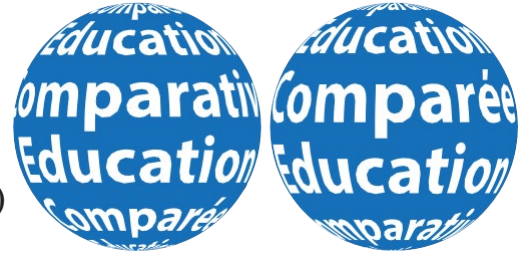


Global Comparative Education

Journal of the

**World Council of
Comparative
Education Societies
(WCCES)**



Éducation Comparée Mondiale:

Revue du Conseil Mondial des Associations D'Éducation Comparée

Educación Comparada Global:

Revista del Consejo Mundial de Sociedades de Educación Comparada

Всеобщее Сравнительное Образование

Журнал Всемирного Совета Сообществ Сравнительного Образования

全球比较教育

世界比较教育学会联合会会刊

التربية المقارنة العالمية

مجلة المجلس العالمي لمختلف مجتمعات التربية و التعليم المقارنين

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ABOUT THE JOURNAL

حول المجلة, 关于期刊, A propos du journal, O ЖУРНАЛЕ, Sobre la Revista

The *Global Comparative Education* is an open-access, peer-reviewed journal that aims to contribute to the comparative education literature by creating spaces to present critical analyses of the differences and commonalities within education worldwide (formal, informal, and non-formal), with an explicit focus on increasing and widening social justice globally, keeping in mind that for instance UNESCO to which WCCES is affiliated declared education a human right more than half a century ago. The Journal welcomes article submissions in the six UN languages: Arabic, Chinese, English, French, Russian, and Spanish.

The Journal seeks articles that are diverse in numerous aspects and perspectives including, but not limited to: theories, methodologies and methods, pedagogical practices/tools/resources, policies, and scope/nature of comparison (e.g., geographically, culturally, linguistically, economically, historically, and population (gender identity, race, ethnicity, sexual orientation)) and any other grounds of differentiation as they relate to educational processes, especially with comparative perspectives. Special focus will be given to providing space for historically under-represented areas of comparative education and transfers of knowledge (e.g., Global South to Global North). *Global Comparative Education* is the official journal of the World Council of Comparative Education Societies (WCCES).

حول المجلة

التعليم المقارن العالمي هو مجلة مفتوحة الوصول إليها من قبل الأقران التي تهدف إلى المساهمة في أدب التعليم المقارن من خلال خلق مساحات لتقديم تحليلات نقدية للاختلافات الرسمية وغير الرسمية، مع تركيز صريح على زيادة العدالة الاجتماعية وتوسيع نطاقها على الصعيد العالمي، مع الأخذ في الاعتبار (و القواسم المشتركة في التعليم في جميع أنحاء العالم وترحب المجلة المقارنين أعلنت أن التعليم حق من حقوق الإنسان منذ أكثر من نصف قرن التعليم و التربية مجتمعات مختلف العالمي أن اليونسكو التي ينتمي إليها المجلس بالرسائل المقدمة باللغات الست للأمم المتحدة: العربية، الصينية، الانجليزية، الفرنسية، الروسية والإسبانية

الموارد والسياسات / وتسعى المجلة إلى مقالات متنوعة في جوانب ووجهات نظر عديدة منها على سبيل المثال: النظريات والمهيجات والأساليب والممارسات التربوية / الأدوات وأية أسس أخرى للتمايز من حيث (النطاقات / طبيعة المقارنة على سبيل المثال: جغرافيا، وثقافيا، لغويا، اقتصاديا، تاريخيا، وديمقراطيا (الهوية الجنسية، العرق، التوجه الجنسي . وسينصب تركيز خاص على توفير حيز للمجالات ذات التمثيل الناقص في مجال التعليم المقارن ونقل المعارف (مثل الجنوب. صلتها بالمنهج التعليمية، وخاصة مع المنظورات المقارنة التعليم المقارن العالمي هو المجلة الرسمية للمجلس العالمي لجمعيات التربية التعليم المقارنين) العالمي إلى الشمال العالمي

关于期刊

《全球比较教育》是一本公开、经过同行评论的杂志，目标是通过呈现对世界教（正式的、非正式的、和不正式的）异同点的批判分析，促进比较教育文献的发展。特别是由于比如 WCCES 附属其下的联合国教科文组织（UNESCO）在半个世纪之前就曾宣告过人权，所以本期刊尤其会着重分析日益严重、影响范围扩大的全球性社会公平问题。本杂志欢迎以下六种联合国语言提交的文章：阿拉伯语、中文、英语、法语、俄罗斯语、西班牙语。

本杂志寻求在诸多方面与视角多样化的文章，包括但不限于：理论、方法论、教学法的实践/工具/资源、政策、比较的视野/本质（比如，地理地、文化地、语言学地、

经济地、历史地、人口地（性别身份、民族、人种、性取向），以及与教育过程，特别是比较教育视角之下的问题有关的其他差异之处。特别关注历史上被忽视地区的比较教育和知识交换（比如，南方世界和北方世界）。《全球比较教育》是世界比较教育学会联合会的官方杂志。

A PROPOS DE LA REVUE

Éducation Comparée Mondiale est une revue accessible et évaluée par les pairs ayant pour but de contribuer à la littérature relative à l'éducation comparée en offrant des espaces pour présenter des analyses critiques des différences et des similitudes au sein de l'éducation (formelle, informelle et non formelle) dans le monde entier, en mettant un accent explicite sur le renforcement et l'élargissement de la justice sociale à l'échelle mondiale, tout en mettant l'accent sur le renforcement et l'élargissement de la justice sociale à l'échelle mondiale, et en gardant à l'esprit que, par exemple, l'UNESCO à laquelle WCCES est affilié, a déclaré l'éducation comme un droit de l'homme il y a plus d'un demi-siècle. La Revue accepte des articles présentés dans les six langues de l'ONU: l'arabe, le chinois, l'anglais, le français, le russe et l'espagnol.

La Revue recherche des articles variés dans de nombreux aspects et domaines, y compris, mais sans se limiter aux: théories, méthodologies et méthodes, pratiques / outils / ressources pédagogiques, politiques et la portée / la nature de la comparaison (par exemple, sur le plan géographique, culturel, linguistique, économique, historique, et démographique (identité de genre, race, origine ethnique, orientation sexuelle)) et tous autres sources/problématiques/questions de différenciation en ce qui concerne les processus éducatifs, en particulier avec des perspectives comparatives. Une attention particulière est accordée aux régions historiquement sous-représentées en éducation comparée et aux transferts de connaissances (par exemple les pays du Sud et du Nord). Education Comparée Mondiale est la revue officielle du Conseil Mondial des Associations d'Éducation Comparée (CMEAC-WCCES).

О ЖУРНАЛЕ

Всемирное Сравнительное Образование - это рецензируемый журнал в свободном доступе, целью которого является вклад в литературу по теме сравнительного образования, путем предоставления критических анализов об общих и отличительных чертах в образовании в мировом масштабе (в форматах обязательного и дополнительного образования, а так же видов образования вне определенного образца), с акцентом на расширение и увеличение социальной справедливости в глобальном масштабе, имея в виду, что, например, ЮНЕСКО, к которой относится WCCES, объявила образование правом человека более полувека назад. Журнал приветствует публикации статей на шести языках ООН: арабском, китайском, английском, французском, русском и испанском.

Журнал ищет статьи, которые разнообразны по многим аспектам и взглядам, включая, но не ограничиваясь следующими темами: теории, методологии и методы; педагогические методики, инструменты и ресурсы; законопроекты; различные области и сферы для сравнительных анализов (например, географической-, культурной-,

лингвистической-, экономической-, исторической направленности, а так же вопросы народонаселения, такие как гендерные и расовые различия, этническая принадлежность, сексуальная ориентация), а также любые другие основания дифференциации, связанные с образовательными процессами, особенно со сравнительными перспективами. Особое внимание будет уделяться областям, исторически недопредставленным в сравнительном образовании и вопросам передачи знаний (например, с Юга на Север в глобальном понимании). *Всемирное Сравнительное Образование* является официальным журналом Всемирного Совета Обществ Сравнительного Образования (WCCES).

SOBRE LA REVISTA

Educación Comparada Global es una revista de acceso abierto, de revisión por pares cuyo objetivo es contribuir a la literatura de la educación comparada mediante la creación de espacios para presentar análisis críticos de las diferencias y de los aspectos comunes dentro de la educación en todo el mundo (formal, informal, y no formal), con un enfoque explícito en incrementar y extender la justicia social globalmente, teniendo en consideración por ejemplo que para UNESCO, de quién el WCCES is afiliado, ha declarado a la educación como un bien social hace más de medio siglo. La revista da la bienvenida a la presentación de artículos en los seis idiomas de la ONU: Árabe, Chino, Inglés, Francés, Ruso y Español.

La revista busca artículos que sean diversos en numerosos aspectos y perspectivas, incluyendo pero no limitándose: teorías, metodologías y métodos, practicas/herramientas/recursos pedagógicos, políticas, y el alcance/la naturaleza de la comparación (p.ej., geográfica, cultural, lingüística, económica, histórica y de población (identidad de género, raza, origen étnico, orientación sexual)) y cualquier otro campo de diferenciación en relación a los campos educativos, especialmente con perspectiva comparada. Se prestará especial atención en proveer espacio para aquellas áreas históricamente sub representadas en educación comparada y en la transferencia de conocimientos (p. Ej., Sur Global hacia Norte Global). Educación Comparada Global es la Revista Oficial del Consejo Mundial de Sociedades de Educación Comparada (WCCES).

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Preface from the Editor

As Editor of *Global Comparative Education: Journal of the WCCES*, I am delighted to present this issue, which constitutes the first of the series of special issues of the Journal. Each special issue will be edited by one or several invited guest editors. This inaugural special issue is based on papers presented at the 3rd WCCES Symposium, which was originally planned to be held in Lisbon (Portugal) in July 2022 to be hosted by Universidade Lusófona de Humanidades e Tecnologias but was eventually held virtually through Zoom due to the COVID-19 Pandemic. It was held from November 25-27, 2020, on the theme *Teachers, Teaching Profession, and Comparative Education: Fostering Values Education and Engaging Academic Freedom amidst Emerging Issues related to COVID-19*.

Participants of the Symposium who presented papers were invited to revise and submit them for consideration in WCCES publications outlets: 1) *Global Comparative Education: Journal of the WCCES*, 2) in an edited volume of the WCCES-Brill Book Series, or 3) *World Voices Nexus: The WCCES Chronicle*. The authors of the articles included in this special issue submitted their papers for consideration in the Journal.

This inaugural special issue of GCE as well as a forthcoming book out of the 3rd symposium are co-edited by Professor Yusef Waghid and Professor Zehavit Gross. They have titled the special issue *Engaging Academic Freedom amidst Emerging Issues related to COVID-19: On activist citizenship education through comparative education*. The final list of papers was made following the usual rigorous peer-review process. It is worth mentioning that, likewise, several papers presented during aforementioned symposium have been published in *World Voices Nexus: The WCCES Chronicle* following the regular peer-review process.

WCCES Symposia have become a regular feature of between-congress events in providing continuity to academic discourse in contributing to past and emerging issues within the comparative education community, as is the case during these tough times of the COVID-19 pandemic. Following the first Symposium in 2018 hosted by the University of Johannesburg (South Africa) and in 2019 by IBE in Geneva (Switzerland) two books have been published. The 4th Symposium was held in 2021 and the 5th Symposium is lined up to be held in November 2022. For the 4th Symposium 17 member societies of WCCES served as co-conveners. A record number of 18 member societies of WCCES have enthusiastically expressed their support as co-conveners of the 5th Symposium. This level of collaboration accentuates my vision for the Council at the time of my election as its President in 2016, and again in 2019 for a second term, which has extended due to Covid-19 pandemic.

We would to continue to publish revised and accepted papers of the 4th and 5th symposia in the WCCES Journal, Chronicle and book series towards the XVIII World Congress of WCCES to be held in 2024.

On behalf of WCCES, I express my heartfelt gratitude to Professor Yusef Waghid and Professor Zehavit Gross for their unrelenting support always and hard work in editing this special issue.

I wish you good health, safe living in this tumultuous global environment and happy reading.

