed of 10 LGP teachers (41.70%), 9 preschool educators (37.50%), 4 special education teachers (16.70%); and 1 school coordinator (4.20%).

Regarding professionals working with deaf children (N = 13), 10 (76.90%) were working exclusively with this population, while 3 (23.10%) professionals were working in the so-called mixed classrooms (with both deaf and hearing children). Also considering this group, 11 (84.60%) professionals were working simultaneously with children with and without cochlear implants, while the remaining 2 (15.40%) were working only with children without cochlear implants.

Regarding the professionals from regular schools (N = 11), it is possible to highlight that most of them have no teaching experience with deaf children (N = 9; 81.80%). Two professionals mentioned previous experience with this population (N = 2; 18.20%).

Regarding the usage of games in their daily lives and considering the full sample, most of the professionals played games "several times a month, but not weekly" (N = 6; 25.00%), followed by professionals who played games "sporadically" (N = 5; 20.80%), "several times a week, but not daily"

(*N* = 4; 16.70%), "daily" (*N* = 4; 16.70%), and "once a week" (*N* = 3; 12.50%). Only two professionals mentioned they "never" (*N* = 2; 8.30%) play games in their daily lives.

Instruments

In this case study, we used two different questionnaires, one for professionals working only with hearing children and another for professionals working with deaf children, or in mixed classrooms. Both questionnaires intended to make a diagnosis of the existing pedagogical resources to teach basic mathematical concepts, and the existing game-based resources. Moreover, it aimed to explore the current state of the usage of game-based learning in the classroom. The two versions were developed to ensure the questions' adaptation to the different classroom realities, with or without deaf children.

The first questionnaire was divided into four sections: the first section had three demographic questions (age, gender, and their role in schools), one single-answer question, one dichotomous question, and one open-ended question; the second section had two dichotomous questions, two multiple-choice questions, one single-answer question, and one open-ended question; the third section had only two open-ended questions; finally, the fourth section had one Likert scale question, ranging from one (none) to four (much), two dichotomous questions and one open-ended question. The second questionnaire was divided into three different sections: the first had four demographic questions (age, gender, their role in schools, and the grade they teach), three single answer questions and one open-ended question; the second section had two dichotomous questions, two multiple-choice questions, one single-answer, and one open-ended question; the third and final section had two open-ended questions and one dichotomous question.

Procedure

The survey was applied online, after the filing of an informed consent form, that explained the aim of the study, and all the ethical procedures involved, namely regarding anonymity, confidentiality, and legal aspects. In the operationalization of such premises, the lack of demographic information collection allowed for anonymity and confidentiality for scientific dissemination purposes.

The quantitative data was gathered through Likert scales and multiple choices with descriptive statistics, through IBM's Statistical Package for the Social Sciences (SPSS), version 26. Open-ended questions were categorized considering words as the unit of analysis. Word frequency was then analyzed through descriptive statistics alongside the rest of the gathered data.

Case study 2

Sampling

The present case study was divided into professionals who work with hearing children and professionals who work only with deaf children or in mixed classrooms, the latter group was further subdivided into two distinct groups: professionals in Special Educational Needs (SEN) and professionals who teach LGP. The first group consisted of three participants (*N* = 3) and had one session of focus group. The second group, SEN teachers, consisted of nine participants (*N* = 9) of which five participated in one the first session and seven participated in the second session (four of the seven participants participated in both sessions). Lastly, the third group, LGP teachers, consisted of seven participants (*N* = 7) of which

five participated in the first session and six in the second session (similarly to the previous group, four participants of the six participated in both sessions). After all, five focus groups were held.

The existence of three different groups intended to ensure an inclusive sample, where deaf professionals' voices were represented. Therefore, a non-probabilistic approach was adopted, through convenience sampling procedure, based on existing contacts with schools, and with online groups of professionals working on the field. Moreover, gender balance was not possible to ensure based on the professionals that volunteered to participate, and the sample was only composed of females.

Instruments

For the five focus groups, two different PowerPoint presentations were used, one explaining the concept of the project and the proposed pedagogical resource – that was used in the first session of each group – and the other with the improvements that were suggested by the professionals (SEN teachers and LGP teachers) in the previous session. Additionally, a non-structured focus group script was also used, composed of four questions that intended to involve the participants in the creative process, through the exploration of their perceptions and needs.

Procedure

To support the preformed content analysis procedures, the above-described focus group sessions were held via Zoom, and recorded, with the express consent of all the participants. Recordings were then transcribed and coded, considering each sentence as a unit of analysis. The adopted coding is shown below.

- General observations about the game concept
    - Advantages of this pedagogical resource
    - Disadvantages of this pedagogical resource
    - Potential improvement points
    - Potential accessibility problems/lack of suitability for the target audience
- Currently adopted pedagogical approaches
    - Advantages
    - Disadvantages
- Attitude regarding game-based learning
    - Positive
    - Negative
- Identified needs
- Currently adopted resources
    - Used games
- Constraints to the implementation of game-based strategies in the classroom
- Specificities of deaf children educational process
    - Cumulative specific educational needs
- Inclusion-driven attitudes
- LGP related aspects
- General positive attitudes towards the project

The content analysis procedure was operationalized with NVIVO software, version 12, with 40.00% (two random focus group transcriptions) of the material being analyzed by two coders. According to the general recommendations (O'connor & Joffe, 2020), Inter Coder Reliability (ICR) was considered acceptable (87.23%).

All participants engaged in informed consent procedures, including that they could decide to opt-out at any time. The Zoom sessions were protected by passwords, as well as the resulting recordings, stored in systems that could only be accessed by the research team. Participating in the focus groups resulted in minimal risks to the teachers and educators.

Findings

Case study 1

All the professionals participating in the study agreed that games can have a relevant role in the learning process (*N* = 24). Regarding the specific skills or areas that can be promoted or learnt through games, 87.50% (*N* = 21) mentioned literacy, followed by problem-solving skills (*N* = 20; 83.30%), numeracy (*N* = 18; 75.00%), interpersonal relationship skills (*N* = 16; 66.70%), cooperation (*N* = 12; 50.00%), and digital skills (*N* = 12; 50.00%). Professionals working with deaf children were also asked about LGP, and all of them (*N* = 13) believed that gaming could ease the learning process of the language. Additionally, one professional (working only with hearing children) mentioned the potential role of games to learn rules, social norms, and to deal with the frustration associated with winning or losing.

Considering the differences between groups, the agreement of professionals working only with hearing children regarding skills promoted through games was generally higher than the agreement of professionals working only with deaf children or in mixed classrooms, as shown in Table 1, excepting for literacy.

Table 1. Frequency of professionals' agreement with skills potentially promoted through games, presented by skill category and organized by groups (*N* = 24)

	Total participants (*N* = 24)		Professionals working only with hearing children (*N* = 11)		Professionals working only with deaf children or in mixed classrooms (*N* = 13)	
	N	%	*N*	%	*N*	%
Literacy	21	87.50	9	81.82	12	92.31
Numeracy	18	75.00	10	90.90	8	61.53
Problem-solving skills	20	83.30	11	100.00	9	69.23
Interpersonal relationship skills	16	66.70	10	90.90	6	46.15
Cooperation	12	50.00	8	72.73	4	30.77
Digital Skills	12	50.00	6	54.55	6	46.15

Most professionals used games in their classrooms (*N* = 21; 87.50%), with three professionals mentioning they do not use games in their daily practice with children (12.50%). From the 21 using, 47.60% mentioned they use games on a daily basis (*N* = 10), 23.80% "several times a week, but not daily" (*N* = 5), 14.30% "several times a month, but not weekly" (*N* = 3), 9.50% "sporadically" (*N* = 2), and "once a week" 4.80% (*N* = 1).

Regarding the analysis split by group, it is possible to mention that 90.90% (*N* = 10) of the professionals working only with hearing children mentioned the use of games in their classrooms, and 84.62% (N =11) of the professionals working only with deaf children or in mixed classrooms mentioned similar practices. If considering the frequency of usage as a scale ranging from one (never) to six (daily), the first group also mentioned a more frequent use of games in the classroom (*M* = 5.40; *SD* = 0.97) than the second group (*M* = 4.36; *SD* = 1.63). Nevertheless, such differences are not statistically significant (*p* = .092), calculated through t-test for Equality of Means (equal variances not assumed; *F* = 6.50, *p* = .020).

When asked about the conditions that could support the usage of games in their classrooms, professionals mainly mentioned the need for more games in schools (*N* = 15; 62.50%), followed by the need to receive more training in the field of game-based learning (*N* = 11; 45.80%); the lack of time to implement such activities (*N* = 11; 45.80%); the lack of flexibility to implement such activities (*N* = 10; 41.70%); and the need for more computers in schools (*N* = 8; 33.30%). Moreover, one professional working with deaf children also mentioned the need for more bilingual games.

As shown in Table 2, professionals working with deaf children showed more frequent agreement with the indicated conditions to foster game-based learning in the classrooms, when compared with professionals working only with hearing children, specifically for the need of more games, computers, and training. The second one agreed more frequently than the first ones with barriers imposed by the lack of time and flexibility to implement such activities.

Table 2. Frequency of professionals' agreement with conditions that could support the usage of games in their classrooms, presented by condition and organized by groups (*N* = 24)

	Total participants (*N* = 24)		Professionals working only with hearing children (*N* = 11)		Professionals working only with deaf children or in mixed classrooms (*N* = 13)	
	N	%	*N*	%	*N*	%
The need for more games in schools	15	62.50	5	45.45	10	76.92
The need for more computers in schools	8	33.30	3	27.27	5	38.46
The need to receive more training in the field of game-based learning	11	45.80	3	27.27	8	61.54
The lack of flexibility to implement such activities	10	41.70	5	45.45	5	38.46
The lack of time to implement such activities	11	45.80	6	54.55	5	38.46

Regarding LGP, professionals from regular schools considered their students had low familiarity with the language, an average of 1.82 on a scale ranging from one and four (*SD* = 1.16). Nevertheless, the group consensually agreed (*N* = 11) with the relevance of hearing children having contact, and learning LGP as a second language in school.

Considering the open-ended question regarding the specific games used in the classroom, by the professionals that used them (*N* = 21; 87.50%), results presented a broad range of answers, some of them specifying game types (e.g. puzzles), specific games (e.g. domino), commercial games (e.g. IXL Maths), game mechanics (e.g. association), game creation platforms (e.g. Kahoot!), tangible materials to play (e.g. Lego blocks), or adopted strategies (e.g. games are created by me). Therefore, the created codings are not mutually exclusive and intend to reflect the information gathered, as mentioned by each participant. From a total of 21 participants providing valid answers, 61 game-related references were coded. Memory games and puzzles were the most used by participants (7 mentions; 11.48% of the coded material each), followed by: games involving association (6 mentions; 9.84% of the coded material); domino, games created by the teacher, and LGP games (4 mentions; 6.56% of the coded material each); board games and building word games (3 mentions; 4.92% of the coded material each); building blocks (Lego), tangram, threading games, loto, and Kahoot! (2 mentions; 3.28% of the coded material each). The rest of the codings were mentioned once (1.64% of the coded material each), and included: serialization games; social games; the Glory Game (in Portuguese "Jogo da Glória" - a board game); snakes and ladders; plug-in games; traditional games; mathematical games; "Jogos da Mimocas" (https://www.tcondeco.pt/produto/os-jogos-da-mimocas/); storytelling games; games with LGP linguist dices; digital games; categorization games; and IXL Maths (https://uk.ixl.com/).

Regarding the teaching of location prepositions, professionals working only with hearing children (*N* = 11), mentioned different pedagogical strategies and materials with a total of 11 participants providing valid answers, 23 coded units. Movement games (4 mentions; 17.39% of the coded material); using the classroom space, furniture and material; role-playing; and daily life examples (3 mentions; 13.04% of the coded material each) were the most mentioned. The full results are shown in Table 3.

Table 3. Content analysis for strategies to teach location prepositions (11 valid answers; 23 coded units)

Coding	Number of mentions	%
Movement games	4	17.39
Using the classroom space, furniture, and material	3	13.04
Role-playing	3	13.04
Daily life examples	3	13.04
Stories	2	8.70
The chair game	2	8.70
Drawings	1	4.35
Mnemonics	1	4.35
Image games	1	4.35
Building blocks (Lego)	1	4.35
Outdoor activities	1	4.35
Using images	1	4.35

Still considering the same group, but now regarding the open-ended question "Please describe the strategies you use to teach numbers (from zero to nine)?", the provided answers also included a wide range of pedagogical approaches and materials, resulting in 23 coded units, from 11 valid answers. Quantifiable daily life examples were the most mentioned (7 mentions; 30.43% of the coded material). The full results are shown in Table 4.

Table 4. Content analysis for strategies to teach numbers, from zero to nine (11 valid answers; 23 coded units)

Coding	Number of mentions	%
Quantifiable daily life examples	7	30.43
Stories	2	8.70
Games (in general)	2	8.70
Using the classroom space, furniture, and material	2	8.70
Logical association	2	8.70
Cards with numbers	1	4.35
Group dynamics	1	4.35
Placement of facilitator materials in the classroom	1	4.35
Songs	1	4.35
Building pedagogical materials with children	1	4.35
Board games	1	4.35
Dice games	1	4.35
Card games	1	4.35

When asked if the LGP learning process could be facilitated through a game and why, 12 of the 13 professionals working with deaf children described their attitudes and beliefs on the subject, highlighting different potentials of games, resulting in 18 coded units. The potential of games to enhance or promote learning was the most mentioned by participants (5 mentions; 27.78% of the coded material). Another frequently mentioned aspect is the relationship between the visual form of LGP and the potentialities offered by digital media, particularly games (3 mentions; 16.77% of the coded material). The remaining referred aspects (1 mention; 5.56% of the coded material each) included the potential of games to: foster attention/concentration; promote child development; support motivation-related processes; promote interaction; promote creativity; to provide multisensory experiences. The children's interest in digital technologies in general, and specifically for games was also mentioned as possibly enhancing the LGP learning process. One participant mentioned the learning embedded in the gameplay as a relevant factor and another one highlighted that games can be effective if working as a complement for the formal learning processes.

Aligned with the previously presented view of the professionals working only with hearing children (N = 11) these students should have contact and learn LGP as a second language in school, participants were asked to describe their views. Eleven valid answers were gathered and twenty units of analysis were coded. Raising awareness for the existence of people with different communication forms and gesture-based languages was the most discussed topic by the group (4 mentions; 20.00% of the coded material). Other discussed topics were related and included the relevance of communication, inclusion, and the potential relevance of learning LGP for childhood development (3 mentions; 15.00% of the coded material each). The relevance of LGP for the future adulthood of these students was also mentioned, as well as the need to start this learning process as early as possible (2 mentions; 10.00% of the coded material each). Communication as a matter of children/human rights, the relevance of building relationships, and gestures/non-verbal communication as the main pillar of all human communication were other discussed aspects in the gathered answers (1 mention; 5.00% of the coded material each).

Case study 2

During the five focus groups, several topics emerged while talking about the game and/or GIM project, of which the most mentioned were: *General observations about the game concept* (*N* = 222; 30.04%), appearing on five out of the five focus groups analyzed; *LGP related problems* (*N* = 125; 16.91%), appearing on five out of the five focus group analyzed; and the *Specificities of deaf children education process* (*N* = 104; 14.07%), appearing on four out of the five focus group analyzed. Additionally, the least mentioned topics were: *Advantages* (*N* = 2; 0.27%) of the currently adopted pedagogical approaches, appearing on two out of the five focus groups analyzed; *Positive* (*N* = 3; 0.41%) attitudes regarding game-based learning, appearing on two out of the five focus group analyzed; *Disadvantages* (*N* = 6; 0.81%) of the currently adopted pedagogical approaches, appearing on one out of the five focus group analyzed; and *Cumulative specific educational needs* (*N* = 6; 0.81%) of deaf children's when they also have other specific educational needs, appearing on one out of the five focus group analyzed. Nevertheless, it is also important to reference that there were topics that were not approached, namely *Negative attitudes* (in attitudes regarding game-based learning), *Currently adopted resources*, *Used games* (in *Currently adopted resources*), and *Constraints to the implementation of game-based strategies*. Excluding these nodes, all the detailed results are systematized in Table 5.

Table 5. Content analysis of the focus groups' most coded nodes (739 coded units; 5 coded items)

Codes	Number of coded units *N* (%)	Number of coded items *N* (%)
General observations about the game concept	222 (30.04)	5 (100.00)
Advantages of this pedagogical resource	53 (7.17)	5 (100.00)
Disadvantages of this pedagogical resource	20 (2.71)	5 (100.00)
Potential improvement points	60 (8.12)	5 (100.00)
Potential accessibility problems - lack of suitability for the audience	5 (0.67)	3 (60.00)
Currently adopted pedagogical approaches	31 (4.19)	5 (100.00)
Advantages	2 (0.27)	2 (40.00)
Disadvantages	6 (0.81)	1 (20.00)
Attitude regarding game-based learning	8 (1.08)	3 (60.00)
Positive	3 (0.41)	2 (40.00)
Identified needs	20 (2.71)	2 (40.00)
Specificities of deaf children educational process	104 (14.07)	4 (80.00)
Cumulative specific educational needs	6 (0.81)	1 (20.00)
Inclusion-driven attitudes	56 (7.58)	5 (100.00)
LGP related aspects	125 (16.91)	5 (100.00)
General attitudes towards the project	18 (2.44)	2 (40.00)

When analyzing the different groups of educators, there are different results. Among the hearing children's teachers, the discussion was focused on *Inclusion-driven attitudes* (*N* = 30; 53.57%), *General observations about the game concept* (*N*= 28; 12.61%), and the *Advantages of this pedagogical resource* (*N* = 20; 37.74%). Among the LGP teachers, the discussion was focused on *General observations about the game concept* (*N* = 92; 41.44%), *LGP related aspects* (*N*=80; 64.00%), and *Specificities of deaf children education process* (*N* = 68; 65.38). Likewise, SEN teachers also focused on *General observations about the game concept* (*N* = 102; 45.95%), *LGP related aspects* (*N* = 44; 35.20%) and *Specificities of deaf children education process* (*N* = 36; 34.62%). The detailed results are in Table 6.

Table 6. Content analysis of the focus groups' most coded nodes, by group (739 coded units; 5 coded items)

Codes	Teachers with only hearing children *N* (%)	LGP Teachers *N* (%)	SEN Teachers *N* (%)
General observations about the game concept	28 (12.61)	92 (41.44)	102 (45.95)
Advantages of this pedagogical resource	20 (37.74)	19 (35.85)	14 (26.42)
Disadvantages of this pedagogical resource	1 (5.00)	7 (35.00)	12 (60.00)
Potential improvement points	2 (3.33)	19 (31.67)	39 (65.00)
Potential accessibility problems - lack of suitability for the audience	1 (20.00)	1 (20.00)	3 (60.00)
Currently adopted pedagogical approaches	7 (22.58)	18 (58.06)	6 (19.35)
Advantages	0 (0.00)	1 (50.00)	1 (50.00)
Disadvantages	0 (0.00)	6 (100.00)	0 (0.00)
Attitude regarding game-based learning	0 (0.00)	7 (87.50)	1 (12.50)
Positive	0 (0.00)	3 (100.00)	0 (0.00)
Negative	0 (0.00)	0 (0.00)	0 (0.00)
Identified needs	0 (0.00)	14 (70.00)	6 (30.00)
Currently adopted approaches	0 (0.00)	0 (0.00)	0 (0.00)
Used games	0 (0.00)	0 (0.00)	0 (0.00)
Constraints to the implementation of game-based strategies	0 (0.00)	0 (0.00)	0 (0.00)
Specificities of deaf children educational process	0 (0.00)	68 (65.38)	36 (34.62)
Cumulative specific educational needs	0 (0.00)	0 (0.00)	6 (100.00)
Inclusion-driven attitudes	30 (53.57)	15 (26.79)	11 (19.64)
LGP related aspects	1 (0.80)	80 (64.00)	44 (35.20)
General attitudes towards the project	8 (44.44)	10 (55.56)	0 (0.00)

By analyzing the Pearson correlations, calculated through the similarity of the coded words by node and case, the following dendrogram was elaborated (Figure 2). Through the mapping of the obtained correlations, it is possible to highlight that LGP related aspects and specificities of deaf children's educational process were the more correlated nodes (r = 0.98). SEN teachers were the group that made more observations about the game concept (r = 0.94), while LGP teachers' statements were more linked to LGP related aspects (r = 0.94) and the specificities of deaf children's educational process (r = 0.93).