N'Dri T. Assie-Lumumba
Editor, *Global Comparative Education: Journal of the WCCES*
President, World Council of Comparative Education Societies (WCCES)
Ithaca, New York, USA

Editorial from the Guest Editors: Engaging Academic Freedom amidst Emerging Issues related to COVID-19: On the possibilities of activist citizenship education for the discourse of comparative education

Yusef Waghid

Stellenbosch University, South Africa

Zehavit Gross

Bar-Ilan University, Israel

We have coined this special issue of the journal, activist citizenship education for three reasons: first, citizenship education cannot just be confined to some form of theoretical exercise as that in itself would undermine the purposes of such a form of education; second, citizenship is a socio-political right of individuals and groups to exercise their autonomy – an idea that connects with the discourse of comparative education; and third, activism is a position scholars assume because of the intellectual inroads they make or endeavour to do in the field of educational inquiry. It is from these premises that we have launched our own inquiry into restating the purposes of comparative educational discourse. Of course, we use the singular here only to accentuate the significance of activism in and for comparative education(s).

The articles included in this issue of the journal have been considered in light of three epistemological and pragmatic interests: firstly, the contribution to the enhancement of comparative education worldwide; secondly, their engagement with imaginative educational thought and practice; and thirdly, their potential to advance a defensible form of citizenship education. Our take on the articles is that they all contribute to advancing a notion of activist citizenship education in the sense that their proffering is conceptually intertwined with what is possible and what can become. Recently, the notion of citizenship education has been linked to practices of democracy, responsibility, and activism (Davids & Waghid, 2021). Democratic citizenship education involves humans engaging with one another based on deliberation with the possibility that educational issues should be resolved through articulation, listening, and talking back. Responsible citizenship education is premised on the idea that people's sense of belonging together invariably impacts their committed actions towards human attentiveness. Activist citizenship education involves the pursuit of deliberative actions that have a socially just end purpose in mind. Our view is that activist citizenship education is more relevant to comparative education because the latter discourse is concerned with bringing into conversation disparate educational practices with the aim of conjuring up the unthinkable and unimaginable (Broadfoot, 2000). In this sense, activist citizenship education is concerned with what is still to come – that is the unimaginable and unexpected.

Looking more closely at the articles included in this issue of the journal, our understanding is that the notion of activist citizenship education is ubiquitous throughout the articles. Catharina Marinho Meirelles and Gabriela Chaves Pereira's 'Professors in the Home Office: A Discussion on Gender Inequality in Public Higher Education Institutions in Brazil' aptly addresses gender discrimination in the workplace in relation to exclusion-inclusion. This is an effort that seems commensurate with practices of activist citizenship education. Steve Sider

and others in 'Canadian perspectives: Performative commitments on equity, diversity, and inclusion by educational institutions' cogently articulate, in line with an activist citizenry, how equity, diversity, and inclusion manifest in Canadian schools. Dehideniya and Yatigamma Ekanayake in 'Technology Enhanced STEM Integrated Science Education to Develop Humanistic Values and Goals' show that technological applications can enhance pedagogical activities in STEM as an instance of activist citizenship education. Brianna Kurtz and Karen Biraimah in 'The Role of Teachers in the Desegregation of America's Schools: Looking Back to Guide a Way Forward' show how quality or lack thereof of in educational practices in segregated and desegregated schools in the US can actually contribute to the cultivation of an activist citizenry. Linli Zhou offers an apposite analysis of global citizenship education and critiques of the concept, thus setting the scene for an activist citizenship education to manifest in educational practices. Thanuja Perera in 'Developing Critical Thinking Skills of Secondary Science Students in Sri Lanka' shows the significance of the practice for the cultivation of an activist consciousness.

Our readership will invariably, and hopefully, construct and even deconstruct their own understandings of the concept of activist citizenship education. We have tried to link, at least conceptually, the articles to such a wider and necessary theme. In the main, these articles offer strong theoretical premises for advancing such a form of citizenship education that would invariably impact comparative educational discourses all over the world. Yet, the challenge remains for these intellectual contributions to contribute justly to the amendment of pedagogical concerns in our educational communities.

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Professors in the Home Office: A Discussion on Gender Inequality in Public Higher Education Institutions in Brazil

Catharina Marinho Meirelles & Gabriela Chaves Pereira
Universidade Federal Fluminense

Historically, it is possible to identify gender inequality in the Brazilian educational context. These inequalities are reflected in the most diverse areas of work and, during the pandemic, were intensified. With the aim of surveying the working conditions of female professors in Brazilian public universities during the COVID-19 pandemic, as well as their perceptions about the possible intensification of gender inequality in domestic work, the research showed that female professors suffered discrimination and harassment. Through the questionnaires, it is concluded that, with the pandemic, gender inequality intensified, indicating that the teachers suffered symbolic harassment and work overload for being women. The importance of comparative education studies in the search for solutions for the effective inclusion of these teachers is highlighted.

Keywords: Education; Gender inequality; Remote work; Teachers.

تاريخيًا ، من الممكن تحديد عدم المساواة بين الجنسين في السياق التعليمي البرازيلي ، حيث تنعكس هذه التفاوتات في مجالات العمل الأكثر تنوعًا ، وقد تم تكثيفها أثناء الوباء. بهدف مسح ظروف عمل الأساتذات في الجامعات البرازيلية العامة خلال جائحة COVID-19 ، بالإضافة إلى تصوراتهن حول التكثيف المحتمل لعدم المساواة بين الجنسين في العمل المنزلي ، أظهر البحث أن الأساتذات عانين من التمييز والتحرش. من خلال الاستبيانات ، خلص إلى أنه مع انتشار الوباء ، تكثف عدم المساواة بين الجنسين ، مما يشير إلى أن المعلمين عانوا من التحرش الرمزي وأعباء العمل لكونهم نساء. تم تسليط الضوء على أهمية دراسات التربية المقارنة في البحث عن حلول لإدماج هؤلاء المعلمين بشكل فعال.

Historiquement, il est possible d'identifier les inégalités entre les sexes dans le contexte éducatif brésilien. Ces inégalités se reflètent dans les domaines de travail les plus divers et, pendant la pandémie, se sont intensifiées. Dans le but d'enquêter sur les conditions de travail des femmes professeures dans les universités publiques brésiliennes pendant la pandémie de COVID-19, ainsi que sur leurs perceptions de l'éventuelle intensification de l'inégalité entre les sexes dans le travail domestique, la recherche a montré que les femmes professeures souffraient de discrimination et de harcèlement. À travers les questionnaires, il est conclu qu'avec la pandémie, l'inégalité entre les sexes s'est intensifiée, indiquant que les enseignants ont subi un harcèlement symbolique et une surcharge de travail du fait d'être des femmes. L'importance des études d'éducation comparée dans la recherche de solutions pour

l'inclusion effective de ces enseignants est soulignée.

Исторически сложилось так, что в бразильском образовательном контексте можно выявить гендерное неравенство. Это неравенство отражается в самых различных областях работы и во время пандемии только усилилось. С целью изучения условий труда женщин-профессоров в государственных университетах Бразилии во время пандемии COVID-19, а также их восприятия возможного усиления гендерного неравенства в домашнем труде исследование показало, что женщины-профессора подвергались дискриминации и притеснениям. На основе анкетирования делается вывод о том, что с пандемией гендерное неравенство усилилось, что указывает на то, что учителя подвергались символическим притеснениям и перегруженности работой из-за того, что они были женщинами. Подчеркивается важность сравнительных исследований в области образования в поиске решений для эффективной интеграции этих учителей.

Históricamente, es posible identificar la existencia de desigualdad de género en el contexto educativo brasileño. Estas desigualdades se reflejan en los más diversos ámbitos laborales y, durante la pandemia, se intensificaron. Con el objetivo de encuestar sobre las condiciones de trabajo de las profesoras en las universidades públicas brasileñas durante la pandemia de COVID-19, así como sus percepciones sobre la posible intensificación de las desigualdades de género en el trabajo doméstico, la investigación mostró que las profesoras sufrieron discriminación y acoso. A través de los cuestionarios realizados se concluye que, con la pandemia, se intensificó la desigualdad de género, indicando que las docentes sufrieron acoso simbólico y sobrecarga laboral por ser mujeres. Se destaca la importancia de los estudios de educación comparada en la búsqueda de soluciones para la inclusión efectiva de estas docentes.

Introduction

Women have long fought for recognition of their place in society and for equal rights. With regard to the labor market, it must be recognized that the claims have had an effect, so that we can observe the female presence in areas considered, historically, male. But this is a slow and still ongoing process, especially in Brazil.

Currently, despite occupying more than 50% of the vacancies in undergraduate courses (National Institute of Educational Studies and Research Anísio Teixeira [INEP], 2017), qualification has not guaranteed equality in access and permanence in the work space, or equity in working conditions, whether material or relational. Thus, it is understood that asymmetries, related to gender inequality, still predominate.

As a reflection of patriarchal society, what is seen in the constitution of the social imaginary is that men and women are treated from unequal perspectives. This fact corroborates the predeterminations, strengthening the gender stereotypes. Whether due to wage differences or discrimination in the choice of profession, gender inequalities are still used as a method for maintaining power.

Gender is understood as “a social, historical and cultural construction organized on sexual differences and power relations, revealing conflicts and contradictions that mark a society marked by inequality, be it, race, ethnicity or gender” (Almeida & Soares, 2012, p. 569)

Such inequality is present in the most diverse fields, such as within the university. Despite the late entry of Brazilian women in undergraduate courses in the country, when compared to men, they occupy the largest number of places in Higher Education. However, when it comes to teaching, men occupy most of the positions. It is important to remember that even if public tenders guarantee equality of access to the teaching function of universities and that there are instruments of legal guarantees of equal rights between teachers and professors, such as career plans, salaries and benefits, among others, the discrimination arising from the patriarchal culture is still rooted in public IES (Higher Education Institutions).

With the pandemic and the mandatory remote work, reports emerged about the various difficulties that the teachers of these institutions have been facing, since, with the non-separation between home and work, they started to exercise the double and even the triple work journey simultaneously. The combination of household chores, comprehensive care with family members, and academic work, carried out in the same physical space, has brought many consequences for the physical and psychological health of these teachers, as well as impairing work productivity.

Thus, the research brings important elements that demonstrate that the invisibilization, the silencing and the discrimination of the feminine work in the Brazilian public HEIs already appeared in a naturalized way in the routine of these institutions, but, undeniably, the pandemic intensified the disparities between genders. The reports collected by the research demonstrate that several acts of symbolic and direct violence tend to be directed to the majority of teachers interviewed. In this way, the research sought to survey the working conditions of professors at Brazilian public universities in the context of the COVID-19 Pandemic, as well as their perceptions about the possible intensification of gender inequality in remote work.

The methodology used in the development of the research was narrative investigation, since it involved the speech of professors from public universities from all over Brazil. For its realization, an online questionnaire with semi-structured questions was used, in order to expand the exploratory field of each answer.

Development

According to the trajectory of struggle traced by women and the claim of their place in education, they are currently the majority in the areas of undergraduate and secondary education. In addition, they have the majority of scholarships for graduation. However, occupying this space does not guarantee proportionality in the academic teaching chairs.

In this context, it is worth noting that such differences are present not only in academia, but in the rate of employability as a whole. According to the survey released by the Organization for Economic Cooperation and Development (OECD) in the Education at Glance 2019 report, “the employability of Brazilian women aged 25 to 34 with higher education is 82% and drops to 63% among women with technical education and to 45% among women without such training”. However, when it comes to the male audience, the rates of higher, technical and non-higher education are 89%, 76% and 76%, respectively. Therefore, it is possible to notice the disparity in the comparison between genders (Idoeta, 2019).

As pointed out, the rate of women employed with higher education, when compared to the rate of women without higher education, suffers a significant jump, with a difference of 37%. This fact could indicate an incentive to enter graduation, however, when looking at the employability rates of men, it appears that difference is only 13%. Thus, the data indicate a significant difference in terms of hiring between genders, regardless of the level of education.

It is worth noting that the distinctions also occur within the scope of graduation. According to Moraes (2018), in an article made for the website of the Ordinary General Assembly of the Brazilian Association of Community Universities (ABRUC), the scissors effect is present in several countries around the globe and even in Brazil. This effect is related to the decrease in the participation of women in the scientific career, according to their evolution and, in contrast, to the increase in the presence of men in this career.

An example is the considerable reduction in the number of grants aimed at women, as the prestige addressed to these grants' increases. Almeida (2018) says that about 49% of the grants from the National Council for Scientific and Technological Development (CNPq) are for women. However, those for productivity comprise only 35.5% and, in this group, of the highest grants, only 24.6% are addressed to women.

Thus, it appears that there are traces of a society that places women on its margins, delimiting its space and its field of exercise. Therefore, the established power relations are clear, within a patriarchal culture. The lack of stimulation, the distorted division of domestic tasks that still fall on women, the machismo¹ existing in the areas of knowledge, the difference imposed on "being a man" and "being a woman" are characteristics present in a society with this type of culture.

According to the 2017 Census, (INEP, 2018) women were the majority as freshmen, effective and concluding enrollments in undergraduate courses. In other words, of the 8,286,663 enrollments carried out between higher education and private education, 4,723,398 were women.

If these distinctions are configured since the formation, they take on new shapes when we refer to the exercise of the teaching position in higher education, with a predominance of men. This fact is very critical, in view of the principles of Public Administration that guarantee equity and impersonality in the form of admission of their own staff, through public examinations and in guaranteeing equal rights, such as career plans, for example. However, in addition to the data demonstrating that this equity is not fully present in the HEIs, it is possible to apprehend, through research reports, that the inequalities in treatment between genders, stemming from the patriarchal culture, are still strongly present in these institutions.

In 2006, the participation of women in higher education was 45.5%, while in 2016 the percentage had increased to 46.5%. In addition, 51% of doctoral degrees acquired between 1996 and 2014 were won by women. However, although the doctorate characterizes the majority qualification for teaching positions, men are found as the predominant gender, both in public and private institutions (Sugimoto, 2018).

Inequalities are present not only in the framework of teachers, but also in the number of women who assume positions of leadership, rectory and coordination within the institutions. In Brazilian

¹ Machismo is a prejudice, expressed by opinions and attitudes, which opposes equal rights between genders, favoring the male gender over the female. In other words, it is an oppression, in its most diverse forms, of women by men. (MOYA, 2019)

federal universities, for example, women comprise 28.3% of deans. They are 19 out of 63 rectors (Almeira, 2018).

These disparities around the fields of activity of women teachers, highlight the relationship of universities with gender. Still, it is worth noting that such differences were not extinguished with the new reality that permeates life in society, the pandemic of COVID-19.

With contamination imminent and the need for isolation, it was necessary to make the home the working environment. In other words, remote work brings as a characteristic the lack of physical separation to carry out the two types of work activities. With regard to the reality, research shows that the pandemic has intensified the gaps between genders, since the double work shift exercised by these women has become triple (Bridi, 2020).

Presentation and Discussion of Results

In a global context of understanding the labor market, it is possible to affirm that the participation of women has occurred in precarious and deregulated areas of work. It is not for nothing that the new and precarious morphology of the working class is called “feminization of work” (Antunes, 2009).

The emancipatory movement articulated by women, in order to break with the historical and social regiments present in society, such as the sexual division of labor, has the “feminization of work” as an important axis of analysis. The consequences of this division in the lives of women are characterized by the overexploitation of capital over women's lives. Such exploitation is achieved through, for example, a double workday to guarantee the reproduction of capital (Antunes, 2009), which has always been observed. However, with the pandemic and remote work, it is possible to speak of a triple working day, being carried out simultaneously and from the same locus of action.

In addition to the multiplication of working hours, it is recognized in the process of feminization of work, the intensification of the effort to meet the goals, the reduction of wages, the withdrawal of labor rights, the unequal conditions of career development, the withdrawal of stability, new and precarious forms of work, such as part time work, intermittent, informal, outsourced, autonomous work, without employment ties. The most intriguing is that when intensifying the exploitation of many workers, it is admitted that this is a process similar to what already occurs with women, hence the name "feminization of work".

The precarious work of men and women is called “feminized work”, that is, disqualified, overexploited, intensified and precarious, in a public recognition that this has always been, to a greater or lesser extent, female work.

Hegemonically, it is observed that the social construction of “being a man” and “being a woman”, has always occurred in different spheres, reserving the role to be occupied in society for each gender. This fact corroborated the limitation of the performance of women within any sector, in order to mark the ways in which the division of labor occurred. Therefore, because women are considered weak and with less capacity, they were responsible for the care of their children, the tribe and the making of pieces. Therefore, gender inequality comes from the very beginning of the existence of the social being (Pinto, 2003) and remains in society until today, as can be seen in one of the research participant’s statements:

Today, women are still mentally responsible for managing the functioning of the house, even though women with better incomes have helpers. When I was married, I always did

what had to be done, while my ex-husband did when he was in the mood. Man's work at home is also more respected, by children and companions. It is common for men to do chores anyway, so that women decide to do it right. (Interviewee 01)

The division of labor, according to this patriarchal social organization, does not make men responsible for domestic chores, as the interviewee points out. In this case, men are granted the right to choose whether or not to assume domestic responsibilities, and are not charged or punished when they do not. Another important aspect highlighted by her is that it is not only about the operational realization of the activities. It is also about the mental management of care, it is about cognitive and emotional implications to manage domestic care, which means a continuous over implication within a space that is always beyond that in which the woman is physically, at that time. In other words, women, even though they have the financial possibility of contracting support for domestic chores, are not completely released from the responsibilities of mentally managing these chores. In contrast, men can choose to manage and carry out the work but without being charged or punished if they do not. For this reason and, what is more intriguing, they are still more respected by those around them.

Society places male labor as more relevant than female labor, even though women have the same duties as men. An example is that in times of pandemic, in remote work, some teachers report the lack of proper space to carry out academic activities, while their companions, as the second interviewee reports, maintain their routine as if they were in the public space:

I notice that I am overwhelmed. My husband, also a professor at a public university, continues to work remotely as if he were doing it when he left home. It is as if he had reinstalled the public work space at home. I am more interrupted by the demands of the house, by the care of my father. (Interviewee 02)

Despite punctuating the term “equality in differences”, male overlap with female is still common in work environments. Interviewee 03 points out that it is not enough for women to be competent and do the job correctly, they need to prove that they are competent at all times. It is as if women need to update their competency status in order to have the right to occupy the same spaces as men. In addition to being a fact of academic life, the distinction between men and women at work has intensified even more, as the author reports:

Women are more commonly required. I have the impression that they need to prove their competence at all times. In the home office, they will be overloaded with the care of the home and family and will consequently have a drop in productivity. Men, in addition to not having to 'prove' productivity, the little they do is enough. Machismo in the division of tasks and in labor relations are updated strongly in the pandemic. (Interviewee 03)

Despite all the discussion, it is observed that even before being born ((Miranda & Schimanski, 2014), the choices of professions and the ways in which individuals will behave are already determined. Therefore, the space that each subject will occupy occurs according to gender:

When my partner is doing his remote work, he isolates himself and leaves the office only when he is finished. When I have to do the same, I am always asked about the importance and validity of my work. (Interviewee 02)

Here, again, interviewee 02 demonstrates how much the woman's work is questioned and disqualified, as she needs to reassert herself and demonstrate the value of what she does. It is not enough to do it, you must justify the importance of what it is and, in some cases, apologize for

doing it. There are reports of women who claim to always need to justify why they need to work in other activities besides domestic ones, as if they needed the symbolic validation of the people with whom she lives. With this, the daily struggle of women to guarantee their space in the production processes and in the search for a place in society is notorious. However, this search causes discomfort, and these are observed in the most diverse spaces. Gender inequality is present in the most diverse contexts and with them a series of stereotypes of the places to which the feminine belongs. Among them is the look directed at the woman as one who has a “natural condition” of care, that is, the look of caregiver of the family and the home.

Thus, it is important to point out that this perspective directly influences the lives of public university professors, since, according to the data collected in the research, 86.5% of respondents from public universities believe that remote academic work presents productivity results. differentiated, according to the gender of the person who executes it. Several factors are linked to this data, one of which is the predominance of looking at women as caregivers, in order to strengthen the differences placed on each gender.

Despite the continuous movement by a group of women to break with these institutions, historical morality still holds strength over behavior, since care appears not as something social, but biological. Therefore, the social division of labor and social relations are propositions that must be analyzed together (Guedes & Daros, 2009).

Women tend to accumulate almost all household chores. When it comes to living with the elderly, men are much less collaborative for cultural reasons. Because mothers end up being responsible for their children at home, even if the husband participates in the organization of the house. (Interviewee 04)

Because women end up being responsible for a large part of domestic activities, having less time to devote to remote academic activities than men. (Interviewee 05)

Based on the reports of the research participants presented here, 72.08% of the answers indicate that the women teachers take care of third parties in one or more conditions. Among these, 36.36% care for children under 18, 19.48% care for people over 60, 3.90% care for people with disabilities, 11.04% care for people with illnesses pre-existing, and 1.3% care for people who fell ill during the pandemic. Finally, 27.92% do not identify with any of the previous situations.

Therefore, it is observed that the dimension of care, crosses the lives of teachers in all instances and in the pandemic this fact has intensified, since they are working at home and accumulating this care with the tasks necessary to exercise teaching in a Public HEI. In this sense, another necessary point to highlight is related to the work day, addressed to women, since before the pandemic there was already a difference between men and women.

The difficulty reported by the teachers in reconciling domestic activities with the activities of remote work is notorious, in that for 75.4% of the teachers interviewed, this reconciliation is “very difficult” or “difficult”, and only 24.6% of the interviewees considered it “a little difficult” or “not at all difficult” to reconcile activities.

It is observed that the majority of women teachers of public HEIs in remote work, despite having help from other members of the family, are still overburdened with domestic chores. For the minority, there are those who perform all tasks alone and for 9.9%, there are teachers who count on the help of a person hired to carry out domestic activities.

With the excess of activities and the non-division of work and home spaces, some consequences reverberate in women:

Remote work causes discomfort in women, who are either overwhelmed with household chores or feel the sense of abandonment aggravated by isolation. (Interviewee 06)

What interviewee 06 points out is significant, as she reports a loneliness in the effort to take care of all the chores, in view of the naturalization of the woman's burden. The pandemic included in the already hard day of teachers, increases the obstacle of not being able to count on professional and family support in the division of tasks. Social isolation, in addition to pushing women home, in the unjust simultaneous overlapping of tasks, has also prevented them from having outside help. From both a material and emotional point of view, this abandonment portrays a process of naturalization of the woman's burden, in a context of extreme vulnerability. It seems that the discomfort with the workload, intensified by the fear of the pandemic, has become taboo and this leads to questions about how institutions have dealt with this situation. Institutional and family demands remain as high as before, despite the pandemic.

Therefore, it is understood that in addition to remote academic work presenting different productivity results according to gender, it also has consequences for the women who perform them, such as, for example, work overload. In addition, it is confirmed that the stereotypes addressed to women move between environments.

The difference in assignments for both men and women is notable. However, such differences are not restricted to remote work, but also in relation to working hours in face-to-face work, performed at the university. According to the reports, activities such as the organization of cafes and events and activities of an administrative nature are aimed at women teachers, as if they were in their "homes":

At work, too, men are more protected, with most operational and administrative tasks falling on women, even when they are men in charge of management. Women are often interrupted when they are studying / writing and in the home office this is much worse. Doctors, schools, referrals and management of household and children's tasks, in general, are in large part demanded from women. At work, even in management positions, men direct operational tasks to women or simply leave tasks of this nature to their colleagues, assigning themselves more political and / or intellectual tasks, while women "secrete" colleagues. This often happens under the guise of a supposed "inability" of men to perform multiple tasks simultaneously. This whole set ends up impacting women's time and energy in academic production, impairing their performance. (Interviewee 07)

So, the heart of the discussion is present in the cultural premises between genders and reflects directly on the role assigned to each one. The exacerbated differences, identified by the sexual division of labor, stand out in all the environments in which they live, as the sixth interviewee points out very well.

Doctoral students, master's students, teachers and researchers feel hostile, victims of symbolic violence, harassed and with a differentiated space when compared to the male gender. In addition, in relation to remote work, they experienced lack of motivation, anxiety, lack of concentration and less work done.

With regard to remote activities, in addition to indicating a decrease in the amount of work delivered, 86.5% of teachers believe that there are different results of productivity in relation to

gender. This is due to the burden on women of domestic activities and care for family members, since 65.30% say that, despite the help of other people, they remain overburdened.

Another point to note is the barriers found by teachers to occupy leadership positions, because, despite being the majority of the student body at universities, at the top of the career path this figure is reversed, and men are the majority in the areas of teaching. As concrete data obtained by the research shows, only 34.90% of the women professors occupy a management position and 8.73% know more than three principals.

Conclusion

It is concluded that it is necessary for there to be a reduction and perhaps extinction of the gender inequalities in Brazilian public employment categories, including the promotion of an effective inclusion of women in the most varied academic areas of the university. This inclusion requires undergoing cultural change, with intense investment in training and awareness of the subject of gender inequality, at all academic levels. Dealing with both vertical and horizontal harassment practices must become obligatory and punishable, with the formalization of channels for the resolution of discrimination and oppression. It is also necessary that the university personnel management policies should consider specificities of female work, overloaded as it is by double and triple work shifts, with the compilation of metrics and requirements demanded by this reality.

Finally, it is understood that the expansion of studies on gender inequalities in public higher education, especially through comparative education, can contribute to the search for solutions to the identified problems.