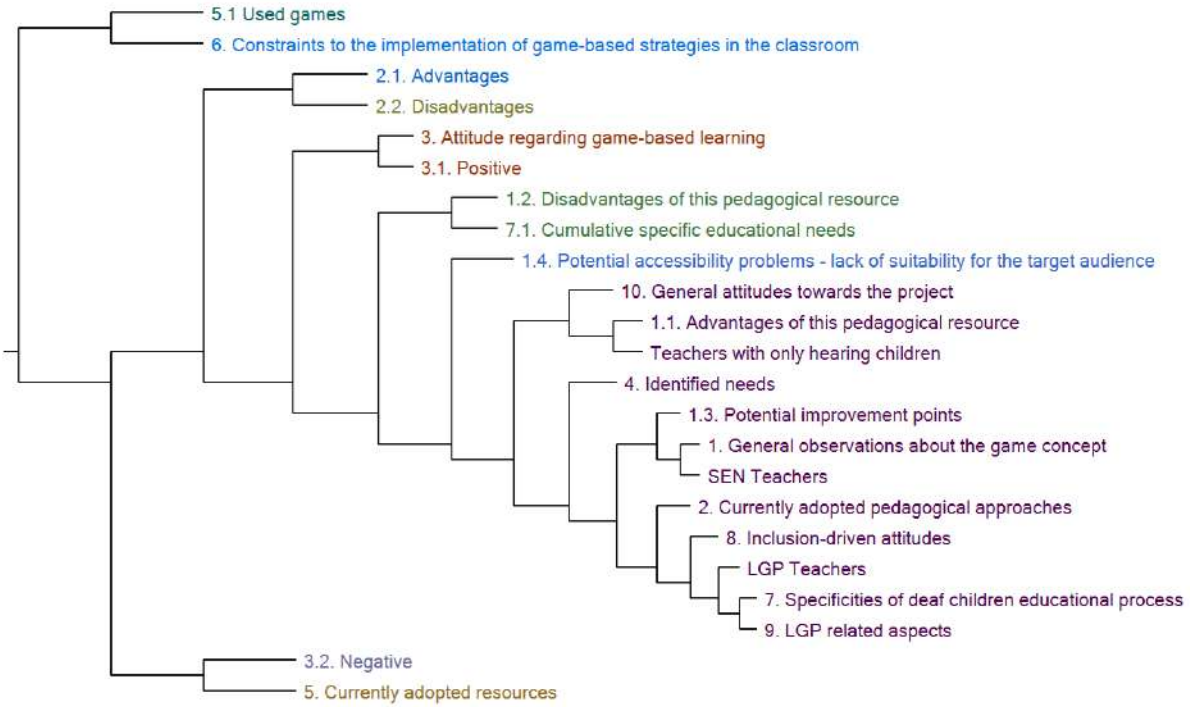

Figure 2. Dendrogram of Pearson correlations, by the similarity of the material coded in each case and node (5 coded items; 739 coded units)

Discussion

In this study, we proposed an approach, based on two different case studies, to support the successful development and implementation of an educational game aimed at deaf children and their hearing peers. The work was based on the assumption that involving teachers and educators since the creative phase could support its feasibility. Through this, we also aimed to diagnosis the needs of deaf children's teachers and educators regarding the teaching of both mathematics and LGP.

The first presented case study, based on an online survey, sustained those teachers overall agree with the potential of games in the learning process, with a very clear focus on the development of literacy, numeracy, interpersonal relationships, cooperation, and digital skills. This finding is aligned with previous studies that sustained the existence of positive attitudes from different stakeholders of the educational processes towards the pedagogical value of games (Saéz-Lopéz, Vázquez-Cano, & Domínguez-Garrido, 2015, Sousa, Henriques, & Costa, 2017). Moreover, it is interesting to note that most participants already implement games in their classrooms, although the usage frequency is very heterogeneous, and the lack of accessible games is acknowledged.

Through the operationalization of the above-explored diagnosis, the main identified needs included: the need for more games, that is more prevalent in the teachers that have deaf children in their classroom; the need for more training in game-based learning; the lack of time to implement game-based activities;

the lack of flexibility in the school schedule to include this type of innovative approaches; and the lack of digital access, materialized by the existence of a very limited number of computers in the school setting. Such findings reinforce the structural barriers for the inclusion of deaf children in classrooms, as previously explored by Munoz-Baell et al. (2011), and that seems to remain a reality in the current context.

Regarding the existing practices in the field of game-based learning, it is possible to highlight that the used games are very diverse in terms of genres and mechanics. This included memory games, puzzles, association games, and dominos. Games created by the teachers for specific purposes are also frequent and reflect the need for more materials, previously identified. Nevertheless, this aspect also reflects the creative side of teaching, which must be considered as an asset, through the implementation of co-creation processes able to capitalize it, such as in GIM.

Regarding mathematics, most participants use daily life examples as a pedagogical approach to the teaching of numbers, from zero to nine, which is the same logic we follow in our game. This can ensure the game is not very disruptive, in a way to introduce an innovation, while keeping the safety of familiar strategies, relevant with very young children. Regarding location propositions, strategies based on movement are the most adopted, which is also aligned with the developed animations. Briefly, GIM seems to be aligned with the already implemented practices, introducing an element of engagement and innovation, that can be also replicable in different settings and disseminated online, as an Open Education Resource (OER).

Concerning LGP learning, teachers highlight the relationship between the visual form of sign language and the potentialities offered by digital media in general, which supports the need for educational innovation in this field. Also, inclusion-driven attitudes were very prevalent, even in teachers that do not have deaf children in their classroom, agreeing that LGP should be taught in school, as a second language.

From the co-creation process, explored in case study two, the specific educational needs of deaf children and the aspects related to LGP were the most approached and discussed themes. Similar concerns were shown by LGP teachers and SEN teachers while hearing children teachers' discussions were more centered around the implementation of inclusion-driven pedagogical strategies in the classroom. The stronger prevalence and correlation of discussions around deaf children's educational needs and LGP teaching reinforces the educators' concerns, emerging from their professional experience. This reinforces the school environment and the existing pedagogical resources as disabling, through the exclusion of these children based on the inability of their context, particularly educational context, to effectively accommodate their needs.

Conclusions

The result obtained through the presented study is seen as cohesive support for the development of GIM but also for the development of other resources that are based on similar premises and needs. The general belief in the potential of games in the educational process, namely for literacy and numeracy, is accompanied by a lack of accessible games for DHH children, and an overall lack of digital access in schools. Therefore, even if science increasingly sustains the implementation of games in schools, a long way must be completed, to ensure this can be a feasible reality, even more, when we consider students with such specific needs as deaf children.

The inclusion of teachers and educators in the game design and game development process, through ideation, discussion, and effective implementation seems to be a feasible strategy to respond to some of the previously explored concerns. Also, while extensively discussing the specificities of their students' educational needs, teachers are supporting the accessibility of the developed resource,

operationalizing a proactive and inventive approach to digital inclusion. This approach also seems to address the inclusion pillars of representation and participation.

Limitations and Recommendations

The previously presented results arise from a process that was developed exclusively in Portugal, with Portuguese teachers and educators. Considering the extremely relevant socio-economic and cultural aspects of the formal education system, both in policies and stakeholders' attitudes, the replication of this study in other contexts would be crucial to understand the transnational differences and similarities. This extension would also solve a potential issue that arises from the limitation of the sample dimension.

Moreover, this study explores the initial steps of a development methodology that intends to be participatory and inclusive but does not yet explore the effectiveness of resources developed in such a way in the promotion of the defined learning outcomes. This is seen as a priority for the future, enlarged to include learning results, motivation and engagement aspects, and inclusion outputs, namely regarding the potential role of inclusive resources in promoting the interaction between deaf students and their hearing peers.

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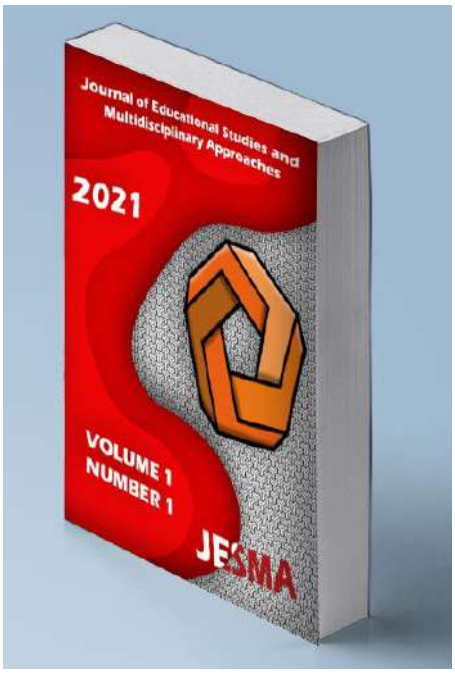

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Teacher Beliefs about Factors that Influence Motivation Among Adolescents with Learning Disabilities

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ABSTRACT
Grounded in situated expectancy-value theory (SEVT), this study explored teacher beliefs about factors shaping task motivation among students with learning disabilities (LD). Directed content and flexible coding approaches were used for analysis of individual interview and group discussions. Analysis indicated that middle school teachers saw several factors outlined by SEVT as influencing students with LDs' expectancy of, and value for, success. These included the cultural milieu, beliefs of key socializers, student aptitudes & characteristics, and prior experiences. Teachers believed that, over time, their students with LD had frequently found themselves in situations that promoted low expectancy and value for present-day academic success. These findings highlight the potential usefulness of SEVT as a tool for taking a longer-term view of reasons students with LD are (or are not) motivated to engage in academic tasks.

Keywords: Motivation, Teacher beliefs, Learning disability, Adolescence

Introduction

Early adolescents' steady academic progress depends on teachers recognizing and addressing these students' unique motivational needs as they arise (Anderman & Maehr, 1994). This is particularly important with regard to students with learning disabilities (LD), who are often at risk for motivational problems that impact academic achievement (Graham et al., 2017; Sideridis et al., 2006). Middle school educators are responsible for providing high-quality instruction and appropriate accommodations to these students (Moreau, 2014); however, teachers must also attend to students with LDs' potentially inconsistent motivation levels, as those who struggle with motivation are unlikely to benefit from evidence-based learning supports (Deshler & Hock, 2007) no matter how soundly these tools are developed and implemented. This underscores the importance of both researchers and classroom teachers having a rich understanding of motivation specifically among adolescents with LD.

Scholars have used multiple theoretical perspectives from educational psychology, such as self-determination theory and goal orientation theory, to study the motivation beliefs of students with LD. An additional theoretical lens, that of situated expectancy value theory (SEVT; Eccles & Wigfield, 2020), has received less attention in the special education context. However, given the ways in which SEVT elucidates specific elements (e.g., cultural factors; beliefs of socializers) that build up over time to shape a student's present-day academic task motivation, this theory has increasingly been cited as having the potential to aid researchers in developing a better understanding of students with LDs' motivation (Louick & Scanlon, 2021; Lovett et al., 2020). Further, some see SEVT as potentially supporting practitioners in making good decisions about how to plan lessons and learning environments for this student population (Louick & Muenks, in press; De La Paz & Butler, 2018). Using SEVT in this way requires teacher buy-in; if they do not find SEVT to accurately represent their students' experiences and needs, teachers are unlikely to implement related teaching techniques and strategies in the classroom.

The current study explores whether and how middle school teachers found SEVT to be a useful tool when talking about the factors that shape their students with LDs' motivation to engage in school tasks. It also explores how these teachers' insights might improve theoretical understandings of academic task motivation among young adolescents with LD. Following a review of the related extant literature on LD and motivation theory, this article proceeds into a discussion of the research questions at hand; the context in which the study took place; the data collection and analysis methods; the study findings; and a discussion of the relevance of those findings to current classroom instruction of adolescents with LD.

Literature Review

This section begins with a brief review of the literature regarding academic motivation among students with LD, highlighting key findings from a range of theoretical perspectives. This is followed by the contention that SEVT, although thus far used only minimally in special education research, may offer important opportunities for teachers, administrators, and researchers to better understand the underpinnings of students with LDs' motivation to engage in academic tasks.

Motivation and Adolescents with Learning Disabilities

According to the Individuals with Disabilities Education Act, a student with a specific learning disability has difficulties with language-based academic tasks; these difficulties exist in the absence of other impairments (e.g., cognitive, visual, hearing, motor, etc.). The National Joint

Committee on Learning Disabilities (2011) further clarifies that, among students with LD, it is common to see "an uneven pattern of strengths & weaknesses" across academic domains (p. 238). Although motivation is an important topic for teachers of all adolescents to address, it is particularly so for those who work with students with LD. These students typically enter middle and high school continuing to require intensive learning supports (Bulgren et al., 2013; Deshler, 2005; Solis et al., 2014), such as strategies for skill development in specific disciplines (Kennedy & Ihle, 2012; Ko & Tejero Hughes, 2015) and ongoing instruction in foundational skills (Faggella-Luby et al., 2015; Graham et al., 2017). Such supports may place limitations on students with LDs' independence, impacting their beliefs about their own abilities to carry out academic work and/or, in some cases, the level of power they feel in the classroom (Gilmore, 2018; Ginsberg, 2020). Challenges in these areas may, in turn, decrease students with LDs' motivation to engage in academic activities (Frankel, 2016). This suggests that teachers, service providers and school administrators must not only be knowledgeable about high-quality academic interventions, but must deliver those interventions in ways that minimize threat to students with LDs' academic motivation. It seems critical, then, that those working with adolescents with LD incorporate an understanding of motivation into their delivery of special education services. Here, findings from educational psychology (and the theories underlying those findings) may prove especially useful.

When studying "motivation" among students with LD, researchers have employed several different theoretical conceptions of the term. Each theoretical frame has provided new insights into students with LDs' motivation, both for the researchers working to improve these students' educational experiences in a broad sense, and for the classroom teachers working with them every day (Louick & Muenks, in press). Scholars who employ academic goal theory to study motivation (Ames, 1992; Dweck & Leggett, 1988) have found that the type of goal a student with LD sets can impact various components of their academic well-being. For example, mastery goals (i.e., goals set with the intention of learning and improving for personally-meaningful reasons; Pintrich & Schunk, 2002) have been found to predict students with LDs' academic success (e.g., Sideridis, 2003, 2005b). On the other hand, performance-avoidance goals (i.e., goals set for the purpose of hiding weaknesses from others; Pintrich & Schunk, 2002) may be especially negatively impactful for students with LD, putting them at greater risk for depression (Sideridis, 2007). When it comes to explaining the causes of success or failure, studies taking an attribution theory (Graham, 2020) approach to motivation indicate that students with LDs' attributions for outcomes can be impacted by teachers' instructional techniques, and that the resulting attributional changes can support reading comprehension strategy instruction (e.g., Berkeley et al., 2011). Still other researchers have taken approaches based in self-determination theory (Ryan & Deci, 2000) and/or causal agency theory (Shogren et al., 2015), considering how students with disabilities' feelings of autonomy and competence impact their motivation to engage in class activities, and the role that teachers play in creating environments in which students with LD demonstrate feelings of self-determination (e.g., Cavendish, 2017; Cavendish et al., 2020). These findings enable both researchers and teachers to better understand the specific challenges students with LD face in-the-moment, in terms of exhibiting and sustaining motivation to engage in academic tasks. However, more information is needed about possible precursors that could shape the academic goals, attributions, and motivation-related beliefs that students demonstrate when they enter a teacher's classroom. An additional theoretical perspective that may prove especially beneficial towards understanding this aspect of motivation is situated expectancy-value theory (SEVT; Eccles & Wigfield, 2020).

Situated Expectancy-Value Theory of Motivation

According to SEVT theorists (e.g., Eccles, 2009; Eccles & Wigfield, 2002; Rosenzweig et al., 2019), students are motivated to engage in academic behaviors based on the information they have gathered regarding the nature of academic tasks, and regarding themselves as learners. This information shapes the degree to which students anticipate that they will succeed at a given task, as well as the significance they place on doing so. Once they have a sense of their likely success, and the degree to which they find that success worthwhile, students make a motivated choice about whether or not they will engage in the task. In their recent conceptual work, Eccles and Wigfield (2020) describe the "situated" nature of individuals' expectancy-value beliefs—that is, the ways in which situational and socio-cultural factors influence students' expectations of and value for success. This adds further nuance to discussions of how and why students are motivated to engage in specific activities, under specific conditions.
Situated expectancy-value theory's particular relevance for the current study lies in its posited antecedents for students' beliefs about themselves as learners. Such antecedents include the broader culture ("cultural milieu") and the actions of those around them ("socializer beliefs and behaviors"). They also include students' own strengths and weaknesses ("student characteristics/aptitudes"), and memories of what has happened to them in the past ("previous achievement-related experiences"). These sources are theorized to impact both student expectancy of success, and student value for success, which in turn shape task motivation. To take an expectancy-value perspective on motivation is not necessarily to address questions about whether or not teachers can "teach" motivation (e.g., instill a "growth mindset;" Dweck & Yeager, 2019). Instead, it is to describe factors that impact motivation. Having knowledge of these factors can allow teachers to better understand the learning choices that their students are motivated to make.

Although widely respected and employed among educational psychology researchers (Koenka, 2020), SEVT has seldom been used to better understand motivation among students with LD in particular. However, researchers are beginning to consider its usefulness for this particular population of students (e.g., Louick & Scanlon, 2021; Lovett et al., 2020). Lovett and colleagues (2020) implemented and studied an intervention that had components specifically targeting expectancy and value beliefs. They found that students with LD who received the intervention ultimately described themselves as "competent" at greater rates than peers with LD in a non-intervention (control) group, and were more likely to recognize their own efforts and abilities as leading to academic achievement. This suggests that the expectancy and value beliefs of students with LD can change depending on classroom practices. In another SEVT-based study (Louick & Scanlon, 2021), researchers employed semi-structured interviews to better understand antecedents to these students' academic task motivation. Analyzing the data from an expectancy-value perspective enabled these researchers to identify ways in which the nature of interactions with classroom teachers, both past and current, shaped students with LDs' motivation to participate in reading and writing tasks. Recently, De La Paz and Butler (2018) called for concepts from SEVT to serve as foundational elements in the interactive and instructional choices teachers make when working with struggling writers and writers with LD. De La Paz and Butler articulate a series of expectancy- and value-related questions that students with LD might ask themselves when approaching an academic task; then, they encourage teachers to consider what their students with LDs' answers to those questions might be, and ultimately plan with the students' anticipated answers in mind.