The Covid 19 pandemic, with as yet unknown consequences, has caused further gender discrimination at work, as can be seen in the home office work of women professors at Brazilian public universities. It is certainly not an isolated fact, as the patriarchal structure is still present in contemporary societies. Therefore, comparative education studies are essential so that, based on discourse with the other, more adequate paths for increased inclusion of qualified women in the work developed in universities are found. It is important to analyze historically how teachers have been included in the most varied public universities in different countries, comparing the forms of work performed, the discrimination suffered and the overcomings experienced.

Considering that comparative education, as a theoretical-methodological field, implies the investigation and analysis of the diverse contexts where educational practice takes place, the importance of elucidating common problems in these varied contexts, with regard to female work in teaching at all levels, is emphasized. It is not about mapping how gender inequalities have been manifested in different institutions and countries, but rather understanding, through the discourse with professors from different higher education institutions in different countries, if these inequalities are occurring and how they are occurring.

The comparison of how gender inequalities have been manifested in different sociocultural contexts, as well as the characteristics of work carried out in the home office during the pandemic, according to the institution and country analyzed, may contribute to changes in this framework of discrimination.

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Performative commitments to diversity and inclusion in Canadian educational institutions: Considerations for equity efforts in comparative and international education

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In this article, four Canadian studies inform an examination of equity, diversity, and inclusion in Canadian elementary, secondary, and post-secondary institutions. The four studies focus on internationalization in higher education, the impact of standardized testing on racialized students in the early years, racism and racialization in school mathematics, and the experience of students with disabilities during the COVID-19 pandemic. From these studies, three themes are considered: diversity, complexity, and comparative perspectives. The article provides important insights on the performative and superficial ways in which Canadian educational institutions are engaging with equity and inclusion efforts and how this analysis may be instructive in comparative and international education.

في هذه المقالة ، أربع دراسات كندية تقدم فحصاً للعدالة والتنوع والاندماج في المؤسسات الكندية الابتدائية والثانوية وما بعد الثانوية. تركز الدراسات الأربع على التدويل في التعليم العالي ، وتأثير الاختبار المعياري على الطلاب الذين يعانون من العنصرية في السنوات الأولى ، والعنصرية والتفرقة العنصرية في الرياضيات المدرسية ، وتجربة الطلاب ذوي الإعاقة أثناء جائحة COVID-19. من هذه الدراسات ، يتم النظر في ثلاثة محاور: التنوع ، والتعقيد ، ووجهات النظر المقارنة. تقدم المقالة رؤى مهمة حول الطرق الأدائية والسطحية التي تشارك بها المؤسسات التعليمية الكندية في جهود الإنصاف والشمول وكيف يمكن أن يكون هذا التحليل مفيداً في التعليم المقارن والدولي.

Dans cet article, quatre études canadiennes éclairent un examen de l'équité, de la diversité et de l'inclusion dans les établissements primaires, secondaires et postsecondaires canadiens. Les quatre études portent sur l'internationalisation dans l'enseignement supérieur, l'impact des tests standardisés sur les étudiants racialisés pendant les premières années, le racisme et la racialisation dans les mathématiques scolaires et l'expérience des étudiants handicapés pendant la pandémie de COVID-19. À partir de ces études, trois thèmes sont considérés : la diversité, la complexité et les perspectives comparatives. L'article fournit des informations importantes sur les façons performatives et superficielles dont les établissements d'enseignement canadiens s'engagent dans les efforts d'équité et d'inclusion et comment cette analyse peut être instructive en éducation comparée et internationale.

В этой статье четыре канадских исследования освещают вопросы равенства,

разнообразия и инклюзивности в канадских начальных, средних и высших учебных заведениях. Четыре исследования посвящены интернационализации высшего образования, влиянию стандартизированного тестирования на расовых учащихся в первые годы обучения, расизму, и расизму в школьной математике, а также опыту учащихся с ограниченными возможностями во время пандемии COVID-19. На основе этих исследований рассматриваются три темы: разнообразие, сложность и сравнительные перспективы. В статье содержится важная информация о перформативных и поверхностных способах, с помощью которых канадские образовательные учреждения участвуют в усилиях по обеспечению равенства и инклюзивности, и о том, как этот анализ может быть полезным в сравнительном и международном образовании.

En este artículo, cuatro estudios canadienses informan sobre un examen de la equidad, la diversidad y la inclusión en las instituciones primarias, secundarias y postsecundarias canadienses. Los cuatro estudios se centran en la internacionalización de la educación superior, el impacto de las pruebas estandarizadas a los estudiantes racializados durante los primeros años, el racismo y la racialización en las matemáticas en la escuela y la experiencia de los estudiantes con discapacidades durante la pandemia de COVID-19. A partir de estos estudios, se consideran tres temas: diversidad, complejidad y perspectivas comparadas. El artículo proporciona información importante sobre las formas superficiales y performativas en las que las instituciones educativas canadienses se comprometen con los esfuerzos de equidad e inclusión y cómo este análisis puede ser instructivo en la educación comparada e internacional.

Introduction

Ten years ago, Ainscow and Sandill (2010) stated that, “The issue of how to build more inclusive forms of education is arguably the biggest challenge facing school systems throughout the world” (p. 401). This need is particularly heightened as a result of the COVID-19 pandemic, the rise of populism, and recent events that have highlighted deep-rooted issues of racism, racialization, and marginalization and how they are exacerbated by their intersection. This paper responds to a question identified by WCCES in anticipation of the Third Annual WCCES Symposium: *What processes are taking place and can be envisioned to leverage the constructive impact of the education systems in different parts of the world during and post the Covid-19 pandemic?* We explore this question with consideration for educational systems in Canada specifically with regard to equity, diversity, and inclusion (EDI). This paper thus provides an opportunity to consider initiatives to address EDI in Canada to stimulate comparative and international perspectives on EDI efforts in other jurisdictions.

Four studies completed in different regions of Canada by the authors serve as the basis of the paper. This focus on research completed within Canada before and during the pandemic includes analyses of internationalization of higher education in relation to EDI initiatives; a study on the impact of standardized testing on racialized students and educators in the early years; research on racism and racialization in school mathematics; and, an examination of disability and inclusion. Examining this research as a collective provides perspectives from different parts of Canada and an opportunity for a holistic synthesis and dialogical conversations on different aspects of diversity and inclusion from a comparative lens to arrive at new understandings about challenges and area for growth that are heightened by COVID-19 circumstances. Thus, this paper provides comparative analysis as we consider diverse EDI efforts within Canada and opportunities to stimulate comparative and international studies which consider the Canadian experience with those in other contexts. Key themes in these studies include: racism; barriers to equity, diversity, and inclusion in Canadian schools and universities; the impact of the pandemic and events such as Indigenous and Black Lives Matter protests; and transformative teaching and school leadership to enact change. In the Discussion section we highlight three ways in which these studies inform education in, and as a result of, the pandemic including: diversity, complexity, and comparative perspectives both intra-nationally and inter-nationally. As a collective and in intersection with one another, this article provides important insights on the ways and extent to which Canadian educational institutions are – or are not – supporting equity and inclusion during the pandemic. Insights are also offered on the need to invest in new and alternative approaches going forward to foster equitable and inclusive educational practices that move beyond performative and superficial efforts (Shields, 2010). We offer these insights to describe some EDI efforts in Canada and to spur further analysis of how these Canadian initiatives align, diverge, and intersect with EDI efforts in other contexts, thus contributing to the field of comparative and international education.

Details of the Four Studies

The following sections describe four different studies that focus on issues pertaining to EDI in education systems across Canada. The first study juxtaposes international student enrollment at Canadian post-secondary institutions with EDI efforts. The second research study takes a critical look at the impact of standardized testing on racialized students and educators in the early years. The third and fourth studies focus respectively on issues related to racism and racialization in school mathematics and on disability and inclusion in Canadian school systems.

Study 1: Internationalization of Higher Education and Equity, Diversity, and Inclusion

Internationalization has grown to be a high priority for higher education institutions in countries of the Organization for Economic Cooperation and Development (OECD). This is evidenced by the fact that ninety-five percent of Canadian universities include internationalization in their strategic plans (CBIE, 2016). Declines in government funding for the Canadian postsecondary sector over the past three decades have pushed universities to become heavily dependent on international student enrollment to make up the shortfall (Crawley, 2017; Stein, 2019). In this context, the drastic curtailment of international travel during COVID-19 and the resulting loss of revenue from international students has become the biggest threat to internationalization.

While the stated rationale for what has been a rapid rise in internationalization of higher education in Canada over the past decade remains that of integrating an international, intercultural, and global dimension into postsecondary institutions, the main strategy for this appears to be the recruitment of international students. In 2019, there were 642,480 international students at all levels of study enrolled in Canadian institutions (CBIE, 2020). Students from India, China, South Korea, and other Asian and Latin American countries top the list of source countries, adding to the already diverse student population in Canada.

This diversity may seem ideal in a country that has its identity based on a perceived commitment to multiculturalism. The Canadian federal strategy for international education (Global Affairs Canada, 2019) and the accompanying EduCanada brand, promotes Canada as a happy and welcoming place for international students. However, amidst the celebratory accounts of the benefits of internationalization for Canadian universities, there is a growing body of scholarship that critiques multiculturalism metanarratives, including research that documents and challenges racism on campuses (e.g. Heer, Ma, Bhandar & Gilmour, 2012; Henry & Tator, 2009; Marom, 2021). As Schick and St. Denis (2005) argue, “The rhetoric of multiculturalism is enacted as a symbol of the ‘good nation’” (p. 295), assigning it benevolence, making multiculturalism itself unassailable, and erasing impacts such as racism.

While internationalization activities have faltered during the COVID-19 pandemic, initiatives championing EDI have become the latest trends in Canadian post-secondary institutions. In the fall of 2017, Canada’s universities adopted seven “Inclusive Excellence Principles” to advance EDI (Universities Canada, 2017). These principles include personal leadership as well as institutional commitments to EDI, identifying and addressing barriers to equity, EDI supports for faculty and leaders, using evidenced-based practices, and mobilizing knowledge about EDI across post-secondary institutions (Universities Canada, 2017). The statement of principles makes reference to Universities Canada’s (2017) “Principles on Indigenous Higher Education” and reaffirms its commitments to fostering intercultural engagement which is a core priority in internationalization of universities (Global Affairs Canada, 2019).

These principles recognize the “richness” to be gained by having diverse student, faculty, staff, and administrator populations, and encourage commitments to action to ensure access and opportunity to all, especially for those from underrepresented groups. There is little mention, however, of the need for systemic and structural change that will bring about equity. The presence of diverse bodies on campuses and raising awareness will hardly solve the issues of racism and equity so prevalent in the higher education system and culture that is largely Eurocentric.

In an earlier study on EDI and internationalization, Trilokekar, Tamtik and Beck (2018) compared these two policy agendas in institutions within the group of Canada’s most intense research

universities with the purpose of understanding why they remained siloed in institutional strategic plans. A critical content analysis of 37 internationalization strategies and EDI reports and strategies was carried out. Among the findings, it was noted that the values and policies of both EDI and internationalization emerged from definitions of the terms in each institution. As expected, EDI reports and strategies are very recent: six universities had EDI strategies or policies, three had statements on diversity and inclusivity, three had EDI reports, and three had none of these.

References to or mention of international students are surprisingly absent in EDI documents with one university providing a specific statement welcoming students from all countries and backgrounds and five universities noting diversity as being present through culture, religion, language, and race. Another significant finding was that of competing ideologies where statements supporting diversity and equity did not align with internationalization documents which incorporate statements regarding competition and revenue sources. EDI was framed as a domestic priority while internationalization was implied to be simply international. Stakeholders held radically different world views and there was inherent tension and competition between the two agendas.

Ahmed's (2012) critique of diversity and institutional adoption of diversity discourses in the United Kingdom and Australia is compelling and is a valuable source of analysis. Ahmed's notion of commitment as non-performativity illuminated, in both areas, in how statements of commitment, whether EDI or internationalization, appear to commit the institution to doing something. The institution can 'show' that they are following (in this case) federal policy or aspirations, using "cultural enrichment discourse of diversity" (Ahmed, 2012, p. 69) through the creation of statements or policies. Paradoxically, showing can also be a way of not committing with institutional documents replacing action, leading to a "a lip-service model of diversity" (p. 58) or "tick box approach" (p. 113). Ahmed concludes:

Statements of commitments can be understood as opaque: it is not clear what they are doing if they are not doing what they are saying. A commitment does not necessarily commit the institution to anything or to doing anything. Statements of commitment can be understood as "non-performatives." (p 116)

The main implication for the current paper is to understand how the discourse of commitment as non-performative may follow suit in post-COVID conditions for internationalization and equity, diversity, and inclusion initiatives in the Canadian higher education sector. Just as importantly, with the rise of international student enrollment at Canadian post-secondary institutions to offset funding concerns, what changes in policies and practices will ensure that international students are supported to do well physically, socially, emotionally, spiritually, and academically upon arrival and throughout their studies? In the post-COVID era, Canadian post-secondary institutions have the opportunity to re-envision the importance of internationalized student bodies, not primarily from a financial perspective, but from a strengths-based framework that contributes to diversity on Canadian campuses.

Study 2: Impact of standardized testing on racialized students in the early years in one region of Canada: Ontario

Standardized testing in Ontario elementary and secondary schools was introduced in 1996 by the Education Quality and Accountability Office (EQAO). All students in publicly funded schools in Grades 3, 6, 9, and 10 began being annually tested in numeracy and literacy. In a recent study, qualitative data was collected via semi-structured interviews with 8 racialized families, each with

a Grade 3 child, to examine their lived experiences with the Grade 3 EQAO standardized testing preparation and administration (Eizadirad, 2019). This age was the focus of the study to address a research gap since the majority of the Canadian literature on standardized testing is conducted at the secondary school level.

Responses of the Grade 3 children interviewed, in terms of what they expressed as negative socio-emotionally induced stress, anxiety, and fear of failure associated with writing the EQAO test, confirms and aligns with what The National Center for Fair and Open Testing (TNCFOT) has identified. TNCFOT has noted the negative harmful effects of using standardized testing on young children impacting their “healthy development and learning” (FairTest, 2017, p. 1). Examples of negative physical and psychological impact expressed by the participants included losing sleep due to worrying about doing poorly, experiencing overwhelming anxiety and nervousness demonstrated by crying and needing reassurance from parents to enter the classroom to take the EQAO test, feeling excluded by being taken out of the regular classroom to prepare for and write the EQAO test, and fear of failure and being labelled as “dumb.” Overall, the harmful impact of standardized testing was identified under the umbrella term *invisible scars* and *traumatizing effects of standardized testing* (Eizadirad, 2019) symbolizing how EQAO tests particularly marginalize and oppress racialized children and those from lower socio-economic backgrounds.

In June 2020, the government announced that Grade 3 and 6 EQAO standardized tests would not be administered for the 2020-2021 school year due to the circumstances created by the COVID-19 pandemic. This allowed an opportunity to pause and reflect on best practices based on the needs of students. An educational culture change is needed that moves beyond simply judging students’ intellectual and academic competencies based on outcome-based standardized tests. Instead, a more holistic interdisciplinary approach is needed which focuses on the opportunity gap and which takes into consideration students’ unique identities and their physical, social, emotional, spiritual, and psychological development and living circumstances (Eizadirad, 2020). The current normalized and legitimized neoliberal market-driven model of education, with its reliance on standardized testing as an accountability tool, homogenizes the needs of all students and communities by disregarding them as holistic beings and dynamic communities and instead judges them predominantly by results and performance on standardized tests (Froese-Germain, 2001). These tests have gained so much currency that they are even driving property values across neighbourhoods often privileging communities that have more access to opportunities due to socio-economic status, fundraising capacities, and other factors.

The discussion needs to shift from an equality paradigm to an equity lens that asks, whose values and knowledge are established as the “norm” and consequentially utilized as a baseline measure for judgement and comparison? Further, whose interests does this approach serve and at what costs? Racialized students have been particularly disadvantaged since they are overrepresented in applied streams of courses as well as in special education programs in schools, and have higher drop-out/push-out and expulsion rates (Colour of Poverty - Colour of Change, 2019). These findings mirror those in other countries (e.g., Rezai-Rashti & Lingard, 2021), thus highlighting that these are not “Canadian” issues but ones which are represented in many parts of the world. We cannot address the achievement gap without first addressing the inequality of opportunity that plagues our educational systems and further marginalizes our most vulnerable student populations vis-à-vis invisible scars and traumatizing effects of standardized testing. As long as Canadian schools continue to operate under a one-size-fits-all mandate, and schools located in higher socio-economic status communities continue to get access to better funding, and more opportunities,

resources, and social support services, the achievement gap will continue to exist and be perpetuated.

Study 3: Racism and racialization in school mathematics

Issues of racism and racialization find their way in school systems around the world, but it is particularly problematic in the United States and in Canada. Morvan (2017) argues that issues of racism and racialization in school mathematics plague Ontario school systems through academic streaming. Kinnon (2016) defines the practice of streaming as “a policy of formally grouping students based on their current academic ability and, in the case of Ontario, also by their supposed academic destination, be that university, college, or the workplace” (p. 17). Streaming is also known as tracking or ability grouping (OECD, 2012). These kinds of practices are poisonous for social mobility and they particularly affect Black, Indigenous, and students of colour.

What is very problematic is not that students are grouped by ability according to their post-secondary pathways. It is rather because Black and other racialized students are overrepresented in less challenging mathematics courses and academic programs leading to limiting their access to opportunities for upward social mobility in the future by lacking the prerequisites or requirements for various postsecondary pathways. According to Parekh (2013), in the Toronto District School Board’s *Structured Pathways*, only 8.8% of the 12.6% self-identified secondary Black students take the majority of their courses in the academic stream (p. 3). That leaves 91.2% of secondary Black students with most of their courses in the applied program of study with limited postsecondary options. Additionally, Parekh (2013) observed that:

Self-identified Black students are the largest racial category represented in Special Education schools (30.2%) and are over triply represented. Self-identified Black students are also over-represented in schools with Limited Academic opportunities (19.3%), but are under-represented in both Alternative schools (10.4%) and ... Specialty Arts schools (3.2%). (p. 7)

Many researchers have argued that school mathematics has been used as a powerful social filter, a tool for systemic biases in policies, practices and processes that privilege or disadvantage some groups of students based on their ethnicity or other social or demographic characteristics (Morvan, 2017). Among them, Herbel-Eisenmann, Choppin, Wagner and Pimm (2011) maintain that “school mathematics remains a powerful social filter, and understanding and explaining access to and success in school mathematics has been of considerable interest to the research community for some time now” (p. v). One must wonder why the problem continues to prevail, and most of the times remains unchallenged in Ontario school systems despite more than 30 years of provincial initiatives regarding racism and race relations (James & Turner, 2017).

In a quest for equity in school mathematics in Ontario, a current study being led by one of the co-authors of this paper seeks to connect the school experiences and achievement of secondary school Black students to school principal leadership. The purpose of the study is to examine how the school experiences of Black students are related to their achievement in mathematics and how principal leadership is connected to these experiences. Data from the Toronto District School Board (TDSB), one of the largest school districts in North America with approximately 250,000 students spread across approximately 600 elementary, middle, and secondary schools, are used in the research. The board’s geographic location, which covers a very large urban area in the Greater Toronto Area (GTA), allows for data that represent a large segment of the racialized population in Ontario. TDSB is also a leader in collecting race-based data and has been very committed, for

many years, to equity issues related to Black students in the Greater Toronto Area. The practice of race-based data collection is highly encouraged in other contexts as it will provide insightful data to mobilize EDI strategies and approaches to address unmet needs.

Preliminary findings show that in 2015-16 Black students (57.5%) and Indigenous students (54.2%) were the highest groups not meeting EQAO standards, as opposed to White students (19.2%) and South Asian students (22.8%). Additionally, the initial results show that 56.8% of Black students did not meet provincial standard in grade 9 math whether they consider their Overall School Experience Index to be high (54.5%) or low (58.9%). These numbers are even more troubling when, for White students, only 15.4% (when the Overall School Experience Index is high) and 23.6% (when the Overall School Experience Index is low) did not meet EQAO standards.

These early findings, as troubling as they are, sharply point to the need for Ontario school systems and leaders to consider some important questions: Why is it that despite more than 30 years of provincial initiatives against racism, Black and Indigenous students continue to be left behind? What can principal leadership and an inclusive school culture and practices do to break the cycle of low achievement for those students? What kinds of systemic barriers, biased practices, and discriminatory policies are still at play in Ontario schools which prevent those students from benefiting from all the support that can be put in place? These questions are important not only in the context of Ontario but in educational jurisdictions in other contexts. There is an urgency to not only eliminate racism and racialization through de-streaming in school mathematics, but also to change educators' mindsets about Black and Indigenous students while ensuring they benefit equitably from educational opportunities. Otherwise, recent announcements in Ontario and beyond to end academic streaming in Grade 9 risks remaining another example of empty rhetoric and performative policy. As school systems globally consider the school experiences of marginalized students, these studies provide ample opportunity to consider comparative analysis of the experiences of racialized youth in subject-specific areas and on standardized assessments which often serve as social filters for future opportunities and endeavors.

Study 4: Disability and inclusion

A fourth area of research has focused on how students with disabilities are included in Canadian schools. Multiple studies have examined the experiences of educators, particularly principals, in supporting students with disabilities during the pandemic (MacCormack, Anderson & Sider, 2020; Sider, 2020; Sider et al., 2021; Whitley et al., 2020). These studies included quantitative and qualitative aspects. In one study, 108 principals were surveyed and asked to identify a critical incident that was representative of their leadership in the pandemic. In another study, 38 principals were interviewed about the types of supports and resources they used during the pandemic. Here we identify three key aspects of these studies specific to equity, diversity, and inclusion and of relevance to comparative and international education.

First, these studies have shown that the COVID-19 pandemic has unveiled educator's beliefs about inclusion of students with disabilities. Principals and teachers often express commitment to inclusive education but during the pandemic, when isolation and distance made supporting students with disabilities particularly challenging, it was clear that some educators were not willing to make the effort required to support students with disabilities. This was reflected by statements shared by educators such as, "The student never worked for me during the regular class. Why should I help them now?" Educators did not have the same access to support workers as they did

in physical classrooms and this magnified the challenge for many. Further compounding the situation was the mixed messages that educators received from government officials about instructional programming during the pandemic (Sider, 2020). In general, there was no clear communication from government ministries to specifically address the needs of students with disabilities during the pandemic. This lack of a clear commitment to students with disabilities may have negatively influenced some educator's commitment to inclusive education. This can be attributed to some extent to educators being overwhelmed with having to teach remotely without extensive training in online platforms.

Second, despite the unveiled beliefs about inclusion that some educators have demonstrated during the pandemic, many other educators became further committed to supporting students with disabilities. We documented many examples of educators who were very diligent and committed, despite incredibly challenging circumstances, to support students with disabilities (MacCormack et al., 2020). The types of efforts that we documented included: educators meeting daily with students by phone, driving to students' homes to deliver technology devices, being accessible early in the morning and late into the evening to support other educators, and distributing resource kits including puzzles, visual cards, and math manipulatives (Sider, 2020). These acts demonstrated that many teachers, principals, and support staff are highly committed to supporting students with disabilities.

Third, the pandemic has changed the ways in which instructional programs for children with disabilities are delivered. Many children with disabilities rely on a familiar adult instructor to support their academic progress. The pandemic disrupted this. It also forced family members to take on increased instructional responsibilities. This was a significant issue of equity as many parents were forced to take time from their paid employment to serve as de facto teachers for their children (MacCormack et al., 2020; Whitley et al., 2020). As illustrative of these challenges, we heard from families who only had one parent in the home with multiple children with disabilities. These situations demonstrated that the pandemic did not impact all people and families equally; those with disabilities often bore a significant price whether in limited instructional contact with a teacher or in the impact it had on parents who had to take on more instructional responsibilities at home. The study raises troubling questions about how students with disabilities are included in Canadian schools. For example, do Canadian educators have superficial commitments to students with disabilities being included within inclusive schools? When planning for pandemic-related instruction, did Canadian teachers and principals incorporate students with disabilities as an afterthought to their planning for non-disabled students? These questions raise insights into the inclusion of students with disabilities in Canada, a country that is often looked to for effective leadership in this field (Sider, Maich & Morvan, 2017). Further, these findings and the related questions provide opportunities for comparative and international analysis of how school systems in different parts of the world have supported students with disabilities before, during, and subsequent to the COVID-19 pandemic.

Discussion: Cross-cutting themes

In this section, we explore how these four Canadian studies can serve to inform comparative and international analyses of equity, diversity, and inclusion efforts in global contexts. We consider diversity, complexity, and aspects of comparative education, from the early years and high school to post-secondary environments, to move beyond performative institutional policies to action-oriented acts so students at different ages can be supported to meet their needs beyond pandemic circumstances.

Diversity... yet Similarity

The four studies demonstrate that across diverse studies, underlying issues of marginalization, stigma, and stereotypes continue to exist in the Canadian educational context. In the first study, we see that international students are sought after in the name of internationalization, often more as an economic function, but are hardly considered in policy areas related to EDI. In the studies related to Black and Indigenous students in standardized testing and academic streaming, these students continue to see significant gaps in academic performance and programming. These gaps are expected to be exacerbated by the pandemic given that marginalized communities are disproportionately more negatively affected by COVID-19. In the final study on disability, students with special education needs often remain disadvantaged by the types of services and supports provided to them. Despite thirty years of legislation and increased awareness and training, educational systems in Canada continue to fail those most at-risk often resorting to performative institutional acts versus on-going investments to address long-term root causes of inequities within the education sector. The fact that this pertains across areas of diverse studies, across different geographical regions, and across educational sectors speaks to the challenges that lie ahead for Canada as it seeks to reconcile its past – for example, its history of racism against Indigenous students and residential schools – to current practices that tend to negatively impact Black, Indigenous, and racialized students and those with disabilities.