Changing teacher understandings and practices may indeed be a meaningful way to impact motivation among this student population, as teachers can either ease or exacerbate students' motivation concerns depending on the learning environments they create, the teaching

strategies they use, and the relationships they interactively build (Cohen, 2011; Rex & Schiller, 2009; Vetter, 2010). Reviewing literature on teachers' role in students' motivation beliefs, Gilmore (2018) contends that although teacher feedback is impactful on achievement and motivation among all students, this is particularly the case for students with LD. She argues that "teachers need to be aware of the range of difficulties that undermine motivation, and watch for possible indicators of problems" (p. 29), and urges teachers to avoid the common mistake of mischaracterizing students at-risk for LD as lazy and/or lacking motivation.

What is missing from this conversation is the input of teachers themselves, as to whether and how motivation theories might be relevant and useful for their own work with students with LD. In order to make decisions about how such theories could potentially be utilized in special education, we must understand teachers' perspectives on this issue, as their perceptions of their students' motivations influence the pedagogical and interpersonal decisions they make on a daily basis (Urdan & Schoenfelder, 2006; Wall & Miller, 2015). To address this need, the current study addresses the following research questions with regard to SEVT in particular:

1. *Of the motivation precursors outlined in SEVT, which, if any, do teachers see impacting their students with LDs' expectancy of, and value for, academic success?*
2. *In what ways do teachers perceive these expectancy and value beliefs as impacting students with LDs' motivation engage in academic tasks?*

In alignment with the premise that teachers' voices are critical to addressing issues in special education (as advocated by Cavendish et al., 2020), the current study utilizes educators' own words to address the research questions at hand.

Methods and Materials

Flexible coding (Deterding & Waters, 2018) and directed content analysis (Hsieh & Shannon, 2005) approaches were employed in the current study of middle school teachers' beliefs regarding the factors that influence students with LDs' expectancy of and value for success, as well as the degree to which those expectancies and values influence students with LDs' motivation for academic tasks.

Study Context

Data collection occurred within a larger collaborative project involving the researcher and Williams Neighborhood School (all names are pseudonyms), a K-8 school in a major metropolitan city in the mid-Atlantic region of the United States. The city education department's website listed the student demographic information for Williams students: 94.8% identified as Hispanic, 3.2% as Black and 1.1% as American Indian; 87.1% demonstrated economic need. 46.7% were classified as English Language Learners, and 26.4% as students with special needs.

Williams is a dual-language school where students receive instruction both in Spanish and in English. Doing research at this school in particular offered an opportunity to consider the perspectives of teachers who work with bilingual and emerging-bilingual students with LD. Researchers have investigated teacher beliefs about disability among emerging bilingual students (e.g., Cavendish & Espinosa, 2013; Gomez-Najarro, 2019; Greenfield, 2013), and have made suggestions as to how teachers can support emerging bilinguals with LD in several areas of learning (e.g., Barrio et al., 2017; Cheatham & Hart Barnett, 2017; O'Keeffe & Medina, 2016; Utley et al., 2011). However, more research is needed regarding how teachers can fully understand the identity beliefs of emerging bilingual students who have learning disabilities (Gomez-Najarro, 2019). The current study informs such work.

Starting in November 2018, as part of professional development (PD) activities at the school, all Williams teachers selected from a list of PD options for the remainder of the 2018-2019 academic year (approximately 6 months). Six of the school's middle school teachers chose to participate in a monthly workshop series called "Instructing Struggling Students: Using Specially Designed Instruction and Understanding Expectancy-Value Theory to Engage and Re-Engage Students who are Struggling Academically." The series was co-led by the researcher and the school's Individualized Education Program (IEP) coordinator. (The IEP coordinator had a masters' degree in special education and 17 years of teaching experience; she had held her current role at Williams for seven years.) During the workshops (each 80 minutes in length), teachers engaged in discussions of, and intentional planning for, the learning and motivational needs of their students with LD. The co-leaders presented key tenets of expectancy-value theory (Eccles, 2009; Eccles & Wigfield, 2002), and teachers reflected on whether or not this information was relevant to their own work providing specific skill instruction for individual students with disabilities. This PD setting provided an ideal site for exploring teacher beliefs about factors impacting their students' motivation, as teachers were already engaged in related discussions as part of their fulfillment of professional development responsibilities.

Participants

At the outset of the workshop series, all six teachers were invited to participate in the research portion of the project. Three teachers—Beatriz, Gloria and Carl—agreed to do so. (The other three teachers remained in the PD group but did not participate in research components.) Beatriz and Gloria co-taught in an Integrated Co-Teaching (ICT) setting (their classes included students with and without disabilities), while Carl taught in a self-contained setting (his class consisted solely of students with disabilities). Demographic information about the participating teachers can be found in Table 1. Small samples are common practice in exploratory qualitative research, as they allow for the collection of the time-consuming and detailed data needed to support meaningful case studies of unique populations (Boddy, 2016).

Table 1. Participant Demographics

Teacher	Beatriz	Carl	Gloria
Grade Level(s) Taught	5 & 6	7	5 & 6
Classroom Setting	Integrated Co-Teaching (ICT)	Self-Contained 12:1:1	Integrated Co-Teaching (ICT)
Teacher Role	Special Education Teacher	Special Education Teacher	General Education Teacher
Years Teaching	3	15	*
Self-Identified Race/Ethnicity	Hispanic/Latina	White/Caucasian	*

Note. *= participant declined to provide data.

Researcher Positionality

Recognizing that all data collection and analyses are "shaped by the worldviews, perspectives, positionalities, and subjectivities of researchers" (Cochran-Smith & Dudley-Marling, 2012, p. 237), it is critical to note that the researcher identifies as a White, monolingual, English-speaking woman. Prior to her current position in academia, she spent eight years as a special education classroom teacher, during which her school regularly collaborated with the Williams

School. In her new role, as a faculty member at a local university, she also volunteered her time at Williams for ongoing professional development (this joint PD work extended beyond the timing of the research project discussed here). As such, the researcher brought her own teaching and experiences to bear on the research, and was a familiar face to some administrators and teachers at Williams, but was nevertheless an outsider to the day-to-day workings of the school.

Data Sources

Data were audio-recorded during teacher interviews and discussion groups, and later transcribed. Small-group discussion activities during the PD workshop events were recorded only for the teachers who had chosen to participate in the research component of the project. Between workshop sessions, these teachers also engaged in semi-structured, 1:1 virtual-meeting interviews with the researcher. A semi-structured interview approach was selected so as to ensure that the key concepts from expectancy-value theory were addressed, while still allowing for follow-up questions that arose out of participant statements (as in Cornell & Sayman, 2020). Workshop materials (see Appendix A) and interview questions were developed in conjunction with an educational psychologist who had specialized knowledge of SEVT; she served as an outside consultant, to ensure fidelity to the theory's key tenets. Once collected and transcribed, data were entered into NVivo software (QSR International Pty Ltd., 2018).

Study Trustworthiness

Responsible qualitative research involves "making empirical, interpretive schemes as public as possible" (Denzin, 2001, p. 317). As such, all analysis methods were recorded systematically and comprehensively (Yin, 2003) in a series of memos that could be used to detail and track the analytic process, establishing an audit trail (Corbin & Strauss, 2015; Merriam, 1998). To further ensure trustworthiness of findings, the researcher clarified her own positioning (see "Positionality") and shared preliminary findings with colleagues for peer examination (Merriam, 1998). In addition, she employed member checks (Creswell & Miller, 2000; Marshall & Rossman, 2016), a process in which "participants add credibility to the qualitative study by having a chance to react to both the data and the final narrative" (Creswell & Miller, 2000, p. 127). Raw data and interpretations were shared with the participating teachers for "reactions, corrections and further insights" (Marshall & Rossman, 2016, p. 16).

Ethical Considerations

Qualitative data was collected from participants who were informed in writing of the study's nature and that there was no ramification if they decided to opt-out at any time. The interview instrument and consent information were stored on a secure hard drive, per the instructions of the Institutional Review Board at the university where the researcher worked. The study's participation resulted in minimal risks to participants.

In this study, all rules stated to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions stated under the title "Actions Against Scientific Research and Publication Ethics", which is the second part of the directive, were not taken.

Ethical review board name: Institutional Review Board, St. John's University, Federal Wide Assurance FWA00009066; New York City Department of Education Institutional Review Board

Date of ethics review decision: St. John's University, 6/14/18; NYC Department of Education, 8/15/18
Ethics assessment document issue number: St. John's University: 0618-007; NYC Department of Education, Study 2040-NYC (IRB)

Data Analysis

Teachers' transcribed statements from interviews and workshop discussions were determined to meet criteria for coding if they included the teachers' perceptions of any of the following: 1) the sources from which students gathered information about themselves as learners; 2) students' responses to their current and prior learning experiences; 3) beliefs students held about themselves as learners; and/or 4) beliefs students held about academic tasks. These criteria represent factors influencing students' expectancy of academic success, the value students place on that success, and ultimately students' motivation (Eccles & Wigfield, 2020; Rosenzweig et al., 2019; see "Expectancy-Value Theory of Motivation"). Thus, exploring teachers' perceptions in these areas allowed for thorough study of the current research questions.

The researcher applied an adapted form of the three-phase flexible coding technique outlined by Deterding and Waters (2018). This process was documented in analytic memos (Saldaña, 2013). In the first phase of analysis, the researcher reviewed all transcribed data, using the memoing and indexing features in NVivo to highlight potential areas of interest and/or relevance to the research questions. In the second phase of analysis, the researcher initially coded interview and workshop transcripts. The directed content approach, used for confirming the tenets of a theoretical framework and potentially extending its applicability (Hsieh & Shannon, 2005), was applied for coding framework construction. Initial code definitions, based on those developed in a prior qualitative study taking an expectancy-value approach to understanding motivation among students with LD (Louick & Scanlon, 2021), served to identify data in which teachers stated their perceptions of factors that contributed to students' development of identity beliefs fundamental to academic motivation. Simultaneous Coding (Saldaña, 2013) was used for statements relevant to more than one code.

In the third phase of flexible coding (Deterding & Waters, 2018), the researcher re-read and re-coded all transcripts multiple times, focusing on one specific code at a time, so as to test and refine each code's use. NVivo software was used to create a series of documents (one per code); the documents included each coded data segment. The researcher then developed a narrative explanation as to why each segment had been assigned particular code(s). Code revisions were made as necessary throughout this data analysis process, and documented thoroughly. For example, during the data re-readings for each of the initial codes, it became apparent that further clarification was needed so as to fully distinguish between them. The researcher revisited her own prior analytic memos, as well as key articles by Eccles and colleagues on expectancy-value theory (e.g., Eccles, 2009; Rosenzweig et al., 2019). While examining these documents, the researcher re-considered their implications for the specific research questions being investigated in the current study. Following these efforts, code descriptions were edited; data examples were chosen to align with the revised descriptions; and prior coding was re-evaluated. Furthermore, an analytic memo was written to document the steps just described. This resulted in the final code list presented in Table 2. Analysis of all coded data was ultimately organized according to its relevance to each of the research questions, as presented below (see "Findings").

Table 2. Directed Content Analysis Codes*

Code	Description	Example
1: Influences on Ability Beliefs	Statements about general messages a student receives	"What messages have students received as a learner… different students are getting different messages"
1a: Cultural Milieu	Statements about student expectations/ assumptions based on societal constructions	"we are in a—on standards-based grading… you know, a 1 2 3 4… they really think that 3 is where, y'know, successful students are"
1b: Socializers' Beliefs & Behaviors	Statements about messages that a student perceives from others (about self as learner)	"He almost saw it as… 'here's what other people think of us. We can't do as well as everybody else.' "
1c: Student's Characteristics/ Aptitudes	Statements about a student's strengths and weaknesses as a learner; conditions under which a student does their best learning	"He needs a lot of repeated experiences and practice"
1d: Previous Experiences	Statements about a student's memories related to learning/school	"He's been left back. He's been moved around. He's been pushed around, and… it's really hard to undo all of those… negative feelings…"
Expectation of Success	Statements about whether or not students believe they can succeed	"He's like… 'That's why we're in this [self-contained class]room and… we're never gonna leave.'"
Value	Statements about students perceiving task as useful for any of the following: • their own enjoyment/desire to learn • accomplishing everyday goals • reinforcing abilities they find valuable	"…he wants to be a fully bilingual person, and… he puts a lot of work and effort into his literacy in both Spanish and English…"

* derived from Durik, Shechter, Noh, Rozek, & Harackiewicz, 2015; Eccles, 2009; Eccles et al., 1983; Rosenzweig et al., 2019

Findings

This study, grounded in situated expectancy-value theory of motivation (SEVT; Eccles & Wigfield, 2020), explored middle school teachers' beliefs about factors that shaped academic task motivation among their students with learning disabilities (LD). Findings (summarized in Figure 1) include the extent to which the theorized antecedents to expectancy of and value for task success were reflected in teacher statements about their students. Also included is a report on the ways in which teachers believed that students with LDs' expectancy of and value for success impacted their motivation to engage in class activities.

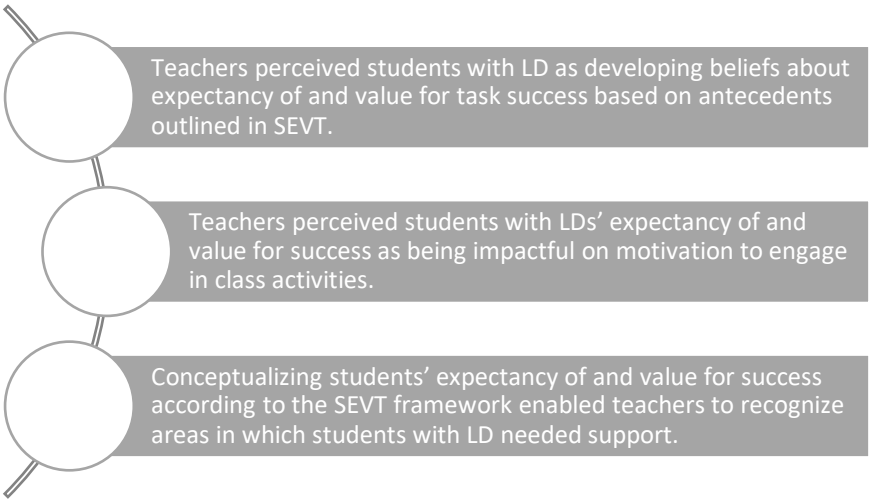

Figure 1. Key Study Findings

Antecedents to Expectancy of and Value for Success

The precursors to expectancy and value beliefs that are proposed by SEVT theorists include the cultural milieu; the beliefs and behaviors of socializers; individual students' characteristics and aptitudes; and students' previous experiences (Eccles & Wigfield, 2020). In this study, participants' statements indicated evidence that they believed all four factors impacted their students with LDs' expectancy of, and value for, task success.

Cultural Milieu. Carl's statements indicated a belief that societal constructions influenced the degree to which his students with LD valued academic tasks and expected to succeed at them. For example, he raised the issue of students' affective responses to their scores on standardized tests and assignments, and contended that students often defined success according to the standards-based grading system. When they repeatedly received scores below the level designated as "proficient" by the city department of education, Carl said his students with LD expected that they would not be able to be sufficiently successful on any subsequent tasks, even if he had written them comments indicating areas of progress that were evident in their work ("if they see, y'know, 1s and 2s [low scores] …They don't even wanna read the feedback… and they'll—they just shut down"). Carl believed that the larger special education placement system impacted his students with LDs' expectations of future success as well:

"Just being in a self-contained class—all of these guys are—already know, and they feel labeled. Another student, a couple weeks ago, talked about how once he's in our classroom, you never leave… he almost saw it like, 'Ok, we're labeled, here's what other people think of us. We can't do as well as everybody else. That's why we're in this room and we're never gonna leave.' "

Here, Carl stated his perception that students took a societal construction of special education placement ("being in a self-contained class") and a message perceived from others ("here's what other people think of us") as indications that they should not expect to succeed ("we can't do as well as everybody else. That's why we're in this room and we're never gonna leave").

Teachers also discussed ways that school and/or classroom culture impacted the value students placed on completing certain academic tasks. For example, Gloria discussed a student with LD who had experienced interruptions in his schooling and had repeated two grades; from her perspective, this put him in circumstances that led to his feeling distanced from his peers, and subsequently devaluing being a part of the school community. She explained to her fellow

teachers what she imagined him to be feeling: "Getting left back so many times, you know, you feel—and you're so much older, and you feel out of place… feeling left out and feeling like, 'this is pointless to be here.' You know, 'What am I doing here? There's no point.' So that's that—that emotional piece that needs to be repaired."

Beliefs and Behaviors of Socializers. Participants spoke at length about the role that messages from family members, teachers, and other community members played in relation to students with LDs' expectations for academic task success. For example, when asked if she felt that motivation beliefs were different among students with and without LD, Beatriz responded:

"it depends on how the families talk about it… I have a lot of parents that see it as a detriment to the students… they see it as a label, and that gets in the way also …but when families are a lot more open and understand that… with all the support that they get, they are able to overcome a lot of their challenges, and close their gaps…"

In this instance, Beatriz cited familial perceptions of disability diagnosis and provision of services as factors that she felt played into expectancy of success specifically among her students with LD. On a similar note, Gloria said she spoke with a student with LD about his mother's recollection that he was very interested in science when he was younger. Gloria believed that the memories his mother shared led the student to value science in the present day, and ultimately motivated him to engage in in-classroom science tasks (see "Relationship of Student Expectancy of and Value for Success to Motivation").

Individual student characteristics and aptitudes. Teachers described how they saw students' personal interests, abilities and perspectives impacting the value placed on engagement in classroom activities. Gloria explained how she believed that one of her students with LD approached challenging tasks:

"He just gets really down on himself when something external kind of impacts him, y'know? But… he starts off very cheery and enthusiasmatic [sic] about things… he likes sharing and discussing…. Just when he's excited about something, he's really focused on, 'Look, this is what I did.' Like, he doesn't really see it as 'Well, is it wrong? Is it right? Is it, like, incorrect? Is it…' He's just like, 'Hey, this is what I did. This is what I'm doing. This is what I'm thinking.' And it's never, like, 'Is it right or is it wrong?' So I'm wondering if he's one of those students that just, challenge is not a bad thing, you know?"

Gloria described the student's personal approach as one in which he was eager to try, and to share his thoughts about a challenging task, but less interested in whether others deemed his work as "right" or "wrong." She believed the student might feel enthusiastic about trying something new and challenging, but that the value he placed on specific kinds of task completion might not be in alignment with the value other people (for example, his teachers) placed on those same tasks.

On a less positive note, Carl recounted times when students started out demonstrating interest in certain topics, but then decided these topics weren't important to them when they ran into academic obstacles related to their LD (e.g., applying vocabulary strategies, or navigating a large amount of oral or written language; see "Relationship of Student Expectancy of and Value for Success to Motivation"). Here, Carl indicated a belief that the dissonance between students with LDs' current aptitudes and the nature/presentation of the material impacted the level of value the students placed on task completion.

Students' previous experiences. Teachers recognized the important role that past experiences could play in shaping these students' academic expectations. For example, in their individual interviews, Beatriz and Gloria each independently described the same incident in which they

believed that one of their current students with LD had been so impacted by prior teachers' evaluations of his writing, that he expected to receive criticism, and misunderstood his current teachers sharing his good work (which they wanted to use as an example for other students). As Beatriz recalled, "he told me… 'I was scared because nobody has ever done that for any of my writing… So I just thought that it was—it was bad… And I thought that you were showing how not to do it.' " Beatriz left this interaction believing that the student had assumed his work was of poor quality (and that the teachers had intended to embarrass him) because he had never perceived a laudatory message from others about his writing before.

Summary. Teachers referred to the ways they believed that the broader culture, the actions of others, individual strengths and weaknesses, and achievement-related memories impacted students with LDs' expectancy of and value for academic task success. As indicated in the next section of findings, categorizing teachers' statements according to the motivation precursors proposed by scholars of SEVT (e.g., Eccles & Wigfield, 2020) clarified the ways in which these teachers saw concepts and experiences of LD impacting students' present-day task motivation in class.

Relationship of Student Expectancy of and Value for Success to Motivation

Teachers indicated multiple situations in which they saw direct connections between students with LDs' expectancy of or value for success at a task, and their motivation to complete it. For example, Carl described situations in which students' scores on an assignment moved from 1 to 2 on the city's standardized grading system (in which 3 was considered "proficient"). He explained:

"You can conference with the student, but it's often difficult to convey the message that there has been growth, and that needs to be celebrated… if I give back a math test for instance, and I might have teacher feedback on there, but if they see, y'know, 1s and 2s …They don't even wanna read the feedback… and they'll—they just shut down… they'll just shut: 'Oh, I hate math. I hate, y'know, I can't do this' …so that's definitely, um, a motiv—well, it *doesn't* motivate them."

In this description, Carl said he believed that socially accepted expectations about success (i.e., specific numerical scores' capacity to indicate acceptable academic work) overshadowed any (potentially positive) information students with LD received from the teacher directly, to the point of students devaluing the task ("Oh, I hate math") and expecting task failure ("I hate, y'know, I can't do this"). Carl explicitly connected these feelings to a decline in student motivation ("it *doesn't* motivate them").

Similarly, teachers indicated a belief that students' perceptions of their own academic strengths and weaknesses influenced the value they placed on completing tasks, and thus their motivation to engage. When asked about motivation during class activities among his students with LD, Carl explained:

"There are students that may start off interested in the material, but as soon as they face some sort of challenge… maybe they didn't understand a vocabulary word, or maybe I'm starting to give them too much information or… because they're not a strong writer, they get frustrated if that's what I'm asking them to do. And so they'll—they tend to shut down… so they quickly will lose interest, even if they were academically motivated… Now there's… some factor that's preventing them from—or that's blocking their motivation… And then there's other students that… maybe their reading level is a little bit stronger so it allows them to access the curriculum in a different way."

Here, Carl described how he felt his students' unique capabilities impacted them when attempting challenges. He contended that lesson elements with which a particular learner struggled (e.g., difficult vocabulary, large volume of information, large writing demands) interfered with the interest value that the student placed on the material, "blocking" motivation to engage. Meanwhile, areas of strength offered more opportunities for a student with LD to engage with the learning material. Beatriz shared the following comments about the value that another student with LD placed on specific kinds of learning:

"… he says that his favorite subject is English, because he really wants to learn English, he wants to be a fully bilingual person, and that he puts a lot of work and effort into his literacy in both Spanish and English, but right now, his focus is English because that's where he needs more work. He says that he still loves to read even though he knows that he struggles with it—that he seeks out books with pictures, and he likes books about superheroes, and superpowers."

When Beatriz said "he still loves to read even though he knows that he struggles with it," and listed types and topics of books that the student sought out, she described occasions when she believed he was motivated to satisfy personal curiosities. She also said the student saw continued study of English as something that would ultimately allow him to become "a fully bilingual person," which was a characteristic that she believed he was motivated to demonstrate to himself and others.

Another example of a teacher describing the value that a student with LD placed on academic learning was Gloria's recounting of how a student's mother seemed to have influenced his academic goals.

"…he says he's gonna be a scientist, he wants to study space—the only reason he loves science is because his mom told him that when he was a little kid, he used to watch a whole bunch of videos on science, and so she knew that he loved science. And he said, 'And she told me that, and I know I love science because she said that I used to watch so many videos, and after that, I'd watch a whole lot of videos on science, and I—I'm gonna grow up and I'm gonna learn science. I'm gonna be a scientist.' "

Gloria felt that this student with LD had received a message from his mother that shaped the academic and career plans he was motivated to pursue. Teachers thus described occasions when they learned that students were motivated to engage in academic pursuits that would help them develop qualities and abilities they hoped to have one day.

In discussing the ways that expectancy and value factors impacted their students with LDs' motivation, teachers also detailed the resultant pressures and responsibilities they felt as educators. For example, Beatriz described what she learned by interviewing one of her students with LD who seemed less motivated than his classroom peers: "he's been failed by so many people in the past. He's been left back. He's been moved around. He's been pushed around, and… it's really hard to undo all of those feelings—negative feelings—because of all the schooling." Beatriz thus explained her belief that academic experiences from the student's past engendered "negative feelings" that she, as the teacher, needed to "undo" in order for the student to be motivated to engage in school effectively in the present day. In another instance, Carl talked about how necessary he felt it was for teachers to be aware of the information that socializers were conveying to their students regarding who the students were as learners: "different students are getting different messages… and if we look closely at those messages, it helps us understand why we might be seeing the behaviors—the academic behaviors, the social behaviors—that we see coming from the students." In other words, he indicated a belief that teachers should take active steps to understand the messages being conveyed to their students with LD, as those messages shape the choices that the students are motivated to make

at school. Teachers thus described the way they felt that their students with LDs' expectancy of and value for success impacted their perceptions of their own roles as educators.

Summary. Teachers indicated multiple kinds of value students placed on engagement in academic tasks, as well as varying expectancies of success, both of which impacted students' motivation to participate in those tasks. Teachers pointed out instances in which value beliefs had a positive impact on student motivation, even if students' mode of engagement was different than what the teacher and/or peers expected. Teachers also described instances in which there was a challenge to value that was, in Carl's words, "blocking [student] motivation" to engage. Finally, participants described how their expectations of themselves as teachers were shaped by what they understood about the factors that had shaped their students' academic motivation.

Discussion

This study explored middle school teachers' perspectives on the factors that influenced their students with LDs' motivation to engage in academic tasks. In discussing the degree to which they perceived their students with LD as expecting and valuing task success, the participants indicated that all four motivation precursors outlined in SEVT played a role in shaping student motivation to engage in academic tasks. Thus, one major contribution of this paper is an increased understanding of how motivational factors impact students with LD. Another contribution is a discussion of how improved teacher and researcher understandings of the factors underlying these students' motivation can be used to develop and maintain optimal learning environments for them.

Alignment of SEVT and Teacher Perceptions of Their Students with LD

Consistent with prior, related research about the relevance of SEVT to students with LDs' school experiences (Louick & Scanlon, 2021), teachers saw a direct line between the factors posited by SEVT, and the degree to which their students with LD felt academic task success was attainable and worth pursuing. Using the SEVT factors as a means of organizing the teachers' perceptions provided new opportunities for insights into how having an LD may influence the choices a student makes about whether and how to participate in an academic task. For example, Carl detailed how societal structures (e.g., the nature of special education classroom placement; the 1-4 scoring system by which students' standardized test scores were used to evaluate their knowledge) impacted his students with LDs' perceptions of themselves as learners, which in turn impacted their beliefs about whether or not it was worth it to engage in math and reading tasks. His comments highlight how the information that students with LD take in from the cultural milieu puts their expectancy for success in jeopardy. In other words, these findings demonstrate that, given cultural and societal structures related to special education, students with LD are frequently placed in situations that challenge their expectancy of succeeding (and, thus, their academic motivation). Similarly, Gloria and Beatriz detailed how prior experiences shaped one of their students with LDs' expectation that he was capable of success at a writing task: he assumed they were sharing his work with the class to shame him, when in fact they were sharing it as an example of good work for his classmates to follow. We can thus see how the behaviors of socializers in the past (which, in the case of students with LD, are too often critical) have built up by the time many of these students get to middle school, setting the stage for them to presume their work in the present will not be judged as being of high quality.

In these ways, SEVT provides an important perspective into how students with LDs' beliefs about the likelihood and usefulness of task success are continually jeopardized throughout their

schooling experiences. Teachers who do not understand the role of these expectancy and value beliefs, and the factors that shape them, are likely to overlook important reasons that their students with LD demonstrate motivation (or lack thereof) for activities and assignments, which could ultimately impact the student-teacher relationship and the opportunities the student has for academic success.

Applying Understandings of Motivation to Learning Environments

By the time they get to middle school, students with LD have already had several years of schooling that have shaped their understandings of their teachers and their classrooms, as well as themselves as learners. Previous research indicates that special education teachers recognize the role of understanding students as individuals as a means of making good instructional choices for them; as Cavendish and colleagues explain, such teachers value "learning your students" (2020, p. 22-23). Findings from the current study indicate that SEVT can be a critical tool towards such ends. Participants talked about how seeing their students' motivation through the lens of SEVT made particular aspects of their roles as educators especially salient. They indicated the importance of being mindful of the messages and experiences students brought into their classrooms from past and current experiences, and allowing that mindfulness to shape their interactions with students. Indeed, Beatriz described the challenges she faced not only in doing the work of teaching, but in "undo[ing]" challenges to present-day student task motivation that had their roots in factors outlined by SEVT. Creating opportunities for teachers to better understand when and why their students with LD expect and value success can be an important means to helping them develop learning environments in which these students feel understood and supported, and ultimately are motivated to engage in learning activities (including high-quality interventions).

As mentioned in the literature review, De La Paz & Butler (2018) argue that SEVT can be useful to teachers of students with LD because it outlines questions that the students might ask themselves when approaching an academic task; bearing their students' anticipated answers to those questions in mind, these authors argue, teachers can then plan lessons accordingly. The current study provides further support for this practical suggestion. Participating teachers saw clear links between the experiences that shaped their students' expectancy of and value for success. They believed that knowing their students with LD well enough to anticipate the students' expectancy of and value for success at a given task allowed them to plan better, and to make more well-informed instructional choices.

Limitations

The present study included a small number of participating teachers from one school in a major urban center. The students, whose families predominantly identified as Hispanic, were either bilingual or emerging bilingual in Spanish and English. More information could be gained by working with a larger number of teachers, in a larger number of settings, and with students from other language and cultural backgrounds. Additionally, the researcher in this study identifies as a White, monolingual English-speaking individual who was not raised in the community in which the study took place. A researcher who came from a similar community to that of Williams students and teachers, and had more similarities to the participants in terms of language and cultural background, would have important insights into teachers' statements about student motivation. Additionally, more teachers may have been willing to participate in a study run by such a researcher, or may have shared different information in interviews and workshop sessions. Future researchers should attend to these concerns, so as to develop an even

more robust account of teacher beliefs regarding the motivation of adolescents with LD, particularly those who are emerging bilingual students.

Conclusion

The findings from the current research represent important progress in understanding how teachers perceive their students with LDs' simultaneous academic and motivational needs. Individual students' responses to particular lessons (or particular activities, or particular individuals) can be challenging for even the most veteran teacher to negotiate. This researcher joins in the call for pre- and in-service programming that supports teachers in understanding motivation constructs, and how they relate to individual adolescents' needs (Bergin & Prewett, 2020; Wiesman, 2012), but extends the urgency of that call specifically for teachers of students with learning disabilities. Teacher education programs, educational researchers and school administrators can use the information from the present study to better support pre- and in-service teachers working with adolescents with LD.

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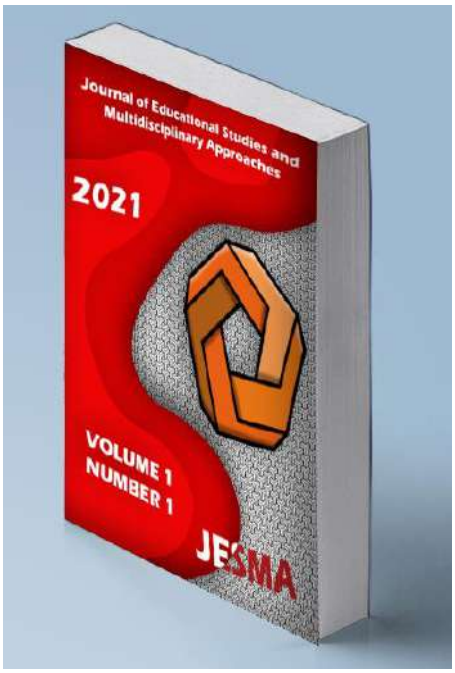

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Youth Voice in Self-Driven Learning as a Context for Interdisciplinary Learning

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ABSTRACT

The recognized importance of including student voice in learning has grown. Youth leadership, which empowers young people to choose the learning topics that they are passionate about, may provide a context for exploring complex issues that demand interdisciplinary solutions. This study explored the extent to which youth chose to pursue interdisciplinary learning topics and why they chose certain learning topics (i.e., task values: "why do I do this") when they were supported to lead their own learning. Through a content analysis of the application materials of 800 youth (M_{age} =16.59) participating in a 10-week self-driven learning program called *GripTape*, we found that 44% of learners chose interdisciplinary learning topics. Compared to those who chose single-subject topics, youth who chose interdisciplinary learning topics placed significantly greater prosocial value on learning but placed lower intrinsic or interest value. The selection of interdisciplinary learning topics was positively correlated with social science-relevant learning topics; social science-relevant learning topics were positively correlated with prosocial value. The results suggest that when youth voice is empowered in self-driven learning, youth may be willing to explore complex societal issues and pursue interdisciplinary knowledge.

Keywords: Adolescents, interdisciplinary learning, leadership, self-driven learning, task values, youth voice

Introduction

Student voice work concerns the ways in which youth can participate in learning decisions that will shape their own lives and that of their peers (Fielding, 2001; Levin, 2000). Student voice has been nominated as a component of youth positive development (Perkins & Borden, 2006), to the extent that it helps students be more engaged and see themselves as knowledge creators (Mitra, 2018), improves classroom practice and academic performance (Conner & Slattery, 2014), and helps educators understand students' specific perspectives on learning issues (Mitra, 2018). Therefore, including student voice in decision-making concerning what and how to learn is increasingly recognized as important (Mitra, 2006, 2018).

Although the importance of youth voice is emphasized, opportunities are often limited to listening to youth and asking about their concerns and desires for youth programs (Serido et al., 2011). Youth lack opportunities to lead their learning, exert decision-making power, or put their voice into action (Evans, 2007; Lerner, 2002). Youth programs have the potential to promote the civic engagement of young people, and youth voice helps them authentically engage in community initiatives and societal challenges (Serido, 2011; Stoll, 2020). Furthermore, understanding complex community and societal problems, situations, and themes requires youth to draw and integrate knowledge derived from multiple disciplines – a hallmark of interdisciplinary learning (Fraser & Greenhalgh, 2001; Ivanitskaya et al., 2002). Interdisciplinary learning also requires youth's greater voice and more central roles in learning because passive learners can hardly integrate disciplinary perspectives. As a result, youth voice may provide a context for interdisciplinary learning as students navigate complex and authentic issues at the school, community, or even statewide levels. However, limited studies focus on whether youth voice promotes interdisciplinary learning, what topics youth are passionate about and why. Therefore, educational programs may miss opportunities to incorporate evidence-based practices that support interdisciplinary learning.

Here, we consider one revelatory and novel case of youth self-driven learning programs that provides a context to nurture youth voice and implement their leadership. The program entitled *GripTape* offers adolescents between 14- and 19-years old opportunities to pursue learning challenges that they are passionate about. It serves as an ideal context to examine when youth voice is empowered in their decision-making, what learning topics they choose, the extent to which their preferred interdisciplinary learning topics, and why they choose certain tasks (i.e., subjective task values).

Student Voice and Self-driven Learning

Student voices can play roles at different levels. In the pyramid of student voice framework, Mitra (2006, 2018) described a three-level pyramid of student voice: being heard, collaborating with adults, and building capacity for leadership (see Figure 1). The higher the pyramid, the greater leadership students would take and the more they would benefit (Mitra, 2018). "Being heard" is the most basic and common form of student voice. It is about listening to students' perspectives and experiences and interpreting the data collected from them. The "collaborating with adults" level describes students and adults working together at school to make changes. At this level, adults tend to initiate relationships and make final decisions. At the top of the pyramid is "building capacity for leadership". At this level, students take the leadership roles in initiating relationships and making decisions with adults' assistance.

Figure 1. Pyramid of Student Voice (adapted from Mitra, 2006; 2018)

Although the pyramid of student voice framework was developed in a school reform context, it can be applied to other contexts that respect and enable youth to freely state their opinions and ideas (Fredericks et al., 2001). Particularly, community-based organizations provide settings for youth voice to flourish (Mitra, 2018) and can nurture youth activism (Kirshner, 2015) because youth are not constrained by teacher-student relations in these settings. Youth need opportunities to assume and practice leadership roles to prepare for future adult responsibilities (Connell et al., 1998). However, the narrowing shape of the pyramid indicates that it is relatively challenging for youth to take greater agency and leadership in an organization, and it is hard to maintain youth's leadership roles. One reason is that groups used to traditional roles may continually push against counter-normative forces (Mitra, 2018). Macedo and Freire (1994) suggested that voice cannot be simply given but requires struggles; the most that educators can do is creating structures that enable the emergence of submerged voices.

Youth are often willing and able to raise issues that adults try to avoid or might not see (Mitra, 2018). Smyth (2007) suggested that even those not succeeding in the current school system can provide insights concerning school structure and culture problems. In community-based organizations, youth not only can work on school-specific problems but also can tackle community and statewide issues (Mitra, 2018) or even beyond. Youth voice is specifically relevant to their goal setting and learning topics. The ones who cannot set their own goals are deprived of their voice and agency, might disagree with the goals set for them, and may not feel obliged to accomplish the goals (Bandura, 1997). Therefore, youth voice concerning what learning topics they perceive as important and relevant is critical (Phillips, 2013). In this study, youth took leadership in determining what to learn, how to learn, and how to evaluate their learning with the assistance of dedicated adults in a youth self-driven learning taking place in a community-based organization.

Interdisciplinary Learning

Interdisciplinary learning is not just about looking at an issue from multiple perspectives without changing the disciplines (i.e., multidisciplinary learning, Kezar & Elrod, 2012) but emphasizes integrating disciplinary perspectives. Educators and policymakers are increasingly interested in supporting interdisciplinary learning opportunities (e.g., Ivanitskaya et al., 2002; Jiang et al., 2019; MacLeod & van der Veen, 2020; Washington STEM Study Group, 2011) because it has several benefits for learners. First, focusing on a problem or theme and comparing and contrasting contributions from the perspectives of multiple disciplines support learners to connect various domains, facilitate them to

develop their personalized organization of knowledge, and promote intellectual maturation (Ivanitskaya et al., 2002). Second, exposure to interdisciplinary learning can foster high-order critical thinking and metacognitive skills (Ivanitskaya et al., 2002). Interdisciplinary learning can help learners sharpen their metacognitive skills as they deliberately expand their knowledge, draw connections between existing knowledge and new interpretations, and reflect on their ways of thinking. Third, the knowledge, skills, and thinking that learners acquire through interdisciplinary learning can be transferred to other contexts and applied to complex real-world issues or problems (Alberta Education, 2015). Finally, interdisciplinary problem solving provides contexts for creativity to arise (Sternberg, 2003; Madden et al., 2013).