Complexity

The issues that confront Canadian educational systems are complex. They involve historical practices, unequal funding models, and inadequate policy frameworks rooted in neoliberalism and meritocracy (Kumashiro, 2000; Noguera, 2003). As stated,

Coronavirus hasn't caused the educational inequities that impact students. But it has shed light on how our most vulnerable communities are marginalized, silenced and oppressed systemically due to lack of access to opportunities perpetuated historically, socially, economically and politically via Canadian institutional policies and practices including by schooling (Eizadirad & Sider, 2020, para. 3).

Canada is often seen on the world stage as a country that embraces diverse cultural and linguistic groups and cultivates a peaceful society. This is an overwhelmingly simplistic, and inaccurate, depiction of Canada, which often dismisses root causes of inequities creating disadvantages across different social groups within Canada and its large geographical landscape. Despite having significant economic and academic capital, Canadian governments and institutions often lack the socio-political will to enact deep, substantial, and long-lasting social change to move from superficial lip-service to reality in ensuring diverse, equitable, and inclusive communities.

The COVID-19 pandemic, the upsurge of racism with the empowerment of White supremacists in the United States and elsewhere, the murder of George Floyd, and all the social movements resulted from these high-profile events, make our world a more complex one. Canadian educational systems and authorities do not have the luxury to stay stuck in the past hoping that old policies on equity, inclusion, and diversity are sufficient and relevant for a post pandemic and post-truth world.

Inter and Intra-national Comparisons

The four studies we have highlighted here provide an opportunity for a unique inter-national and intra-national comparative analysis. Canada has a federal system in which provinces carry significant weight in education decision-making. This provides intra-national insights as provinces

can be examined in comparison to each other in regard to international students, Black, Indigenous, and other racialized youth, and those with disabilities. Also, as a push for race-based data collection is gaining momentum in Canada, educational institutions and systems will be in the spotlight when comparative analysis starts unveiling EDI failures and successes.

Further, as educational jurisdictions globally strive to ensure equitable and inclusive education, the Canadian experience can serve as a case example. The Canadian example speaks to how educational, social, and political entities can effectively – or not – mobilize and work towards implementing policies and practices that genuinely ensure that all students access quality education and opportunities for upwards social mobility. It is important to keep in mind that the Canadian experience, just like that of other jurisdictions, is not a singular experience but differs depending on identity, community, and neighborhood location. Thus, this paper provides opportunities for comparative and international education scholars to engage in analysis of EDI efforts both within and between geo-political contexts.

Conclusion

A key question raised at the Third Annual WCCES symposium was: What processes are taking place and can be envisioned to leverage the constructive impact of the education systems in different parts of the world during and post COVID-19 pandemic? The four studies, each with a different focus on EDI issues in the Canadian context, provide a unique opportunity to consider this question. We posit that, in Canada, the COVID-19 pandemic has unveiled the “niceties” of Canadian society and laid bare that much more needs to be done to foster an equitable society that is not performative or short-sighted but seeks to discuss and mitigate the root causes of inequities. The COVID-19 pandemic has exposed the injustices that marginalized racialized students, international students, and students with disabilities have experienced in Canada. There may be no better time than now and in the post-COVID-19 era to rebuild a fractured educational system with various voices from social groups and communities who historically and currently are systemically disadvantaged, as part of the mobilization and strategization for a better future. However, we question whether Canadian governments and institutions have the political will and the synergy to actively dismantle the structures that have led to the current inequitable context. Further, as other jurisdictions engage in EDI efforts, we encourage analysis to assess the degree to which these are performative or substantive and structural. Further comparative and international education research examining EDI efforts is warranted as governments and educational institutions grapple with these efforts in the midst of a global pandemic.

The four studies highlighted in this paper provide insights into Canadian experiences with international students, racialized children and youth with standardized assessments and academic programming, and students with disabilities. Despite enacting policies and practices that articulate a commitment to fostering an equitable and diverse society, the studies examine the degree to which this actually occurs. As comparative and international education scholars attempt to examine differences and commonalities across geo-political boundaries, we believe that these four Canadian studies – and the analysis of them as a collective – shed light on Canadian efforts, including corresponding challenges and barriers and how to strategize and mobilize to foster equity, diversity, and inclusion in education. We welcome comparative and international analyses to better understand these efforts, and others, across political boundaries.

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Technology Enhanced STEM Integrated Science Education to Develop Humanistic Values and Goals: Reviewing the Literature

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An effective education system can propel a country to the forefront of the 21st century world where technology and its applications are indispensable components. Integrated teaching-learning strategies are considered more efficient in inculcating and developing skills and values required by the future world. Therefore, development of educational technologies and technology-integrated pedagogical approaches should be continued. This article reviews the available research literature confirming the effectiveness of technology as a tool developing personal skills in STEM: Science, Technology, Engineering and Mathematics integrated science classroom.

As stated in the research literature, technology contributes to the design and implementation of a variety of STEM activities. Flipped classrooms, mobile learning, visualization, educational robotics and gaming are some of the major technological applications used in STEM based teaching-learning experiences. Self-regulatory learning, inquiry-based learning, problem based learning and cooperative learning are the principal pedagogical practices in STEM education. Since STEM challenges are usually conducted in a team environment, they are directly linked with socio-constructivism in which students develop a number of humanistic values: working with others cooperatively, sharing and accepting ideas, helping others, empathy, effective communication and collaboration, along with cognitive development. This also encourages bearing failures and enjoying success as a group and as individuals. Generally, they are the social skills and the human values required by a 21st century individual.

Developing a balanced individuality with humanistic values, knowledge and skills is a major concern for education in the 21st century. Recent research studies and practical applications have identified STEM education as an efficient facilitator of collaboration, emotional flexibility, adaptability and empathy as 21st century skills. Hence, it is argued that the merging of technological applications in support of STEM practices will strengthen the development of humanistic values and cognitive skills that are highly demanded in the 21st century.

Key words: Humanistic Values, STEM Education, Technology, 21st Century Skills

يمكن لنظام تعليمي فعال أن يدفع بالبلد إلى صدارة عالم القرن الحادي والعشرين حيث تشكل التكنولوجيا وتطبيقاتها مكونات لا غنى عنها. تعتبر استراتيجيات التعليم والتعلم المتكاملة أكثر كفاءة في غرس وتطوير المهارات والقيم التي يتطلبها عالم المستقبل. في خضم ذلك، يجب الاستمرار في تطوير تقنيات التعليم والأساليب التربوية المتكاملة التكنولوجية. تبحث هذه المقالة عن المؤلفات البحثية المتاحة التي تؤكد فعالية التكنولوجيا كأداة لتطوير المهارات الشخصية في العلوم والتكنولوجيا والهندسة والرياضيات: العلوم والتكنولوجيا والهندسة والرياضيات الفصول الدراسية للعلوم المتكاملة.

كما هو مذكور في الأدبيات البحثية، تساهم التكنولوجيا في تصميم وتنفيذ مجموعة متنوعة من أنشطة العلوم والتكنولوجيا والهندسة والرياضيات. الفصول الدراسية المقلوبة والتعلم المتنقل والتصور والروبوتات التعليمية والألعاب هي بعض التطبيقات التكنولوجية الرئيسية المستخدمة في خبرات التعلم والتعليم القائمة على العلوم والتكنولوجيا والهندسة والرياضيات. التعلم التنظيمي الذاتي، والتعلم القائم على الاستفسار، والتعلم القائم على حل المشكلات، والتعلم التعاوني هي الممارسات التربوية الرئيسية في تعليم العلوم والتكنولوجيا والهندسة والرياضيات. نظرًا لأن تحديات العلوم والتكنولوجيا والهندسة والرياضيات يتم إجراؤها عادةً في بيئة جماعية، فهي مرتبطة ارتباطًا مباشرًا بالبناء الاجتماعي حيث يطور الطلاب عددًا من القيم الإنسانية: العمل مع الآخرين بشكل تعاوني، ومشاركة الأفكار وقبولها، ومساعدة الآخرين، والتعاطف، والتواصل الفعال والتعاون، جنبًا إلى جنب مع التطور المعرفي. يشجع هذا أيضًا على تحمل الفشل والاستمتاع بالنجاح كمجموعة وكأفراد. بشكل عام، هي المهارات الاجتماعية والقيم الإنسانية التي يتطلبها فرد القرن الحادي والعشرين.

إن تطوير شخصية متوازنة مع القيم والمعارف والمهارات الإنسانية هو مصدر قلق كبير للتعليم في القرن الحادي والعشرين. حددت الدراسات البحثية والتطبيقات العملية الحديثة تعليم العلوم والتكنولوجيا والهندسة والرياضيات كميسر فعال للتعاون والمرونة العاطفية والقدرة على التكيف والتعاطف كمهارات القرن الحادي والعشرين. ومن ثم، يقال إن دمج التطبيقات التكنولوجية لدعم ممارسات العلوم والتكنولوجيا والهندسة والرياضيات سيعزز تطوير القيم الإنسانية والمهارات المعرفية المطلوبة بشدة في القرن الحادي والعشرين.

Un système éducatif efficace peut propulser un pays à l'avant-garde du monde du XXI^e siècle où la technologie et ses applications sont des composantes indispensables. Les stratégies intégrées d'enseignement et d'apprentissage sont considérées comme plus efficaces pour inculquer et développer les compétences et les valeurs requises par le monde futur. Au milieu de cela, le développement des technologies éducatives et des approches pédagogiques intégrées à la technologie devrait être poursuivi. Cet article recherche la littérature scientifique disponible confirmant l'efficacité de la technologie en tant qu'outil de développement des compétences personnelles en STEM : classe de sciences intégrée en sciences, technologie, ingénierie et mathématiques.

Comme indiqué dans la littérature scientifique, la technologie contribue à la conception et à la mise en œuvre d'une variété d'activités STEM. Les classes inversées, l'apprentissage mobile, la visualisation, la robotique éducative et les jeux sont quelques-unes des principales applications technologiques utilisées dans les expériences d'enseignement-apprentissage basées sur les STEM. L'apprentissage autorégulateur, l'apprentissage basé sur l'investigation, l'apprentissage basé sur les problèmes et l'apprentissage coopératif sont les principales pratiques pédagogiques dans l'enseignement des STEM. Étant donné que les défis STEM sont généralement menés en équipe, ils sont directement liés au socio-constructivisme dans lequel les étudiants développent un certain nombre de valeurs humanistes : travailler avec les autres de manière coopérative, partager et accepter des idées, aider les autres, empathie,

communication et collaboration efficaces, ainsi qu'avec le développement cognitif. Cela encourage également à supporter les échecs et à profiter du succès en tant que groupe et en tant qu'individus. Généralement, ce sont les compétences sociales et les valeurs humaines requises par un individu du 21^e siècle.

Développer une individualité équilibrée avec des valeurs, des connaissances et des compétences humanistes est une préoccupation majeure pour l'éducation au 21^e siècle. Des études de recherche récentes et des applications pratiques ont identifié l'enseignement des STEM comme un facilitateur efficace de la collaboration, de la flexibilité émotionnelle, de l'adaptabilité et de l'empathie en tant que compétences du 21^e siècle. Par conséquent, il est avancé que la fusion des applications technologiques à l'appui des pratiques STEM renforcera le développement des valeurs humanistes et des compétences cognitives qui sont très demandées au 21^e siècle.

Эффективная система образования может вывести страну на передовые позиции в мире 21 века, где технологии и их применение являются неотъемлемыми компонентами. Интегрированные стратегии преподавания и обучения считаются более эффективными для привития и развития навыков и ценностей, необходимых будущему миру. В связи с этим следует продолжать разработку образовательных технологий и технологических интегрированных педагогических подходов. В этой статье проводится поиск доступной исследовательской литературы, подтверждающей эффективность технологии как инструмента развития личных навыков в STEM: объединенный класс естественных наук, технологий, инженерии и математики.

Как указано в исследовательской литературе, технологии способствуют разработке и реализации различных видов деятельности STEM. Перевернутые классы, мобильное обучение, визуализация, образовательная робототехника и игры - вот некоторые из основных технологических приложений, используемых в обучении и обучении на основе STEM. Саморегулируемое обучение, обучение на основе запросов, обучение на основе проблем и обучение в сотрудничестве являются основными педагогическими практиками в STEM-образовании. Поскольку STEM-задачи обычно решаются в командной среде, они напрямую связаны с социально-конструктивизмом, в котором учащиеся развивают ряд гуманистических ценностей: совместная работа с другими, обмен и принятие идей, помощь другим, эмпатия, эффективное общение и сотрудничество, наряду с когнитивным развитием. Это также поощряет переносить неудачи и наслаждаться успехом как в группе, так и по отдельности. Как правило, это социальные навыки и общечеловеческие ценности, необходимые человеку 21 века.