Despite these mentioned benefits, several challenges tend to hinder the implementation of interdisciplinary learning. First, as described above, the organization of curricula is usually discipline-specific and does not support students to navigate across disciplines to fully understand a theme or solve a problem (Baloche et al., 1996), especially in the K-12 context. Second, students may not have developed the competencies (e.g., critical thinking, metacognitive skills) to navigate complex problems or deal with conflicting theoretical, epistemological, and methodological intentions at the intersections of disciplinary boundaries or (Ivanitskaya et al., 2002). Third, teachers need to adopt more holistic approaches and support students to take more responsibility in determining their learning content and process to enable them to navigate complex conceptual spaces. In this process, teachers may feel a sense of uncertainty, incompetence, and discomfort (Wilkie, 2004).

Although the need for interdisciplinary learning is well recognized (McNair et al., 2011), current literature on interdisciplinary learning mainly focuses on the conceptual and theoretical perspectives rather than on the practical aspect (Franks et al., 2007). In practice, some explorations have been made in higher education concerning designing interdisciplinary programs, curricula, and research experiences (e.g., Graybill et al., 2006; Hannon et al., 2018). Program designers and instructors in higher education tend to have more control over designing programs and curricula than K-12 teachers. This motivates us to explore when youth take leadership in determining their learning topics and not constrained by curriculum structures, whether and the extent to which they would choose interdisciplinary learning topics.

Subjective Task Values

Youth want to do specific tasks (i.e., learning topics in this study) for reasons (i.e., "Why do I do this"), which can be described as subjective task values (Wigfield et al., 2006). Task values are subjective because different individuals may assign different values to the same task (Wigfield & Eccles, 2020). For instance, some students may learn math because they enjoy doing so while others may do so because math is important to their future. Eccles and colleagues (1983) defined four dimensions of subjective task values: intrinsic or interest value, attainment value, utility value, and cost. Intrinsic or interest value is about individuals performing tasks for enjoyment and subjective interest. Attainment value is the importance of doing a task well because of its connection with individuals' identity, self-expression, and life. Utility value is more about how tasks relate to individuals' future goals and doing the tasks for extrinsic reasons (e.g., exploring skills that help pursue a career in the medical field). Unlike other task values, the cost value is about the negative aspects of doing the task, including required time and effort, limited access to other activities, and anticipated emotional cost (e.g., fear of failure, anxiety).

Learners' task values do not operate isolated or independently but are correlated. Learners may have more than one task values towards an activity, but they may place the values at different orders. These placement/hierarchies are influenced by individual factors such as identities, self-concept, self-schema; characteristics of tasks such as perceived task difficulty, the emphasis of collaboration or competition; individuals' interpretation of different sources of information; previous experiences and affective memories relevant to tasks; biological needs; social and cultural factors (Higgins, 2007; Wigfield et al.,

2017; Wigfield & Eccles, 2020). The components of values develop over childhood and tend to be more distinguishable and mature at adolescence (Wigfield, 1994). Altogether, youth may have multiple task values towards an activity, and adolescence is an appropriate time to observe various task values. Wigfield and Eccles (2020) provided a comprehensive review of research on ''students' subjective task values and motivation in the past 35 years. Details of definitions of subjective task values, its development, relevant interventions to enhance subjective task values, and future directions can be referred to this article.

Subjective task values and expectancy for success (i.e., "Can I do this," Gaspard et al., 2019) are two core constructs of expectancy-value theory, which suggests that learners' expectations for success and subjective values of domain areas predict their academic choices (Wigfield et al., 2016). Expectancy for success refers to learners' beliefs about how well they can perform on upcoming tasks (Eccles et al., 1983). Learners are more likely to choose academic areas that they believe they can perform well and are important to them. Expectancy-value theory has often been used to explain learners' academic motivations and intentions. For instance, adopting the expectancy-value framework, Ball and colleagues (2017) examined whether changes in students' academic expectancy, intrinsic value, and utility value positively correlate with their STEM attitudes. In another study, Ball et al. (2017) applied the framework to investigate the factors influencing students' intentions and motivations for completing high school and attending college. Gaspard and colleagues (2019) explored how upper secondary school students' expectancies and values in math and English influenced their concurrent academic achievements and future choices of STEM majors at university. In this study, we posited that because the youth chose their learning topics, they had high expectancies for success towards these topics. Therefore, this study focused on what task values motivated the youth to work on their choice's learning topics.

The Current Study

Available research suggests the potential role of community-based organizations in nurturing youth voice (including leadership roles) and promoting interdisciplinary learning because of the weak or absence of curriculum constraints and teacher-student relations. Youth leadership may foster interdisciplinary learning because it supports learners to choose authentic learning topics that they are passionate about. Not only what learning topics adolescents choose are important, but also why they desire to do the task are critical. Adolescence is an appropriate period to observe how individuals may place various task values toward learning activities. This study aims to explore the extent to which youth select interdisciplinary learning topics when they are empowered to drive their own learning; how youth's task values are related to their actual choices of learning challenges in various domains. We explored this question among youth participating in a community-based self-driven program called GripTape. This study examined the following research questions:

1. To what extent do adolescents choose interdisciplinary topics when empowered to lead their own learning?
2. Do task values differ between the *Single-subject Topic* and *Interdisciplinary Topic* groups?
3. Are adolescents' topics of interest associated with their task values in self-driven learning?

Methods

Participants and Procedure

There were 1,217 adolescents accepted by the *GripTape* self-driven learning project (*https*://griptape.org/) from 2016 to 2020. *GripTape* provides opportunities, funding, and adult support for 14 to 19 years old adolescents across the United States to pursue their self-determined learning challenges. The program is driven by a belief that "all young people should have the support and

resources to deepen their interests and chart their path to success" (*https*://griptape.org/). Therefore, priorities are given to youth without an abundance of available learning opportunities. This program usually takes place in three cycles each year, and each learning cycle lasts for about ten weeks. Before each learning cycle, a call for proposals is advertised on the *GripTape* website and social media and distributed through GripTape staff and alumni networks. Various methods are offered for youth to submit their applications, including text, video, and presentations. Applicant selection is made based on *GripTape* staff's interpretations of (1) whether the youth is passionate about what they have proposed; (2) whether there is a clear and significant learning part in their goals; (3) whether the youth has a starting place for how to approach the challenge. The participants of this study were 800 youth who were accepted to the *GripTape* program and whose textual responses to the application questions were made available to us by program adminstration. This study focused on participants' textual responses to questions "*What topic or skills are you planning to explore during this Challenge?"* and *"Why are you passionate about this?*" Participants' responses ranged from several sentences to several paragraphs. This study was waived from the ethics protocol review by the researchers' institution because we only have access to unidentifiable information of the participants.

The average age of the 800 participants was 16.59 years old. There were 58.25%female participants, 39.50% male participants, and the other 2.25% participants reported non-binary, other genders, or preferred not to report gender information. One participant could report multiple races/ethnicities. Among the participants, 32.13% did not report race information; 20.75% identified as Hispanic or Latino; 19.63% identified as Black or African American; 11.88% identified as White, Non-Hispanic; 63 identified as Asian/Asian American (7.88%); 7.88%identified as American Indian or Alaska Native; 0.75% identified as Native Hawaiian or Other Pacific Islander; and 4.25%selected other (4.25%).

Ethical Considerations

The data set was collected by the *GripTape* team (https://griptape.org/) for internal evaluation and future research purposes. The Institutional Review Board at Cornell University waived the ethics protocol review on January 28, 2021 because we do not have access to the private identifiable information of the participants nor any master list that would allow the re-identification of the data. Derived data supporting the findings of this study are available from the corresponding author upon request and with the permission of the *GripTape*.

Code Development

A coding scheme was developed to analyze the content of the youth's determined topics or skills, mainly using a deductive qualitative approach (Hsieh & Shannon, 2005; Armat et al., 2018). Common subject and skill classifications guided the development of the coding scheme, and new categories were added inductively when the data did not fit the categories. The learning topics were very diverse; therefore, we used the common subject classification to frame them: Arts & Humanities, Business & Economics, Clinical, Pre-Clinical & Health, Computer Science, Engineering & Technology, Life Sciences, Physical Sciences, Social Sciences and Law (Timers Higher Education, 2020; Cornell University, 2021). Detailed descriptions of each subject classification and relevant examples extracted from the applications of the participants are shown in Table 1.

Sometimes learning challenges were more skill-based rather than knowledge-based. Skills are about individuals' abilities to do things or work with expertise (Kalyani, 2019). It involves the knowledge of what to do and the procedures, experiences, or habits of how to do it (Kalyani, 2019). Grounded in the data, we added Transferable/Functional skills, Personal Traits/Attitudes skills, and Knowledge-based skills to capture the skills that the learners aimed to develop during their learning challenges (Kalyani, 2019; Skillscan, 2012).

Transferable/Functional skills are a core set of skills and abilities that can be applied in various areas and contexts, such as writing, speaking, and communication skills (Kemp & Seagraves, 1995). Personal Traits/Attitudes skills are individual distinguishing characteristics and qualities that contribute to task performance, such as being confident and independent and opening to different ideas (Skillscan, 2012). Knowledge-based skills refer to knowing specific procedures and information necessary to perform particular tasks such as sewing, baking, and welding (Skillscan, 2012). In this study, we distinguished the code of Arts & Humanities and Knowledge-based skills based on whether a learning challenge emphasizes the artistic, creative value, or talents elements.

There are also cases that the learners mainly aimed to attend or organize an activity (e.g., attending a conference or summer camp, organizing an event) during their learning challenges. Therefore, another big category "Activity" was added in addition to knowledge and skills.

Table 1. A coding scheme of subjects, skills, and activities of participants' choosing

Dimensions	Sub-dimensions	Descriptions of the sub-dimensions	Examples extracted from participants' applications
Knowledge	Arts & humanities	Art, performing arts, design, languages, literature, linguistics, history, philosophy, theology, architecture, and archaeology	Music, Latin American rhythms, music and culture and learn how to play guitar, culture, play a guitar, music industry and production; African heritage through dance, art of dance; Spanish Language and Dominican Culture, I would like to learn other languages, writing stories, poetry, academic papers; film, artwork and art studio, skilled photography, fashion, fashion/Styling and Photography, graphic design, culinary arts and fashion designing, shading in drawings, acting,
	Business & economics	Business and management, accounting and finance, and economics and econometrics.	Branding/Business (skating collective), how business works, business management, attend a business institute, entrepreneurship, run your own business; Entrepreneurship, entrepreneurship and starting a business, enterprise, venture ecosystem, entrepreneurship and leadership
	Clinical, pre-clinical & health	Medicine, dentistry, and other health subjects	The medical field, a medical field with people and with animals, cardiovascular surgeon, Sports Medicine; Neurodegenerative Disease Mental disabilities; Dentist, orthodontist; physical health awareness, create a better way for genuine doctors to both connect with patients and critically understand their symptoms; look for colleges that include nursing programs
	Computer science		CS, Artificial Intelligence, Virtual Reality, IT/computer design, UI/UX, games, Blockchain, computer forensics; computer programming, coding, program, R and Python, software development (coding)
	Engineering & technology	General engineering, electrical and electronic engineering, mechanical	Go further in-depth in the sciences programs;

		and aerospace engineering, civil engineering, and chemical engineering	welding and electrical engineering, digital electronics, mechanical engineering, 3D printing; audio engineering, video development as well as editing software Alternative methods for farming, ranch management; Biomedical Engineering, biology or science, biology;
	Life sciences	Agriculture and forestry, biological sciences, veterinary science, and sport science	Sports management, mindset, and work ethics that are needed to become a great quarterback in football, girls' wrestling
	Physical sciences	Mathematics and statistics, physics and astronomy, chemistry, geology, environmental sciences, and earth and marine sciences.	Math, difficult mathematics topics, such as statistics and calculus; Physics; Chemistry; Pollution, renewable energy YouTube, sport media; Voter Registration, Naval Special Warfare/SEALs, Police-Community Relations; Homelessness, Income Inequality and systematic oppression, media and reaching low-income parents, while promoting Summer Learning; Raise funds to reach desired transportation, social working, How technology can help in the fight against human trafficking? Create a non-profit organization, what makes up a successful social enterprise? Black Panther Party; Curriculum in elementary and secondary schools and its evolution over the years, education - as a whole - and different minority groups across the world Empowerment of Girls, helping people to become self-sufficient and sustainable signs of development, human development;
	Social sciences	Communication and media studies, politics and international studies (including development studies), sociology (e.g., gender, inequality), and geography. Education, teacher training, and academic studies in education. Educational, sport, business, animal, and clinical psychology.	building an amazing physique builds confidence, race and identity; Mental Health Impact of Bullying, mental and physical health, suicide, anti-bullying, depression & LGBT+, body image among young teen girl and young women's, mental health problems and suicide prevention issues, change in society with relation to the impressions left on children ages 4 – 8, Mental Disabilities in Health Care, physical health awareness; Animal Therapy, animal behavior and animal communication
	Law		Criminal justice and law; computer forensics, Forensic Science; I want to first start with the fight against human trafficking.

			Writing, public speaking, communication skills, leadership skills and my presenting skills;
	Transferable /Functional	Actions taken to perform a task, transferable to different work functions and industries	creativity, thinking outside the box and being a leader, critical thinking skills; ability to organize large events and projects; editing software
	Personal Traits/Attitudes	Traits or personality characteristics that contribute to performing work	Self-confidence and independence, wants to learn how to become more confident; the ability to expand my ideas and willingness to take charge and be proud of my ideas
Skills	Knowledge -based	Knowledge of specific subjects, procedures, and information necessary to perform particular tasks; do not emphasize the artistic or creative value or talents	Baking, cooking, culinary, sweet; Sewing, sewing class; Cosmetology/Make-Up, my skills on doing hair, modeling; Welding, blacksmithing and welding
Activity	Activity	The main task is attending activities such as summer programs and conferences	Summer program "Science: It's a Girl Thing", explore conferences at Rice University, study abroad program in Spain, attending a Model United Nations conference in Washington, D.C., medical field by wanting to attend a summer away program, attend a business institute

Similarly, a task value coding scheme was developed to analyze the task values connected with the topical areas reflected in participants' applications. We referred to Eccles et al.'s (1983) classification and definition of interest, attainment, utility, and cost values. Given the high motivation of the participants (authors) and the self-driven nature of the learning challenge, the participants did not describe costs associated with their learning challenges. Therefore, cost value was not included. Because nearly all the participants used the phrase "passionate about" in their application, we did not consider an application to fall into the intrinsic or interest value category unless more relevant terms (e.g., love, like, interested) were used. Our data suggested that many participants considered contributing to and influencing their families, communities, or even the whole society as a driving force of their learning challenges. Therefore, we added the "Prosocial" code to capture this value (Beutel & Johnson, 2004).

Table 2. A coding scheme of subjective task values

Task values	Descriptions of the dimensions	Student examples
Intrinsic or interest value	The enjoyment individuals get from performing the task, or the subjective interest they have in the subject.	I've always been interested in manufacturing/ creating my own computer. I cannot explain why I am passionate about this field, but my interest started when I was around 12, but it wasn't until this year that I experienced it in a classroom.
Attainment value	Doing well on a task is important because it is linked with one's identity; the task is a big part of one's life; doing the task is a way to express oneself and show others who we are. A participant may talk about their previous experiences or connections that have been there for years.	I want to become as skillful as my grandfather, which welds himself. I am good at the subject, but I feel I can be better and would like to further my knowledge. I'm against early child marriage because I believe that everyone deserves chances at getting a good education no matter what their race is or gender. This learning will help me decide whether to go into the medical or engineering field.

		I'm passionate about this because drawing to me is a good way to let your creativity out for the world to see.
		I love taking pictures and editing them it really distracts me from all my problems at home and school.
		I'm inspired by amazing works like Alfred Hitchcock, Stephen Spielberg, and a lot of short films on YouTube
Utility value	A task relates to future goals or is a step toward big goals. It captures more-extrinsic reasons for doing the task (e.g., valuing an organic chemistry class because of planning to be a doctor).	The skills that I am most interested in exploring are those that will most help me pursue a career in the medical field.
		I want to attend a business institute to explore different opportunities in regard to business.
		I hope my project can shed light on how autism can impact a child's education and life.
		I enjoy helping out people especially those in need when they are sick.
Prosocial value	Related to help others, serve the community and influence the societal structure.	MUN allows me to find collaborative measures to solve these problems and gain a new perspective while solving them.

Analytical Plan

Qualitative Coding

Two raters first examined the data together and applied the subjects, skills, and activities (see Table 1) and subjective task value (see Table 2) coding schemes to the data. We aimed to develop a shared understanding of the data and coding schemes through this process. Then the two raters independently coded 258 (31.73%) application content. In the process, they met every week to compare and discuss the disagreement. The coding schemes were updated if there was a new understanding, and the previous coding results were discussed again and updated if revisions were made to the definitions of the coding categories. After good inter-rater reliability between the two raters was achieved, the two raters split the remaining data and coded separately. The two raters highlighted the coding they were not certain about during the independent coding process, especially the Activity and Physical Science coding. They met two more times to discuss uncertainties to reach an agreement.

Welch Two Sample T-tests and Association Analysis

Based on the qualitative coding result, the responses with two or more subject, skill, or activity coding were labeled as interdisciplinary learning topics. To respond to the first research question, we analyzed the frequency of different learning topics and the percentage of interdisciplinary learning topics. We also summarized the popular combinations of different learning topics to understand how participants connected various subject areas. To answer the second research question, we calculated the percentage of various task values. We used Welch Two Sample t-tests to analyze how participants who chose single-subject and interdisciplinary learning topics differ in task values. Regarding the third question, we conducted a correlation analysis to examine how participants' learning topics were associated with their task values.

Results

The inter-rater reliability between the two raters was calculated using Cohen's kappa. The average agreement for all the sub-dimensions of learning topics is 0.62, indicating substantial agreement (Landis & Koch, 1977). As shown in Table 3, moderate to perfect agreement (0.48 to 1.00) was achieved for most categories except for the Physical Sciences and Activity. The low inter-rater reliability on Physical

Sciences and Activity categories was because of their low occurrence, which led to fewer discussions between the two raters on these coding during the process of reaching a shared understanding; rater B misunderstood environmental-related issues as Life Sciences rather than Physical Sciences. Concerning task values, the average Cohen's kappa is 0.57, and the agreement for each sub-dimension ranges from 0.44 to 0.73, indicating moderate agreement (Landis & Koch, 1977).

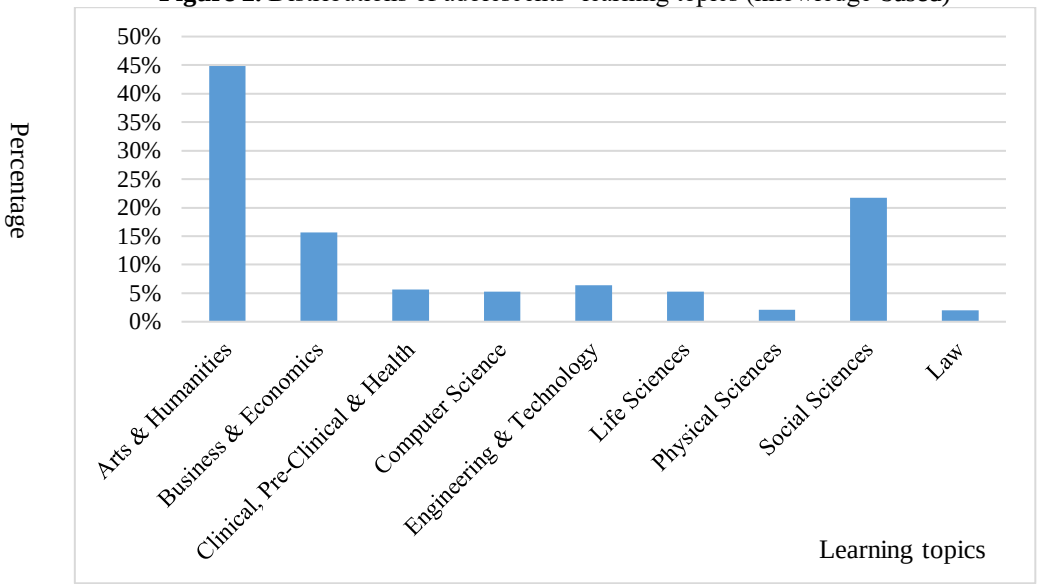
Table 3. Inter-rater agreement of the content and task value coding

Dimensions	Sub-dimensions	Cohen's kappa
Knowledge	Arts & Humanities	0.83
	Business & Economics	0.86
	Clinical, Pre-Clinical & Health	0.74
	Computer Science	0.87
	Engineering & Technology	0.60
	Life Sciences	0.53
	Physical Sciences	0.00
	Social Sciences	0.69
	Law	1.00
Skills	Transferable/Functional	0.68
	Personal Traits/Attitudes	0.66
	Knowledge-based	0.48
Activity	Activity	0.16
Task values	Intrinsic or Interest	0.54
	Attainment	0.57
	Utility	0.44
	Prosocial	0.73

Single-subject and Interdisciplinary Learning Topics

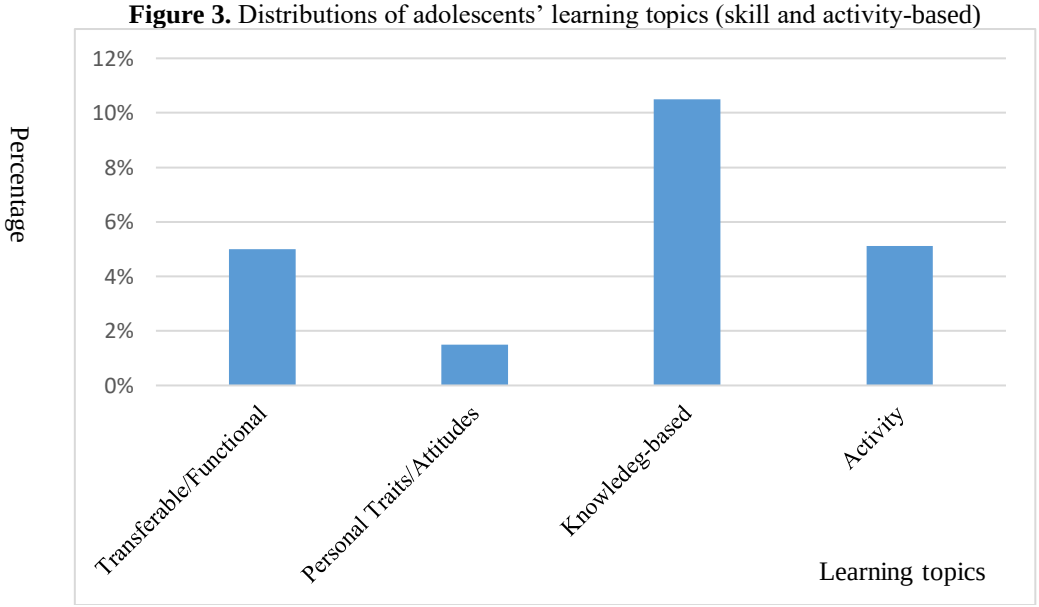
Figure 2 shows the learning topics chosen by the participants. Arts & Humanities (44.88%), Social Sciences (21.75%), and Business & Economics (15.63%) are the three most popular topical areas that the participants were interested in pursuing in their self-driven learning. The majority of the participants chose to work on photography, music, dancing, fashion design, branding, business, management, entrepreneurship, psychology, education, sociology, communication, politics, etc. There were about similar percentages of participants interested in Engineering & Technology (6.38%), Clinical, Pre-Clinical & Health (5.63%), Computer Science (5.25%), and Life Sciences (5.25%), respectively. Physical Sciences and Law were less popular among the participants when they could decide their learning topics, with 2% and 2.13% choosing relevant learning challenges.

Figure 2. Distributions of adolescents' learning topics (knowledge-based)



In addition to knowledge-based learning topics, as shown in Figure 3, a fair number of participants focused on improving their skills or attending or organizing activities during their learning challenges. In detail, 10.50% of participants aimed to acquire or enhance Knowledge-based Skills, 5.00% aimed to work on Transferable/Functional Skills, and only 1.50% planned to work on Personal Traits/Attitudes. Among all the applications, 5.13% had an Activity focus.

Figure 3. Distributions of adolescents' learning topics (skill and activity-based)



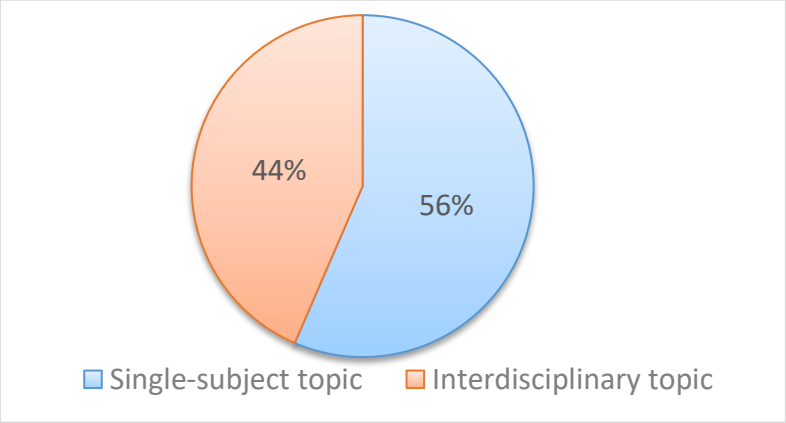
As shown in Figure 4, 56% of participants focused on one topical area in their learning challenges. We named the learning topics only involving one topical area as single-subject topics. The following is an example of a single-subject topic that falls into the area of Arts & Humanities:

"I plan on exploring music and singing during this challenge. I want to buy music equipment so that I can record the songs that I have written (and hopefully post videos on Youtube). I am passionate about this because music is all that I know. I have been singing and writing songs since I was a little girl, about 6 or 7 years old, I really want to make it into the entertainment field…"

The other 44% of participants integrated two or more topical areas in their learning challenges. We named these topics interdisciplinary learning topics. Some most frequently occurring combinations of these interdisciplinary learning topics are Arts & Humanities and Business & Economics (53 out of 800); Arts & Humanities and Social Sciences (50); Social Sciences and Activity (23); Arts & Humanities and Knowledge-based skills (21); and Law and Social Sciences (16). The following quote represents an example of interdisciplinary topics involving Arts & Humanities and Psychology.

"I hope to pursue study in photography and the increase of self-esteem of youth that comes from the inner city (using cameras and images), specifically at James Hillhouse school. I'm passionate about this because I was once bullied and didn't have the person in my life besides my mother, (who was alive at the time) to help me build that inner confidence with this project I hope to alleviate some of that pain that students like myself have faced."

Figure 4. The distributions of single-subject and interdisciplinary learning topics in adolescents' applications



Distinctions of Task Values

Figure 5 displays the distribution of the task values reflected in participants' applications. Roughly two-thirds (66.13%) of participants indicated that attainment value drove their learning challenges, suggesting they worked on the learning challenges that were important for them to do well. These learning challenges could be relevant to participants' identities, previous experiences or connections, or had been a big part of their life. We found that 45.25% of participants had intrinsic or interest value. Notably, 40.38% of participants had prosocial values, suggesting their driving force of helping others (including families), serving the community, and influencing the societal structure. Compared with other task values, fewer participants (30.63%) had utility value related to efforts to prepare for future careers or other goals through the learning challenges.

Figure 5. Distributions of the task values reflected in adolescents' applications

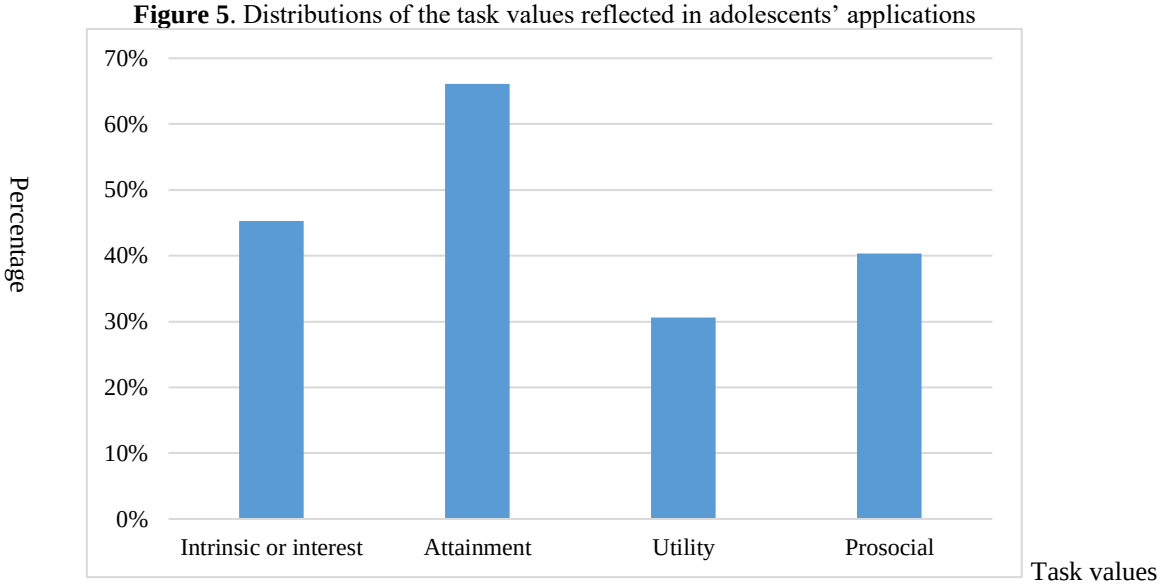


Table 4 shows the task value distinctions between participants who chose single-subject and interdisciplinary learning topics. The two groups did not differ significantly concerning attainment or utility values. However, the *Interdisciplinary Topic* group had significantly greater prosocial value than the *Single-subject Topic* group but significantly lower intrinsic or interest value.

Table 4. T-tests results of task values between participants who chose single-subject and interdisciplinary learning topics

	Mean		SD		df	t	p
Task value	Single-subject group (n=452)	Interdisciplinary group (n=348)	Single-subject group (n=452)	Interdisciplinary group (n=348)			
Intrinsic	0.54	0.37	0.50	0.48	758.13	4.79	<.005
Attainment	0.67	0.68	0.47	0.47	750.35	-0.41	0.68
Utility	0.31	0.34	0.47	0.47	738.4	-0.79	0.43
Prosocial	0.34	0.52	0.47	0.50	724.88	-5.36	<.005

Associations between Learning Topics and Task Values

Table 5 shows the correlations between participants' learning topics and task values. Here we only highlighted moderate correlations. Social sciences-relevant learning topics are positively correlated with prosocial value but negatively correlated with intrinsic or interest value. Interdisciplinary learning topics are positively correlated with social sciences-relevant learning topics. These results together indicate that participants were concerned about complex social sciences-relevant topics which usually demand interdisciplinary knowledge to tackle. They chose social sciences- relevant topics mainly to help others, serve their community, or influence the societal structures rather than because of personal enjoyment or interest.

Table 5. The correlations between learning topics and task values

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Arts	1																
2. Biz	-0.05	1															
3. Health	-0.22***	-0.05	1														
4. CS	-0.20***	-0.08*	0.02	1													
5. ET	-0.16***	-0.10**	-0.06	0.18***	1												
6. LS	-0.21***	-0.11**	0.07*	-0.02	0	1											
7. PS	-0.07*	-0.03	-0.04	-0.01	0.04	0.07	1										
8. SS	-0.26***	-0.16***	0.10**	-0.06	-0.14***	-0.08*	-0.04	1									
9. Law	-0.16***	-0.06	-0.04	-0.04	-0.05	-0.05	-0.03	0.18***	1								
10. Trans	-0.16***	0.03	-0.05	-0.02	-0.06	-0.08*	-0.01	0.07*	0.02	1							
11. Traits	-0.09*	-0.01	-0.03	-0.03	0.03	-0.04	-0.02	-0.03	-0.02	0.04	1						
12. Knwl	-0.17***	-0.05	-0.08*	-0.09*	-0.06	-0.06	-0.03	-0.09**	-0.04	-0.09**	0.04	1					
13. Acvy	-0.07*	-0.11**	0.01	-0.05	-0.04	-0.03	0.05	0.09*	-0.02	0.01	0.04	-0.06	1				
14. Intrin	0.23***	-0.04	-0.06	-0.02	0.02	0.09**	-0.01	-0.32***	-0.07*	-0.13***	-0.03	0.03	-0.08*	1			
15. At	0.16***	-0.06	0.02	-0.01	-0.08*	0.02	0	-0.01	0.02	-0.06	-0.03	-0.09**	0.06	0.17***	1		
16. Utl	-0.05	0.21***	0.04	0.09**	0.03	-0.02	-0.01	-0.13***	0.04	0.05	0.01	-0.03	-0.07	0.02	0	1	
17. Psol	-0.29***	0	0.14***	0.05	-0.07*	0.03	0.08*	0.38***	0.05	0.07*	0	-0.06	0.10**	-0.26***	0.01	-0.10**	1
18. Intd	-0.02	0.21***	0.15***	0.08*	0.10**	0.03	0.12***	0.42***	0.11**	0.17***	0.15***	0.09**	0.26***	-0.17***	0.01	0.03	0.19***

Note. Arts: Arts & Humanities, Biz: Business & Economics, Health: Clinical, Pre-Clinical & Health
CS: Computer Science ET: Engineering & Technology, LS: Life Sciences, PS: Physical Sciences SS: Social Sciences
Trans: Transferable/Functional skills, Traits: Personal Traits/Attitudes, Knwl: Knowledge-based, Acvy: Activity
Intrin: Intrinsic or Interest value, At: Attainment value, Utl: Utility value, Psol: Prosocial value
Intd: interdisciplinary topics
*$p < .05$; **$p < .01$; ***$p < .001$

Discussion

This study explored when youth are empowered to make their own learning decisions, to extent to which they choose interdisciplinary learning topics, what the associated task values are, and if the task values of single-subject and interdisciplinary learning groups differ. Results showed that approximately 44% of participants chose interdisciplinary topics, suggesting that youth voice provides a context for interdisciplinary learning. Compared with the *Single-subject Topic* group, the *Interdisciplinary Topic* group had significantly greater prosocial value but lower intrinsic or interest value. There was a moderate positive correlation between social sciences-relevant learning topics and prosocial value; social sciences-relevant learning topics were positively correlated with interdisciplinary topics.

It is worth noting that 44% of participants integrated two or more learning topics into their challenges. It suggests that youth voice in self-driven learning provides a context for pursuing interdisciplinary learning topics. As the correlations between learning topics and task values suggest, participants' chosen learning topics are usually derived from their interests, life experiences, identity, future expectations, and desire to help others or society. This result confirms the connections between youth voice, learning, and identity (Rahm et al., 2014), indicating that youth tend to participate in the larger community and find a place in society where they can lead their learning (Serido et al., 2011). Their chosen learning topics tend to be authentic and complex and may require the participants to acquire related knowledge, resources, and approaches from several disciplines to make sense of (You, 2017). Making connections across different areas can enrich learners' deep understanding of core ideas and practical applications of knowledge (NRC, 2012). Furthermore, interdisciplinary learning benefits the affective aspect of learners as it "can provide relevant, challenging, and enjoyable learning experiences" (Scottish Government, 2008, p. 21). Interdisciplinary problem solving and interactions between subjects provide contexts for creativity to arise (Madden et al., 2013; Sternberg, 2009). Therefore, educators propose that teaching and learning should connect different learning topics within and across subjects and ensure students can explore a subject from multiple perspectives (e.g., NRC, 2012; Ontario Ministry of Education, 2007). This study suggests the feasibility of interdisciplinary studies in self-driven learning where youth are empowered to determine learning content and lead learning.

This study found that about two-thirds of adolescents chose to work on learning challenges that are important to who they are, relevant to their previous experiences or personal connections, and what they have always been doing, wanted to do, or struggled with. A further examination of the content coded as attainment value suggests the importance of youth racial, gender, and religious identities in directing their learning topics. This study indicates the importance and feasibility of integrating youth voice, identities, and interests in their learning. Similarly, Rahm et al. (2014) suggested that youth voice was tied to their identity development, engagement, and learning within an afterschool ScienceGirls program and beyond. In the school learning context, Faircloth (2009) found that identity connections that are important to the self, background, and the ability to make themselves known contributed significantly to the belonging of grade 9 students. Pellegrino (2020) indicated that breaking down the barriers between school learning and socio-cultural activities will make learning more meaningful, purposeful, and personally relevant. Adolescents are intensively involved in identity development, and their process of identity development can be positioned to powerfully support meaningful connections to school (Faircloth, 2009; Harter, 1990). Exploring the relationships between student identity and learning may be an effective way to support their engagement, comfort, and connection at school (Rubin, 2007). Unfortunately, what adolescents gain from their lives outside of school is rarely accessed in the school setting (Moje et al., 2004; Lee, 2007). From the perspective of youth voice, this study further confirmed the importance of integrating these funds in learning and provided another approach for doing so in a youth self-driven project out of school.

The greater prosocial value but lower intrinsic or interest value of the *Interdisciplinary Topic* group indicates that the participants who chose interdisciplinary learning topics were more motivated by

helping others, supporting the community, and even changing societal structures than their individual interests or enjoyment. This, in turn, confirms the complexity of addressing real-life and societal issues. Furthermore, the positive correlations between interdisciplinary learning and social sciences-relevant topics and between social sciences-relevant topics and prosocial value suggest that adolescents, as citizens, are concerned about complex societal issues and are willing to tackle them using interdisciplinary knowledge. These results speak to citizenship education which is concerned with supporting students to understand the nature of crucial problems that our world is facing and take active roles in addressing them (Ibrahim, 2005; Watt et al., 2000). The active participation of all citizens, including youth, is necessary and critical in a democratic society (Sherrod, 2005). Stoll (2020) also indicated that "young people want and may be able to provide answers to global challenges" (p. 423). This study suggests that adolescents were motivated by their prosocial value to tackle pressing political, societal, and environmental issues such as voter registration, homelessness, income inequality, and environmental and renewable energy issues. Similarly, Ben-Eliyahu et al. (2014) suggested that participating in politics or serving others tended to trigger the "sparks" or deep interests of some 15-year-old adolescents.

This study contributes to the literature on youth voice, self-driven learning, interdisciplinary learning, and task values. Although the importance of interdisciplinary learning has been recognized, various challenges hinder its implementation in the school context. This study confirmed that self-driven learning, which enables youth to integrate their identity, interests, and voice in their learning, provides opportunities for interdisciplinary learning to take place. Furthermore, although there is increasing recognition that task value predicts current and future choice of activities (Wigfield et al., 2016), few studies have specifically researched the correlation between intrinsic or interest, attainment, and utility values and various learning topics in different domains. This study addressed this gap by examining the relationships between adolescents' specific task values and various domains.