Развитие сбалансированной личности с гуманистическими ценностями, знаниями и навыками является главной задачей образования в 21 веке. Недавние исследования и практические применения показали, что STEM-образование эффективно способствует сотрудничеству, эмоциональной гибкости, адаптивности и эмпатии как навыкам 21-го века. Следовательно, утверждается, что объединение технологических

приложений в поддержку STEM-практик усилит развитие гуманистических ценностей и когнитивных навыков, которые очень востребованы в 21 веке.

Un sistema educativo eficaz puede impulsar a un país a la vanguardia del mundo en el siglo XXI, donde la tecnología y sus aplicaciones son componentes indispensables. Las estrategias integradas de enseñanza-aprendizaje son consideradas más eficientes para inculcar y desarrollar habilidades y valores que demanda el mundo en el futuro. En medio de ello, es necesario continuar con el desarrollo de tecnologías educativas y enfoques pedagógicos integrados con la tecnología. Este artículo busca con base a la literatura de investigación disponible, confirmar la efectividad de la tecnología como una herramienta para desarrollar habilidades personales en STEM: Ciencia, Tecnología, Ingeniería y Matemática en aulas integradas de ciencia.

Como definimos en la revisión de la literatura, la tecnología contribuye a diseñar e implementar una variedad de actividades de STEM. Aulas invertidas, aprendizaje móvil, visualización, robótica educativa y videojuegos son algunas de las mayores aplicaciones tecnológicas usadas para las experiencias de enseñanza-aprendizaje basadas en STEM. El aprendizaje autorregulado, el basado en la indagación, aquel basado en problemas y el cooperativo son las principales prácticas pedagógicas en la educación STEM. Dado que los desafíos STEM generalmente se llevan a cabo en un entorno de equipo, están directamente relacionados con el socioconstructivismo en el que los estudiantes desarrollan una serie de valores humanísticos: trabajan con otros de manera cooperativa, comparten y aceptan ideas, ayudan a los demás, empatizan, se comunican efectivamente y colaboran, junto con el desarrollo cognitivo. Esto también ayuda a soportar los fracasos y disfrutar del éxito como grupo y como individuos. Generalmente, se trata de las habilidades sociales y los valores humanos que requiere un individuo del siglo XXI.

Desarrollar una individualidad equilibrada con valores, conocimientos y habilidades humanísticos es una de las principales preocupaciones de la educación del siglo XXI. Estudios de investigación recientes y aplicaciones prácticas han identificado la educación STEM como un facilitador eficiente de colaboración, flexibilidad emocional, adaptabilidad y empatía como habilidades del siglo XXI. Por lo tanto, se argumenta que la fusión de aplicaciones tecnológicas en apoyo de las prácticas STEM fortalecerá el desarrollo de valores humanísticos y habilidades cognitivas que son muy demandadas en el siglo XXI.

Introduction

The 21st century school, society, workplace, and the entire world is transforming into an intercultural and collaborative environment in which knowledge, attitudes and skills are equally valued. In this platform 21st century skills and competency development, especially in the young generation, is one of the biggest challenges ahead in the field of education. Obviously, education not only involves the transmission of knowledge but also practicing accurate thinking, developing skills, habits and shared values. In other words, it is the formation of a balanced person with knowledge, skills, and attitudes. As various studies have highlighted many of today's young generation are competent in hard skills but lack in soft skills and social

skills vital in the modern workplaces. In support of that there is an emerging necessity of enhancing socio-emotional skills in children. It suggests that education should not only appreciate the head and hands but also the heart. Lack of heart-felt values has been seen as resulting in growing violence and terrorism, pollution and ecological imbalances, power and inhumanity across the global scenario. Hence, developing humanistic values or, as in the general usage "social skills or soft skills" development, has become one of the main educational objectives. Also required by today's working culture and social skills is a factor that ensures the employability of an individual. In that respect, educational approaches such as STEM and STEAM have been identified as strategically important regarding skill development in the younger generation. They are at the forefront of the educational agenda in the majority of countries regardless of economic stability, geographical region or cultural variations. Moreover, integrating school subjects with STEM and STEAM applications, especially those integrating science is a novel tendency which targets skill development. At this point, technology supported teaching-learning processes are an added value in developing skills and competencies in students. In general, technology refers to man-made things and people have both positive and negative images of it. Although technology has been identified as purposely designed components such as computers, telephones and machines, it is far more than that. In short, technology is involved in every move that humans make to change the natural world to suit their own purposes, needs and comforts. Or in other words it is a designed world which mediates the activities of the natural world and the social world. When it comes to the social world especially, regarding the influence of technology on socio-emotional aspects is not always welcoming. But in the sense of education, technology is always considered positive and beneficial. Argued here is that addressing value development through educational technologies as a novel trend is one that needs further in-depth study.

Considering all the above the current review is focused on the context of developing humanistic values and goals giving special reference to technology enhanced STEM integrated science teaching. It aims to investigate the following research questions.

- What technological tools can be integrated into STEM teaching and learning processes?
- How do integrated technological applications facilitate humanistic value development in students?

The discussion of humanistic value development through technology supported STEM based science experiences within the context of this literature review is considered particularly important in of the personal, social and professional life of an individual. Moreover, it is maintained, the future world highly requires both knowledge and skills, most importantly technology skills and social skills. Therefore, it is significantly important for educational stakeholders and policy makers to orient their efforts to enhance the knowledge, technology skill and values of the future generation.

Surveying the Literature

In support of this article's title 'Technology Enhanced STEM Integrated Science Education to Develop Humanistic Values and Goals: Reviewing the Literature', the literature review focused on synthesising research based evidence in five major areas: Science Education, STEM Education, technology, 21st century competencies and humanistic values.

Science Education

Science education essentially aims to systematically develop and sustain a learner's curiosity about the world while enhancing scientific thinking and understanding of how natural phenomena in the world can be explained (Das & Amrit, 2014; Harlen et al., 2015). Developing scientific literacy (Turiman, 2012) and Science Process Skills are the main aims of science education. Science Process Skills are defined as tools that acquire information about the world (Gultepe, 2016). They are also defined ways of problem identification, formulation of the hypothesis about the problem, making a valid prediction, identifying and defining of variables, designing an experiment to test the hypothesis (Kamba et al, 2018). Scientific literacy means knowledge and understanding of the scientific concepts and processes required for personal decision-making, participation in civic and cultural affairs, and economic productivity (NCREL & Metiri Group, 2003). The purpose of science education has been the subject of continuing debate over a long time (Wellington, 2001) and it seems that there is no direct observable relationship between science education and value achievements. However, as most of the science teaching-learning activities are continued by means of collaborative/cooperative approaches and PBL, it partially targets developing socio-emotional skills. On the surface, social and emotional learning and social skill development may not feel a good fit for a science classroom but as revealed through a number of studies, scientific literacy and science process skills trigger the developing of social skills in science students. That development may obviously intensify further when the science lessons are conducted in a STEM integrated background.

STEM Education

In general, the integrated study of Science, Technology, Engineering and Mathematics is named STEM, which evolved out of the American government policy in the early 1990s, specifically from within the National Science Foundation [NSF] (Deghaidy et al, 2016). As McDonald (2016) states, it is an acronym commonly used to describe education or professional practices in the areas of Science, Technology, Engineering and Mathematics, which have been staple forms of all students' academic careers. From the educational point of view, STEM education includes the knowledge, skills and beliefs that are collaboratively constructed through the integration of Science, Technology, Engineering, and Mathematics subjects, and is the epitome of interdisciplinary education (Corlu, Capraro & Capraro, 2014; Lapek, 2018). Within the framework of STEM education, rigorous academic concepts coupled with real-world lessons are conducted in team environments by means of PBL (Project/Problem Based Learning) and Cooperative Learning and Inquiry Based Learning. Furthermore, it promotes student centered learning and makes connections between school, community, work, and the global enterprise enabling the development of STEM literacy and the ability to compete in the new economy. Through all these interventions STEM education targets 21st century skill development: communication, collaboration, technology skills, logical and critical thinking and most specifically social and life skills. (Hooker, 2017; Deghaidy et al, 2016; Beers, 2011). When focusing on social skill development, teamwork challenges obviously promote communication and collaboration as mentioned earlier. Other than that, such skills as negotiation, sharing and accepting ideas, bearing and respecting individual differences, and maintaining a supportive relationship among team mates, are also indirectly targeted through STEM based learning experiences.

Along with the need for better means of educating the young generation, technology has the potential to redesign and implement STEM in novel ways. Use of technology with STEM will make the learning process more effective, attractive and efficient.

Technology

There is a positive interconnection between technology and education, but when it comes to values and value development it might be viewed negatively. However, it must be accepted that technology is deeply rooted in today's society. The evolution of Information and Communication Technologies has revolutionized the world during the past two decades. Most often what is human made (Yakman, 2010) is identified as technology. But in the broadest sense it is the making, usage, and knowledge of tools, machines, techniques, crafts, systems or methods of organization, in order to solve a problem or perform a specific function (Akgun, 2013). Direct integration of technology with education facilitates and nurtures the teaching and learning processes. Hence, technology has been recognized as an indispensable component of any STEM and project based (PBL) activity as it contributes to design and implementation of STEM activities in multiple ways (Dogan & Roblin, 2015). Although science and technology are frequently treated as two different fields, they are often used together. Moreover, science provides the building blocks to develop new technologies and new technologies enhance the quality of science and its processes. Applying this to education, for an effective science teaching and learning experience enriched with PBL, collaborative learning and cooperative learning approaches, integration of digital technologies would be an added advantage. During such learning experiences students can use collaborative digital tools and applications, and work in small groups and teams. Thereby students develop their creativity, their problem-solving skills and learn to work together with others to achieve a common goal in a real-world setting. In this respect technology facilitates value development indirectly.

Overall, technology-rich learning activities ensure students develop certain forms of literacy and skills such as technological literacy, critical thinking, and problem-solving and social skills, all of which are emphasized in STEM, Science education and 21st century skills. It can be argued that there is a close interrelationship between STEM, science education, 21st century skills and technology, and that together they contribute to humanistic value development at any stage of their applications or practices.

21st Century Skills

The rapid and increasingly diverse development of information and communication technologies, also known as the digital revolution, has resulted in a continuous transformation within the political arena, the education and health sectors, the economy and labour markets, and many other fields at national, regional and global levels. Parallel to the consequences of the expansion and explosion of knowledge, globalization and internationalization are deeply felt in most aspects of public life. Related to this global movements calling for new models of instruction for 21st century education has emerged, often aiming to inculcate and develop a wide variety of skills and accomplishments in students. These include both academic achievement and the development of broader competencies, such as critical thinking creativity, collaborative and communication skills, adaptability, and global awareness (Soland, Hamilton & Stecher, 2013; Scott, 2015; Tan et al, 2017). They are often referred to as “21st century skills” or “21st century competencies” (Voogot & Roblin, 2010; Soland, Hamilton & Stecher, 2013). As defined by Asia-Pacific Economic Cooperation (APEC), 21st century competencies are the knowledge, skills and attitudes necessary to be competitive in the 21st century workforce, participate appropriately in an increasingly diverse society, use new technologies, and cope with rapidly changing workplaces. It is notable that there is a number of definitions and frameworks on 21st century skills and competencies and they all highlight the need for developing social skills, soft skills or human values in different terms. For example, *The Dales Report (1996)* refers to learning to live together and learning to be, for *EU Key Competences for Lifelong Learning (2006)* it is social and civic competencies, and *P21(2007)* terms it as life and career skills. In that sense, human value development has been identified as a crucial

necessity, and educational systems increasingly focus on the inculcation of values that guide the students in the desirable use of the acquired knowledge and skills.

Based on the above discussion on science and STEM education, it is evident that both focus on developing the set of humanistic values which are emphasized in 21st. As well, each strengthens one another and is definitely reinforced by blending with technology.

Humanistic values

Depending on the contexts and the situations the concept of values has been defined differently in literature. Values can be viewed as the socially accepted beliefs and philosophies that every individual holds about his or her life and its purposes. They play a vital role in the lives of every individual and are the determinants or the motives of human behavior. Furthermore, value systems and the value patterns of a society always determine human activity in social life, education and professional life. Schwartz (2012) interprets values as the way that people perceive what is important in their life. They are the core to our choices, attitudes and often defined as abstract ideals that guide people's behavior (Schwartz, 1992). Matthews et al (2007) inferred values as the criteria for the choice of actions that may become standards for judgments, preferences and choices.