Implications

This study provides implications for schools and positive youth development organizations. First, it implies that youth voice in self-driven learning provides a context for interdisciplinary learning, considering almost half of the participants choose interdisciplinary learning topics when they could lead their learning. A strict disciplinary structure and irrelevant curriculum coincide with students' disengagement (Fredricks et al., 2019). In contrast, interdisciplinary learning can foster critical thinking, metacognitive skills, engagement, and applications of knowledge and skills to new contexts (e.g., Alberta Education, 2015; Ivanitskaya et al., 2002). Therefore, schools or positive youth development organizations should find ways to better incorporate youth voice in learning (Mitra et al., 2014) to foster interdisciplinary learning, increase their commitment and engagement, and strengthen their ability (Kramer et al., 2020).

Second, this study implies the importance and possibility of integrating youth voice, identities, and interests in their learning, considering most adolescents were directed by their attainment and intrinsic or interest values to choose learning topics. Considering adolescents' identities and interests in learning tends to enhance the relatedness and connectedness of learning and allow the ones who do not belong to the mainstream to find themselves (Hatt, 2007). Culturally connected curriculum units and materials make learners feel a sense of inclusion (Darling-Hammond et al., 2020). Kramer et al. (2020) also found that secondary schools with better-than-predicted graduation outcomes shared a theme: promoting youth-driven identity development and goal setting. Therefore, schools or positive youth development organizations should harness the assets (e.g., identities and interests) that learners bring with them.

Limitations and Directions for Future Research

Several limitations of this study need to be addressed in future research. First, this study qualitatively analyzed participants' textual application to a self-driven learning program. Future research should be extended to other self-driven or independent learning and collect various data types such as surveys, interviews, and observations to complement and validate participants' textual responses. Furthermore, the data represents a snapshot of youth's learning topics and task values when applied to the project. Future research is needed to investigate how the participants' learning topics and task values unfold over time as they tackle the learning challenges. Second, the participants of this study are not a general sample of adolescents in the United States. Because of the belief of this program, females and racial minority groups (e.g., Black or African American, Hispanic or Latino, Asian/Asian American) are more represented in the sample. Finally, although we achieved moderate to perfect inter-rater reliability for most coding, it should be noted that our agreement on Physical Science and Activity coding was not satisfying. Although we discussed all the differences to reach an agreement and paid specific attention to these coding when we coded separately, compared to the results of other coding, the coding results of Physical Science and Activity may be more skewed from reality. Future research should address these issues.

Constraints on Generality

Our findings suggest that adolescents would choose interdisciplinary learning topics when they could lead their own learning. The participants were 800 youth between 14 and 19 years old in the United States, with a larger proportion of females and racial minorities (e.g., Hispanic or Latino, Black or African American) than their actual proportions among youth across the country. We expect our results to be generalized to other contexts in which a similar group of adolescents can take a leadership role in determining the learning challenges/topics/projects they are passionate about in the formal school or informal learning context. We have no reason to believe that the results depend on other characteristics of the participants, materials, or context.

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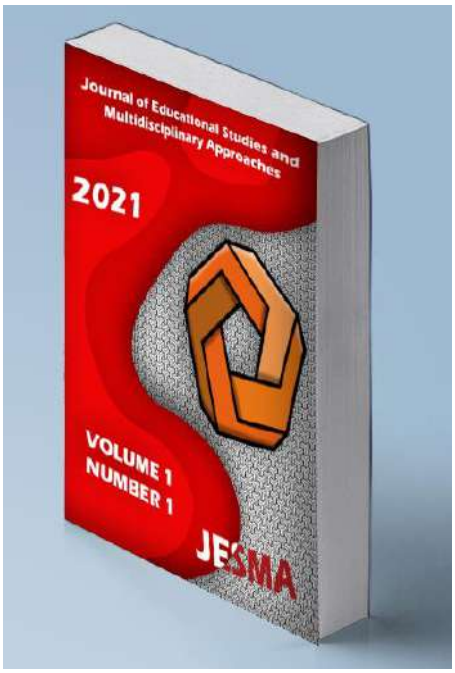
Biographical notes

Gaoxia Zhu: This work was conducted when Dr. Zhu was a postdoctoral associate at Cornell University. She has Learning Sciences, Educational Technology, and Curriculum & Pedagogy backgrounds. Her research interests include student agency, socio-emotional interactions, learning analytics, Knowledge Building, and computer-supported collaborative learning (CSCL).

Anthony L. Burrow: Dr. Burrow's research follows two paths. The first investigates why having a sense of self-direction – or purpose in life – serves as a psychological resource for those who cultivate it. A second path examines how notions of race are incorporated into one's sense of self (i.e., racial identification) and potentially shape perceptions of everyday encounters.



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Exploring The Effect of Online Course Design on Preservice Teachers' Knowledge Transfer and Retention Through Learning Analytics

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Exploring The Effect of Online Course Design on Preservice Teachers' Knowledge Transfer and Retention Through Learning Analytics

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ABSTRACT
There is a vast amount of data collected on e-learning platforms that can provide insight and guidance to both learners and educators. However, this data is rarely used for evaluation and understanding the learning process. Hence, to fill this gap in the literature this study explored the effect of online course design on students' transfer and retention of knowledge through learning analytics. The aim was to reveal study behaviors of participants over a short time while exploring their academic performance. Using a mixed method approach, this research is conducted in two different countries in a limited time. The results showed that the more times students visited the learning module and the longer these visits, the higher the students' transfer knowledge scores in this module. Most importantly, the only variable found to be a significant predictor of students' transfer learning outcome was the number of sessions in the module website.

Keywords: online course design, knowledge transfer, retention, learning analytics

Introduction

Demand for online programs and courses has increased dramatically during the last two decades due to the convenience of online learning, the flexibility of scheduling and the opportunity for students to adapt online learning to their lifestyles (e.g., Ifenthaler & Widanapathirana, 2014; Law et al., 2018; Loh et al., 2015). The ease of access to continuously changing and emerging technologies coupled with the ability to reach a widening range of open multimedia learning resources has allowed many online students to benefit from the media-rich learning content and to explore enormous relevant information (Low & Sweller, 2005; McGuinness, 1990).

Furthermore, students' engagement in their learning process can be monitored through learning management systems and analytics tools which track a variety of information about the students' progress and performance. Learning systems can also provide educators feedback and analyses of students' data to make formative evaluation and future learning decisions (Gašević et al., 2016). Although, educators can use this data to reflect on the teaching process, there is little information provided on how to interpret these data regarding students' learning outcomes and their online habits (Viberg et al., 2018).

Literature Review

Prior research in the field of learning analytics (LA) is mainly focused on gaining insights into learners' behaviors and academic performance in online learning environments (Greller & Drachsler, 2012; Peña-Ayala, 2018; Saarela & Kärkkäinen, 2017). Other LA research was conducted to provide automated feedback about students' patterns in online learning environments (Er et al., 2021; Huang et al., 2019). The overarching theme of these studies was to review and analyze students' activities collected data to support learning and teaching (Nguyen et al., 2017, 2018; Nistor & Hernández-Garcíac, 2018). However, few studies have explored students' behaviors to predict their academic performance. Some of the early studies have used learning interaction data to evaluate and predict the students' academic performance in online learning environments and found that students' access behaviors of learning content, books, forums, and course activities can significantly affect their learning outcomes (e.g., Kokoç & Altun, 2021). Other studies found a significant correlation between students' online activities and their academic performance (e.g., Rubio-Fernández et al., 2019). Similarly, researchers found that there is a positive correlation between the number of logins, homework completion and video completion rate and the final grades of students (e.g., Qureshi et al., 2021; Shen et al., 2020; Zheng et al., 2020).

Another aspect of LA research is the investigation of the design and implementation of online learning content on students' academic outcomes. The main finding of this research is that ignoring the guidelines of online course design could prevent meaningful learning experiences and result in undesirable learning outcomes (Gašević et al., 2015; Lockyer & Dawson, 2012; Lockyer et al., 2013; Redmond & Macfadyen, 2020). Therefore, using LA in conjunction with properly designed online learning content can reveal students' learning difficulties, distractors as well as personal learning preferences while providing them with effective and timely feedback to assist and support their learning process (Muljana & Luo, 2020). For instructors, identifying best practices, characteristics of high achievers and milestones for increasing achievement help improve course design and teaching. Instructors' improvement of the learning environment complements the students increased understanding of their own strengths and weaknesses in the learning process (West et al., 2016; West et al., 2015). Although there is a vast amount of data collected on many e-learning platforms that can provide insight and provide guidance to both learners and educators, the data collected is rarely organized and provided to students and/or instructors (Mah et al., 2019; Schumacher & Ifenthaler, 2018).

Most of the prior research has shown that LA has a promising impact on teaching and learning. However, there are only a few studies that investigate the effect of online course design on students'

transfer and retention of knowledge through learning analytics (Martin & Ndoye, 2016; Schmitz et al., 2017). Additionally, prior research showed that preservice teachers prefer to see personalized recommendation based on their feedback and learning analytics (Yilmaz & Yilmaz, 2020). Therefore, this study will explore the effect of online course design on students' learning outcomes through learning analytics.

Research design

When students interact with the content in the learning management system (LMS), they leave massive digital footprints. As a result of this big data, a new area in educational research has emerged, learning analytics. The main purpose of learning analytics is to collect static and dynamic information about the learning environments, and the learners' activities and assessments. Web analytics programs such as Google Analytics track students' usage of LMS and other digital learning objects to gauge learner engagement. Additionally, learning analytics programs collect and process various data such as learner characteristics, library catalogue searches, online frequency and times, interactions, downloads and anticipated learning outcomes (Ifenthaler & Widanapathirana, 2014; Wong, 2017). This data has presented great prospects to discover useful insights of students' online learning hapits and can result in highly adaptable and personalized learning environments through analyzing, predicting, and optimizing students' learning processes, learning environments and educational decision-making (Loh et al., 2015). Additionally, embedding the LA interface within the online course environments offers different features such as visualizations, learning recommendations, prompts, rating possibilities, and self-assessments (Ifenthaler & Widanapathirana, 2014).

Students' knowledge transfer

Knowledge transfer is a major goal of higher education (Brennenraedts et al., 2006; O'Reilly et al., 2019; Sharifi et al., 2014). According to Bloom's Taxonomy, students' creation of new knowledge is a result of their ability to retain, understand, apply, analyze, and evaluate the new concept (Bloom, 1956). The transfer of knowledge is an indication of students' deeper understanding of the learning content rather than basic rote learning (Barnett & Ceci, 2002; Schunk, 2012). Therefore, many college instructors test newly acquired skills as evaluation criteria for students' mastery of the learning content.

Background of the Study

There are many studies conducted about learning analytics, which focus on a wide range of variables and tries to reach meaningful interpretations of data for students and instructors. However, few studies attempt to discuss the effect of online course design on students' learning outcomes through findings gathered through Google Analytics (Strang, 2017).
Therefore, the purpose of this study was to explore the effect of online course design on students' transfer and retention of knowledge through learning analytics. This research study was designed to reveal study behaviors of participants over a short time while exploring their academic performance. This study was guided by the following quantitative research questions:

1. Do students' final scores in an online module correlate with their number of session views and the duration of these visits?
2. Do students' retention knowledge scores in an online module correlate with the number of the website visits and the duration of these visits?
3. Do students' transfer knowledge scores in an online module correlate with the number of the website visits and the duration of these visits?
4. What factors best predict students' transfer knowledge scores in an online course?

Additionally, the following qualitative research questions were postulated:

5. How did the participants define and what examples could they provide for "Universal Design for Learning?"

6. How did participants perceive the use of multiple representations, multiple actions, and expressions in their lessons?
7. How did the participants design instruction to address the given scenarios?

Method

Research design

This study employed a mixed method to examine the effect of online course design through learning analytics on students' transfer and retention of knowledge.
The quantitative method used correlation and multiple linear regressions analyses to examine the effect of the learning module design on students' knowledge transfer and retention. The qualitative method used students understanding of the learning concept (Universal Design for learning), and the learning analytics data during completion of the learning module. Google and YouTube Learning Analytics were used to collect data on the students' learning activities and video watching patterns while they completed the online learning module.

Sample and participants

The investigators used a convenient sample to recruit participants in the current study.
The participants in the present study were 81 preservice teachers enrolled in instructional technology course. Participants were 49 students from a state university from the USA (4 male and 45 females, age between 18-40 years) and 32 students from a state university in Turkey (all female, age 18-22 years). Participations consisted of freshmen, sophomores, juniors, and seniors in education major. Majority of participants were familiar with using technology and fluent in English and completed all module activities online as part of their class activities.

The Learning Module

The investigators developed a website with online video, online presentations, and web pages for reading and assessment. The materials used in this module focused on teachers' use of universal design for learning (UDL). The UDL is an educational framework based on research in the learning sciences, including cognitive neuroscience, that guides the development of flexible learning environments that can accommodate individual learning differences. In this learning module, students learn about how to design curriculum to be universal, the use of multiple representations in a lesson, the meaning of using multiple actions and expressions in a lesson, the use of instructional methods to present information, assess students, and maintain their engagement. The webpages used in this study included: introduction, applications, engagement, representation, and action and expression. The objective of the learning task was for students to understand the UDL concept and its applications for teaching and learning. The learning content included interactive multimodal learning content in both verbal and visual representation. The design of the learning content allowed students to have full control to navigate the website pages and review the content without limitations. The following URL represent the learning content: (https://sites.google.com/view/udl2019/home).

Measures

Quantitative Data

The investigators developed two assessments: (1) Retention knowledge was measured with a quiz that included four open-ended questions. The retention quiz was to show how much learners recalled from the information about the UDL framework, thus confirming that students really learned the information. (2) Transfer knowledge was measured by a quiz that included two open-ended questions. The Transfer knowledge quiz demonstrated the students' ability to apply this information in teaching. To ensure that

the instrument is reliable and valid, the investigators computed the interrater reliability of the instrument using the correlation between the results from different classes and semesters and found that it has strong correlation (.870). The investigators checked further the internal consistency of the instrument (using Cronbach's Alpha) and found that it was .895. Taken together, these results demonstrate that the instrument is robust and ready to be used in this study. Other measures were collected through student's module activities from Google Learning Analytics: Students' effort (measured by the average learning session duration on the online learning content), motivational factors (measured by the number of sessions they conducted on the online learning module) and metacognitive factors (measured by the time spent watching video, viewing presentation and navigate the online reading).

Validity and Reliability of the Instrument

To establish the content validity for the measure, the investigators used a scale that was tested over several semesters with preservice teachers. For the construct validity, the investigators conducted Pearson correlation coefficient analyses between all items and found positive significant correlations. For reliability, the researcher used Cronbach's alpha internal consistency reliability ranging from 0.495 to 0.818.

Qualitative Data

The investigators looked for patterns and trends in students' responses to identify the main themes in their answers. The process of the data analyses includes reading through students' responses, categorizing the responses, labeling each comment with one or several categories, examine the focus of responses, identifying the patterns and trends of all responses and then writing up the analysis.

Procedure

Preservice teachers in the Turkish and the American universities completed the assigned module about the use of Universal Design for Learning (UDL) in teaching and learning. Students in both universities had one week to complete the UDL activities. At the end of the week, students completed retention and transfer knowledge tests. Students' quantitative data, such as their behaviors and activities in the online module, was collected through Google Analytics. Students' qualitative data was gathered through open-ended questions offered on the course site. In the first section of the module, students started the UDL module by viewing the introductory video about the UDL framework and then answered four open-ended questions structured at the lowest levels of Bloom's Taxonomy to solicit about the level of remembering and understanding of the UDL concept. In the second section, students explored examples of the UDL applications in teaching and learning. At the end of the second section, students were presented by two teaching scenarios and challenged to address the four higher levels of Bloom's Taxonomy, namely, applying, analyzing, evaluating, and creating.

Data Collection and Analysis

To reveal student behaviors, Google Analytics was used to collect quantitative data, while qualitative data was gathered through open-ended questions on the course site.

After viewing the introductory video on Universal Design for Learning (UDL), students answered four open-ended questions structured at the lowest levels of Bloom's Taxonomy – remembering and understanding. After the presentation of the UDL applications, students faced two teaching scenarios, challenged to address the four higher levels of Bloom's Taxonomy – applying, analyzing, evaluating, and creating.

Results

Quantitative Results

First question: Do students' final scores in an online module correlate with their number of sessions views and the duration of these visits?

To answer the first question, the investigators conducted a Pearson product-moment correlation coefficient to assess the relationship between students' module final grade (retention & transfer test scores) and their number of the websites visits and the duration of these visits to the module. The analysis shows that there was a strong and positive correlation between students' module final grade (M = 8.3 SD = 2.8), n = 76, the number of their session views in the module (M = 5.41, SD = 6.34), r = .56, p = < .001, n = 71, and the duration of the website visits in seconds (M = 334.44, SD = 520.89) r = .53, p = < .001, n = 76. Overall, there was a strong and positive correlation between all three variables. In summary, the more times students visited the learning module and the longer these visits, the higher students' grades in this module. Table 1 summarizes the correlation analysis.

Table 1. Correlations between three variables: students' scores of the module (retention and transfer), number of sessions views in the module and the duration of the website visits in seconds

		Total grade of retention and transfer	The number of sessions views in the module	Site session duration in seconds
Total grade of the module (retention and transfer)	Pearson Correlation	1	.563**	.526**
	Sig. (2-tailed)		.000	.000
	Sum of Squares and Cross-products	592.039	693.296	59364.065
	Covariance	7.894	9.904	791.521
	N	76	71	76

Note: *Three variables were included **. Correlation is significant at the 0.01 level (2-tailed).*

Second question: Do students' retention knowledge scores in an online module correlate with the number of the websites visits and the duration of these visits?

To answer the second question, the investigators conducted a Pearson product-moment correlation coefficient to assess the relationship between students' retention knowledge scores and the duration and the number of visits to the module. The analysis shows that there was a positive correlation between students' retention knowledge scores (M = 5.82, SD = 1.831), number of sessions in the module (M = 5.41, SD = 6.337), r = .28, p = < .02, n = 71. However, the results showed that there was no relationship between students' retention knowledge scores and the duration of their module visits (M = 123.97, SD = 221.39), r = .50, p = < .001, n = 84.
In summary, the more times students visited the learning module the higher students' retention knowledge scores in this module. Table 2 summarizes the correlation analysis.

Table 2. Correlations between three variables: students' retention test scores, number of sessions in the module and the duration of the website visits

		Total of retention questions	Number of sessions	Session duration in seconds
Total of retention questions	Pearson Correlation	1	.276*	.064
	Sig. (2-tailed)		.020	.608
	Sum of Squares and Cross-products	251.421	228.493	1694.848
	Covariance	3.352	3.264	26.075
	N	76	71	66

Note: *Three variables were included **. Correlation is significant at the 0.05 level (2-tailed).*

Third question: Do students' transfer knowledge scores in an online module correlate with the number of the websites visits and the duration of these visits?

To answer the third question, the investigators conducted a Pearson product-moment correlation coefficient to assess the relationship between students' transfer knowledge scores and the duration and the number of visits to the module. The analysis shows that there was a strong and positive correlation between students' transfer knowledge scores in the module (M = 2.91, SD = 1.792), the number of their sessions in the module (M = 5.41, SD = 6.337), r = .54, p = < .001, n = 71 and the duration of the website visits in seconds (M = 334.44, SD = 520.885), r = .50, p = < .001, n = 84.
In summary, the more times students visited the learning module and the longer these visits, the higher students' transfer knowledge scores in this module. Table 3 summarizes the correlation analysis.

Table 3. Correlations between three variables: students' transfer test scores, number of sessions in the module and the duration of the website visits

		Transfer test scores	The number of sessions views in the module	Duration of the website visits in seconds
Total of transfer questions	Pearson Correlation	1	.544**	.495**
	Sig. (2-tailed)		.000	.000
	Sum of Squares and Cross-products	205.446	408.246	32048.803
	Covariance	3.210	6.379	500.763
	N	65	65	65

Note: *Three variables were included **. Correlation is significant at the 0.01 level (2-tailed).*

Fourth question: What factors best predict students' transfer knowledge scores in an online course?

To answer the fourth question, the investigators conducted multiple regression analysis to identify the unique variance predicted by independent variables.
The investigators screened students' data to remove any incomplete responses (17 records were removed). The multicollinearity assumption was checked and found that the correlations between variables were less than 0.7; therefore, the multicollinearity assumption was met. Further, the probability and the scatter plots were checked and found that all points were following a straight line and the regression standardized predicted value on the x-axis within negative 3 to 3. Finally, the investigators checked the residuals statistics and found that standard residual was with minimum of -1.74 and maximum 1.86.

Multiple linear regression analysis was conducted to develop a model to predict students' transfer knowledge scores in an online course through their number of sessions in the module and their session duration. The predictor model was able to account for 27% of the variance in the dependent variable and was statistically significant at p < .01. Individual predictors were examined further, and the result indicated that out of the two independent variables, the only variable found to be a significant predictor of students' transfer learning outcome was the number of sessions in the module website (t = 4.532, p = .01). Model Summary and regression coefficients are summarized in Tables 4 and 5.

Table 4. Regression analysis model summary predictors

	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.521a	0.272	0.246	1.528	0.272	10.635	2	57	0

Note: *a. Predictors: (Constant), the number of sessions in the module, and the session duration. Dependent Variable: Module transfer tests scores.*

Table 5. Unstandardized coefficients, standardized coefficients and significance of all independent variables included in the model

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.178	.284		7.658	.000					
	The number of sessions in the module	.136	.030	.515	4.532	.000	.519	.515	.512	.990	1.010
	Session duration	.021	.052	.046	.403	.688	.097	.053	.046	.990	1.010

Note: *a. Dependent Variable: The transfer test scores*

Quantitative Results

Fifth question: How did the participants define and what examples could they provide for "Universal Design for Learning?"

In defining universal design for learning, most participants mentioned the importance of addressing individual differences of learners in terms of various dimensions such as learning styles, backgrounds, and interests. Additionally, most participants also cited the importance of providing equal learning opportunities or alternative learning options for all students. As one participant stated "UDL is all about adapting your teaching style to your individual students so that the students do not have to struggle to learn the concepts". However, when participants were asked to provide different examples not mentioned in the video, only one-third were able to provide realistic examples. More than half of the participants explained the three important concepts by either defining or providing justification for importance while a few specifically focused on addressing individual differences.
The most frequent examples focused on providing alternative learning and assessment methods. Flexible work and study space, learning preferences (audio, visual, kinaesthetic) interest and abilities, tools & software, and providing feedback were also mentioned by several students.
One of the students mentioned that "If I had a student that was in a wheelchair and couldn't move around good, they would do a virtual reality lesson instead of physically exploring something. If we were learning about plants the virtual reality game would allow the student to look at all the different plants in their natural settings, but virtually." While another mentioned that "If a teacher has a student with dyslexia, maybe they could read instructions out loud or use more assignments and assessments that are performance-based rather than on paper".

Sixth Question: How did participants perceive the use of multiple representations, multiple actions, and expressions in their lessons?

When participants are asked the meaning of using multiple representations in their lessons, the most frequent answer mentioned multiple media and/or materials and tools that would help students in the learning process. Some of the students suggested accommodating several types of learning and/or learning styles to reach all types of learners. One participant stated, "A mixture of representation for each lesson is a good way to make sure every student gets the proper educational attention" while another participant proposed "Allowing the content to be displayed in various forms can help bridge the gap between teaching style and learning type". Most of the participants were in favour of using multimedia resources to promote both audio and visual support. Hands on learning activities to address the needs of kinaesthetic learners was also frequently mentioned.

When participants are asked what it meant to use multiple actions and expressions in their lessons, the most frequent responses were giving students opportunities to display what they know and have learned through multiple means, using more than one way to test your students, or allow them to demonstrate their skills and their knowledge. One of the participants stated "Students should be given multiple outlets to show what they know. To account for varying levels of proficiency, each should be presented with varying levels of models, feedback, and support. Ongoing tasks can be scaffolded for support with the offer of graphic organizers or guided notes. Teachers should create tasks that could, for example, be completed through written assignments, technology-based presentation tools, or a recorded video. Feedback can be provided in verbal form, written form, or even using a screencast to combine the two" whereas another student added "Authentic materials prepared by the teacher can be used to get students' attention during teaching or practice sessions. I think the most important thing is to get your students' ideas while designing your lesson, so teachers should pay attention to their students' advice to meet their needs".

Participants mentioned the importance of providing alternative learning and assessment activities, allowing students to choose how to present their information to the class. The participants also noted the value of providing regular feedback, support and providing models and/or examples to help students set goals based on their own levels and interests.
In terms of examples of learning activities, participants' responses split into providing different alternatives to be chosen by the student or providing a project where the students would decide their own roles and the products they would produce.

Seventh Question: How did the participants design instruction to address the given scenarios?

a) Suggested Instructional Methods to Representation, Assessment and Engagement

Participants were presented a scenario of teaching a second-grade class a unit on plants. After reading the scenario, the participants were asked what instructional methods they would use to present the information, maintain student engagement, and assess student learning. Most participants focused on learning activities and instructional media rather than on instructional methods. Some students referenced the importance of the three concepts but did not mention any specific method.
Regarding the presentation of information, approximately one-fifth of the participants mentioned assessing students' prior knowledge. Lecture, discussion, and questions and answers were the most noted instructional methods. Learning stations, guest speakers, virtual reality and self-discovery were also suggested.

Multimedia, visuals, and hands-on activities were the learning activities most preferred by the participants. Some also suggested the use of online tutorials, 3d models, experimenting with plants on the Internet and listening to audiobooks.
No two participants suggested the same approach to the scenario, even the purpose and content of videos were different. While one participant suggested showing how plants grow, another planned to demonstrate the life cycle of a bean from seed stage to a full-grown plant. Even those who agreed on observing plant growth differed as to location – plantings at home or at school. Still others recommended dissecting plants to learn about the parts. For assessment purposes, most of the participants favoured group work but approached the activity in various ways – such as growing plants in groups or preparing a class leaf identification book. Also mentioned were quizzes and tests, interactive online applications, and discussions.

The creation of posters, presentations, written reports, songs, stories, video clips or animations were also suggested as activities reflecting the students' level of understanding. Some participants provided alternative assessments. One suggested: "answering questions out of a textbook for visual learners, playing a plant simulation on computer for kinaesthetic learners, or listening to text to speech and answering questions on computer for auditory learners".

Challenged with maintaining students' engagement, participants favoured hands-on activities and group projects. Others suggested that discussions, interactive educational games, field trips, or student visual reports would help in maintaining engagement. Guest speakers and learning through apps were also recommended for increasing and maintaining engagement.

b) Suggested Lesson Design for a Specific Learning Goal

Participants were also given a scenario of a classroom having a total of 29 students in a tenth-grade biology class. The proposed class included 12 visual learners, 10 verbal learners, and 7 kinaesthetic learners. Additionally, two of the students struggle with reading and several have difficulty with the planning and organizing of writing assignments. Participants were tasked to design a lesson on DNA. They were to identify materials, instructional methods, and assessment techniques. The specified learning goal was Students will learn about and present information on their understanding of DNA.
Most participants favoured lectures accompanied by either videos or visually rich presentations to address visual and audio learners. Hands on activities were mentioned for kinaesthetic learners. Videos and visually rich presentations (graphics, animation, or simulation) were mentioned by almost all participants whereas the use of DNA models and printed materials was referred to by approximately one-third of the participants. Additionally, some participants listed audio support, graphic organizers and tests and rubrics as instructional materials for their courses. The least cited instructional materials included microscopes, arts and crafts, games, and online learning tools.

In parallel with the preference of instructional materials, most participants stated their preference as lecturing assisted by visuals and further supported by hands on activities such as building a DNA model. Group work, discussion, self-guided research, learning stations, online learning games and using analogies were also mentioned by some participants. Hence, participants noted the integration of both cognitive and constructivist learning approaches in their planning. One of the participants said "Students will be given guided notes to fill in as they watch a video on DNA (pausing to recap important ideas) and participate in a class discussion. They will pair off and review their answers to make sure their notes are accurate. Students will travel to stations to learn about each part of DNA and how it functions through a short video or activity or website and a 3D model". Most participants mentioned individual or group presentations of the final student products while providing various alternative choices. Less than 10% of participants preferred summative assessment using quizzes and tests.

Many project ideas also focused on constructing a DNA model composed of different materials or even online. One of the participants stated, "For final assessment, students may complete a 3D model of a DNA structure in the media of their choice (online, using craft supplies, etc.), make a movie, or create a song/rap/poem/skit that explains the different parts of the DNA structure and their purpose". Whereas another participant mentioned alternatives including "a story board, build a model of DNA structure, or write an essay on DNA". One of participants mentioned that "collaborative groups to create a presentation they can share with the class, create illustrations and posters to demonstrate their understanding. They could create a drama in which the characters are the different components that make up DNA". Thus, participants proposed a wide range of alternatives for students to demonstrate understanding.

Discussion

This research study was designed to reveal study behaviours of participants over a short time while exploring their academic performance. For this purpose, the effect of online course design on students' transfer and retention of knowledge was analysed using learning analytics. Based on a mixed method approach, both qualitative and quantitative evidence is used to understand the phenomenon.

Evidence on Performance of Students

The first question addressed the possible correlation of the students' final scores in an online module correlate with their number of session views and the duration of these visits. There was a strong and

positive correlation between all three variables. Thus, the more times students visited the learning module and the longer these visits, the higher students' grades in this module. This finding is similar with many findings in the literature (Webber et al., 2013; Yukselturk & Bulut, 2007). One conclusion that can be drawn from this correlation is the material was either new to the students or considered difficult. If the material had not been novel and or difficult, students would have considered it prior knowledge and not have repeatedly viewed the material. Although this is not causal, the correlation does demonstrate that students with higher final scores valued the material and repeatedly accessed the online module.

Next, the students' retention knowledge scores were examined for a possible correlation with the number of the website visits and the duration of these visits. As with the students' final scores, the more times students visited the learning module the higher students' retention knowledge scores in this module. This finding is parallel with the literature where Wolff et. al. (2013) also stated that "it is possible to predict student failure by looking for changes in user's activity in the VLE, when compared against their own previous behaviour, or that of students who can be categorised as having similar learning behaviour" (p. 145).

The third research question examined the relationship of students' transfer knowledge scores in an online module with the number of the website visits and the duration of these visits. Again, there was a strong and positive correlation between all three variables. The more times students visited the learning module and the longer these visits, the higher students' transfer knowledge scores in this module. Thus, the students found value in the online module and returned to the online module. This is a fact that learning design activities strongly influence how students engage online (Rienties et al., 2015).
This correlation of transfer knowledge to the number and duration of website visits leads to the question of what factors would best predict students' transfer knowledge scores in an online course. A multiple linear regression analysis was conducted to develop a model to predict students' transfer knowledge scores in an online course through their number of sessions in the module and their session duration. Individual predictors were examined further and indicated that the only variable found to be a significant predictor of students' transfer learning outcome was the number of sessions in the module website.

Engagement Analytics of Participants

Participants were presented with a four-and-a-half-minute video. In comparing video interactivity, Turkish participants spent an average of just over six minutes engaged with the video compared to the U.S. participants who ended the video at four minutes. Even though all Turkish participants were fluent in English, new and unfamiliar phrases might account for the increased time, perhaps re-watching sections of the video again to fortify the definition of the new terms or clarify the contextual meaning. Most U.S. participants opted not to view the last 30 seconds of the video. In reviewing the video, this may be due to the presenter declaring, "…and that's it." at the four-minute mark followed by the words "in summary…". Thus, U.S. participants may have recognized from these verbal clues that the last 30 seconds had no new information and chose to opt out.

Definition and Examples of Universal Design for Learning

After viewing the video and other websites, participants answered four open-ended questions. Most participants were able to cite the importance of addressing individual differences in defining Universal Design for Learning (UDL) and providing equal learning opportunities for all students. However, while the participants grasp the definition and basic concept of UDL, they struggled with providing meaningful examples. Approximately one-third of the participants were able to provide a realistic example of UDL other than those presented in the video. Thus, the online module provided information at the lowest level of Bloom's Taxonomy (Remember) while providing a path to move up to the next levels of Bloom's Taxonomy (Understand and Apply).

Meaning of Using Multiple Representations, Multiple Actions and Expressions

The most common definition of multiple representations involved multiple media and/or materials and tools that would help students in the learning process. Some of the participants suggested accommodating different learning styles to reach all students. This would confirm that the participants understood that one approach is not ideal for all students.

Understanding of Instructional Design

a) Suggested Instructional Methods to Representation, Assessment and Engagement

After reading a scenario in which they would be teaching a second-grade class a unit on plants, the participants were asked to identify the instructional methods they would use to present the information, maintain student engagement, and assess student learning. Approximately 20% of the participants mentioned assessing students' prior knowledge. While lecture, discussion, and questions and answers were the most noted instructional methods, most participants focused on learning activities and instructional media rather than on instructional methods. Thus, the majority did not delineate between teacher instructional methods and student learning activities. One possible explanation for this confusion of terms is that many participants are early in their teacher education program and have limited background knowledge in instructional methods. Yet, in analysing the participants' assessment preferences, assessment approaches were not only in line with constructivist approaches but also addressed individual differences. This further supports the believe that the students could easily recognize constructivist learning activities and constructivist evaluation techniques but lacked the knowledge to integrate the three concepts of instructional methods, learning activities, and evaluation from a constructivist viewpoint. It is also important to note that this scenario provided no specific information on student needs. Thus, the scenario encouraged participants to focus on the lesson topic, not the students.

b) Suggested Lesson Design for a Specific Learning Goal

While the description in the first scenario was limited to "…teaching a second-grade class a unit on plants," the second scenario included learning styles of the students and learning challenges for certain individual students. The participants were tasked with having "students learn about and present information on their understanding of DNA." As in the prior scenario, participants favoured lecture as the primary form of instruction. Videos and visually rich presentations (i.e., graphics, animation, or simulation) were cited by almost all participants to address the needs of visual and audio learners. About one-third of the participants mentioned using DNA models for kinaesthetic learners. Most participants stated a preference for individual and/or group presentations for the final student products. Many included a variety of choices to allow students to personalize their presentations. Summative assessments found little support, with less than 10% of participants opting for quizzes and/or tests. The variety of final project ideas illustrated the participants' strong belief in constructivism. Creativity and alternative assessments were numerous, including creating songs, skits, movies, and 3D models. It was obvious that the participants felt that providing alternatives for learning and demonstration of gained knowledge and skills is important and should be supported by continuous feedback.

Conclusion

The quantitative and qualitative results of this study may appear at first to be at odds. With only one-third of participants able to cite a realistic example of Universal Design for Learning (UDL) one might assume that the module had little effect on the participants. However, it is important to remember that none of the participants had any prior knowledge of UDL before accessing the learning module. Additionally, this module was only available for one week. Thus, most participants would be considered on the "Remember" level of Bloom's Cognitive Theory, moving up from no knowledge. Having a third of participants be able to offer a unique example (Bloom's Understand level) of UDL is a significant

improvement in a short period of time. Scaffolding takes time and is tied to prior knowledge. It is anticipated that knowledge gained in the module will lay the foundation for growth in other courses.
In addressing the needs of the students in the second scenario, participants overwhelmingly targeted student learning styles and individualized needs. Valuing learning styles and individual needs are cornerstones to properly using UDL concepts. It is anticipated that as these preservice teachers learn more about teaching methods, they will improve their ability to incorporate UDL into their lesson plans. Additionally, the pretest/posttest indicates a possible cumulative effect – final grades, retention knowledge scores, and transfer knowledge scores were highly correlated to the number of times the students visited the learning module. The more times students visited the learning module and the longer these visits, the higher participants' grades in this module. Although this is not causal, the correlation does demonstrate that students with higher final scores valued the material and repeatedly accessed the online module. As with the students' final scores, the more times students visited the learning module the higher students' retention knowledge scores in this module. In line with these findings, the more times students visited the learning module and the longer these visits, the higher the students' transfer knowledge scores in this module. Most importantly, the only variable found to be a significant predictor of students' transfer learning outcome was the number of sessions in the module website (Chen et al., 2020; Ibrahim et al., 2019).

Implications and recommendations

This study presented the results of the effect of online course design on students' transfer and retention of knowledge using LA. A major implication of these findings is that students' engagement in online learning environment and grade improvement appear to be the result of applying the online design principles to the learning content. Although many online platforms use LA to monitor students' learning patterns and the design of these online platforms are improving over time, some platforms ignore the role of theory-based and the best practices design principles to guide their design. Therefore, we recommend developing learning platforms based on best practices in the field of online learning and monitoring students' learning patterns using LA. Furthermore, online course developers should use design elements to encourage students to engage more often with the learning content to enhance students learning outcomes. It is also recommended to embed online course elements to encourage students to spend more times and pay frequent visits to the online learning modules to enhance their learning and engagement with the learning content.

Limitations of the study

The invistigators recognize in the present study that there is possible limitation related to the sampling technique. First, this study utilized a convenience sample. As such, this type of sampling has its limitation because it centers around one specific population of students and in one domain of study. Furthermore, the fact that the content used in this study was relatively low in difficulty (i.e., "remember" level of Bloom's Cognitive Theory), suggests that it is possible that researchers working with more complex topics, and other populations will produce entirely different results. This limitation has been consistently reported in another research. For example, it was reported that cognitive support through instructional design is particularly effective when used with novice learners and complex topics (e.g., Shapiro, 1999). Finally, while the investigators attempted to control for as many differences as possible between groups, any two groups, especially from two different countries, always runs the risk that prior differences exist between them on variables not measured, and these differences may cause differences in the outcome variables. However, we had no reason to suspect that the two groups of students participated in this study would differ, as all students were non-science majors and generally in their junior or senior year of college.

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Appendix

Students answered four questions after the introductory video:

1. What is Universal Design for Learning approach?
2. How can you design curriculum to be universal? Give three examples of designing universal learning different from the examples in the video?
3. What does it mean to use multiple representations in your lessons? Give three examples.
4. What does it mean to use multiple actions and expressions in your lesson? Give three examples.

Students answered two questions after the presentation of the UDL applications:

1. Imagine that you are a second-grade teacher beginning a unit on plants. You wish to make certain that you address the three principles of UDL. Describe the instructional methods you would use to present the information, assess your students, and maintain their engagement in the subject.
2. At the beginning of the year, Ms. Hamilton, a tenth-grade biology teacher, collected information about her students' learning preferences and learning needs. Of her twenty-nine students, twelve prefer to learn new information through visual means, ten prefer to hear the information, and seven prefer to learn it using a hands-on-approach. Additionally, two students struggle with reading, and several have difficulty planning and organizing writing assignments. Help Ms. Hamilton to design a lesson about DNA. Make sure to state the learning goal and to identify materials, instructional methods, and assessment techniques. Learning goal- Students will learn about and present information on their understanding of DNA.

Ethics Approval: All procedures performed in the current study were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments and the comparable ethical standards.

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