Value education can address different forms and definitions. In religious senses it is most possibly defined as moral and spiritual development. In relation to sociological concepts, it is termed as the part of socialization and personality development or a transmission of cultural elements and in the dimension of education it is addressed through citizenship education. However, along with the rapid changes in the world, the concepts of values and value education have gained renewed attention due to the increased social immorality. As Santhi (2016) suggested social, moral, spiritual, national values and humanity should be inculcated in students. In that case, direct and indirect values education through academic or non-academic and /or curricular or co-curricular activities, inspire building a balanced person who holds a number of necessarily wanted skills: Flexibility and Adaptability, Initiative and Self Direction, Social and Cross-cultural Skills, Productivity and Accountability, Leadership and Responsibility.

Both STEM and science education approaches address 21st century skills development which focuses on humanistic value development as one of the major attributes. That process can be empowered further through the appropriate integration of digital technologies in the STEM based science instructional process. In relation to this review, collaboration and communication skills, cross-cultural skills and social skills and their different explanations and definitions are considered humanistic values.

Methodology

This research is based on a systematic review of literature with narrative summary which exclusively depended on online databases. As inclusion criteria, documents such as journal articles, conference papers and reports in full text that covered the period between 2000 and 2020 were purposely selected. In relation to the year of publication, studies published in online databases of Research gate, J-store, Google Scholar, Sci-Hub and Elsevier were searched to find relevant literature.

The comprehensive search resources were completed based on a wide range of key terms and phrases including "STEM education-human values and technology", "science education-values and technology", "values development". However, similar terms that are often used interchangeably in the literature were also used. In particular, the concept of humanistic values

has also been searched through the terms humanistic values, soft skills, social skills, and moral education.

As the search action resulted in a limited number of appropriate sources, the reference sections of the found texts were studied in a search for more relevant texts. After the exclusion of sources that did not satisfy the needs of the study, 15 texts directly related to the topic of discussion were selected for data collection and analysis. As well, 11 other supportive documents were used for the review. The contents of the selected resources were studied and analyzed in detail to retrieve required data and were organized to address the study objectives under five main themes: Digital storytelling, virtual reality (VR), educational robotics, educational games and mobile devices.

Results

Search results are arranged considering the frequently referred technological applications in literature. As well their contribution towards humanistic skill development is also discussed under the same heading. Digital storytelling, virtual reality (VR), educational robotics, educational games and mobile devices were prominent among the mostly considered technological applications in education.

Digital Storytelling

Storytelling is one of the oldest methods that has been used to convey information or transfer knowledge and values. As well, storytelling is a powerful tool for personal learning, self-discovery and it helps to make sense of other living beings. Blending it with modern technologies, nowadays many educators believe that digital storytelling facilitates the development of virtually all the skills including social skills which people are expected to have in the 21st century. Scholars have defined digital storytelling as combining the art of storytelling with several multimedia such as text, image, audio, music and video for certain purposes (Olokunde et al, 2018). According to Dogan and Robin (2015) digital storytelling is the process of using various multimedia components, such as still images, text audio narration and music, to create a short, purposeful video on an educationally meaningful topic.

Stories have long been used to entertain, spark our imaginations, force us to think, feel and see the world in new ways, teach values and to give moral education. In that regard, making reference to More (2008), Olokunde et al. (2018) state that digital stories can be used to increase social skills for children with disabilities, and discovered that the children got better in communication skills as digital stories promote the idea of dialogue between people. Furthermore, digital storytelling as an educational tool for children learning STEM subjects by accommodating cross-cultural understanding and numerous positive interactions between students (Anastasiadis et al, 2018). In addition to that improving students' self-confidence and better social and psychological skills (Smeda et al., 2014) have been identified as learning outcomes of digital storytelling. Collectively digital stories have proven to be an effective way to express one's voice with more intellectual depth than writing, and in a STEM integrated collaborative science learning context it facilitates social skill development plus student engagement in deeper learning.

Virtual Reality (VR)

Virtual reality has been defined from different perspectives. In a general sense it allows a user to interact with a computer-generated three-dimensional model, or to experience far away destinations from across the world by being in front of the screen. In a VR simulation a

computer simulates and displays environments which are exactly the same as reality. In line with these explanations, Lakshminarayanan and McBride (2015) define VR as a virtual environment which uses computer generated imagery and human computer interfaces to create the effect of a three-dimensional world where the user interacts directly with the virtual object using a number of peripheral devices. Use of VR in science classrooms is possible and is ideally suited for effective learning. Although using VR for value development is debatable, it has been suggested as a potential medium for developing values in students by means of collaborative/cooperative learning and PBL contexts.

According to recent research, surveys of employers have continued to show that STEM graduates are deficient in soft skills that are necessary for applying technical expertise to business problems (Hickman & Akdere, 2017). As a solution for STEM students' shortcomings in soft skills, effectiveness of integrating VR with the classroom experiences has been studied in several contexts and the results have shown that VR is a potential supporting tool. As Hickman and Akdere (2017) cite in reference to the literature, VR has been suggested as a potential locale for intercultural competency development which is a vital soft skill for the modern workforce. Further based on their research study related to VR and STEM they have concluded that their approach to develop intercultural leadership competencies through virtual reality holds the potential to aid in the development of well-rounded STEM students. Similarly, although it is not related to either STEM or Science teaching, many research studies indicate the critical role of VR in improving the behavioural, communication and social skills of children who have autism spectrum disorder (ASD) (Kamínska et al, 2019).

In general, though, the online availability of literature that directly addresses the issue of human value development through VR based STEM context is rare. Therefore, this is undoubtedly an innovative field of study, for which new research findings would definitely contribute towards addressing the soft-skill shortages among students.

Educational Robotics (ER)

Robotics and its applications is another mode of digital technologies that has gained increased attention in education. Aris and Orcos (2019) view robotics as a motivational tool for students in the teaching-learning process since it allows working in an integrated way, while also developing several competences. Further, it is a multidisciplinary field that combines engineering and computer science (Nemiro, 2019). Recognizing the importance of providing students with timely opportunities to build and practise 21st-century world-related skills, a variety of programs are being used by the educators. Studies have shown that robotics programs with STEM education have a positive impact on student learning and skills such as: initiative, responsibility, autonomy, creativity, and teamwork. During the activities with ER, students work in groups creating cooperative learning environments. It enhances interest along with the scientific curiosity of the students and favours meaningful learning (Aris & Orcos, 2019; Nemiro,2019).

Basically the study findings of Nemiro (2019) show that the opportunity to work in teams on robotics challenges promoted: (1) a better understanding of how to form effective teams and to use team roles to build individual student's strengths; (2) collaborative behavior between students, such as interpersonal connection, helping behavior and peer assistance, and the sharing of knowledge; (3) the development and use of authentic conflict-resolution skills necessary to work effectively in teams; and (4) new collaborative relationships between teachers and students. In parallel, Arís and Orcos (2019) also conclude that both teachers and students believe ER projects promote social skill development through teamwork, and most importantly they also emphasized its effect on collaboration skills. As a whole research

evidence shows that robotics is a powerful learning tool for developing students' social skills and the ability to collaborate and work effectively in teams.

Flipped Classroom

The simplest definition of the flipped classroom is: "Inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa" (Lakshminarayanan & McBride, 2015). The flipped classroom pedagogy offers learning opportunities for students by inverting the traditional classroom lecture content delivery (Gomez-Lanier, 2018). Compared to a traditional lecture based lesson, the flipped classroom may provide more space for collaborative learning. During the flipped classroom sessions, project-based and/or problem-based learning is taking place where students work together to solve problems, listen to the different viewpoints of teammates, and gain a deeper understanding of the subject. Rather than depending on the instructor, students have more opportunity to engage and interact with their peers in search for content. They even get the chance to collaborate with peers in online communities. As well it develops effective communication skills in students.

Gomez-Lanier's (2018) study findings suggest that in team collaboration within a flipped classroom, student perception became more positive over time due in part to the variety of class activities, the greater interaction between classmates, and sharing and merging experiences. As well, students grew to be more attentive to their teammates as they got to know them. As specified by Kenneth, Dianna and Deyoe (2014), implementing a flipped classroom in STEM higher education promotes skill development in learning, as well as professionalism and the development of collaboration and communication. Importantly without being biased towards the benefits of the group learning in STEM-flipped approach, the researchers present a balance evaluation on their outcomes. As they revealed, group learning has made work easier as they could share tasks, and increased communication, sharing ideas, the utilization of different perspectives and strengths of their peers within the groups helped in fixing mistakes. Contrastingly, conflicts between teammates, frustration and stress, and losing equal opportunities to participate and perform, hindered learning experiences for some and have highlighted the disadvantages.

However, in order to meet the educational needs and the societal needs of value development, STEM education facilitated with flipped learning seems to be more effective and efficient than staying with traditional forms of classroom instructions.

Digital Games

Digital game-based learning involving the use of computer and video games as tools to address learning goals is not a new concept in education. Educational games are planned and purposeful games that provide the achievement of the objectives determined during the education process, to develop knowledge and skills (Donmez & Kirit, 2020). In recent years educational computer games have received increased attention from researchers and educators but less from the game industry (Gros, 2007). In order to enhance the skill requirement of the digital society educators are in need of changing their pedagogical approaches. Hence, interactive technological applications such as digital games have been recognized as one of the effective ways that may change teaching-learning behaviour, knowledge production and skill development. According to OECD (2013) educational gaming offers a promising model to enhance student learning in STEM education, not just by improving content knowledge, but also motivation, thinking, creativity and collaboration.

As Gros (2003, 2007) cites one of the aspects that most of the research has focused on is the sociological approach in which the main goal is to describe the use of games' effects on social development and relationships. In the sense of social development as one of the basic functions of games, Gros (2003) refers to Calvo (1997) in saying that games are also ways of relating to others. In addition to their socializing dimension, their capacity to symbolically generate roles makes them effective transmitters of society's predominant values and attitudes. The argument is further strengthened by Gros (2007), citing Squire (2005), who says that American researchers prefer to look at the structural characteristics in computer games that could be used for education and social processes surrounding the educational experience. Though the sociological functions of digital games are not always favoured by the majority, obviously they offer real educational possibilities along with social skill development.

Digital game-based learning is gaining more popularity among educators as it supports creating an active learning environment suite for the 21st century. On that ground, game-based approaches in STEM assures diversify education, increase students' interest and motivation, and offer positive and effective learning experiences which develop both knowledge and skills. Johnson et al. (2013) indicated the relevance of games and gamification in STEM learning and teaching. As they elaborate, discovery-based and goal-oriented learning is inherent in educational games and this strategy offers opportunities for collaboration and development teamwork skills which are aimed to develop through STEM interventions. According to Ebner's (2015) categorization of digital gaming applications collaborative apps seek to stimulate group activity and collaborative learning social interactions (Eichler et al., 2018).

Outwardly it seems that the main focus of digital game-based learning is to improve knowledge rather than values. As one of the benefits of game-based learning, Girard et al (2013) suggest that the use of games allows for the harmless simulation of many physical situations and natural phenomena that cannot be reproduced in real-world situations (Eichler et al., 2018). During the play the user's mentality changes according to the situation created within the game. Thus, users may experience fear, defeat, challenge and excitement as in real life. It resembles real social situations and the players create it within the game while playing. In a research study by Donmez, Tekce and Kurmit (2020) to examine the contents of the representations that students used while producing digital games in the scope of STEM education, they observed that while playing digital games, some of the students consciously or unconsciously used violent contents such as weapons, bullets, rays and swords that will physically damage the opposing character. confirming the general image that digital gaming arouses violence and destruction. Donmez, Tekce and Kurmit (2020), with reference to Anderson, Shibuya and Ihori (2010) state that violent digital games cause an increase in aggressive behaviors, thoughts and physiological stimulation, and also bring about desensitization towards violence and low empathy, and decrease the prevalence of benevolent behavior. Hence, appropriate application of digital gaming is needed to get the true benefit of it in knowledge and values development and opens a new path for future research studies on digital games and value development.

Mobile learning (M-learning)

Because technology is developing at an ever faster pace, Sulisworo and Toifur (2016) view mobile learning as a consequence of increasing information and communication technology development. Simply, Mobile learning (m-learning) means using mobile technologies for educational purposes. In a much broader sense m-learning or mobile learning can be defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (Lakshminarayanan & McBride, 2015). Given the advantages of availability, user friendliness and device mobility and features, there has been considerable

research on novel applications of mobile devices in multiple learning contexts, including classrooms. Mobile devices are generally small, portable and compact devices like smartphones, iPads, netbooks, laptops and tablets. they are widely in use and play a major role in communication and information access. Research studies have shown that mobile technology gives more possibilities to improve the quality of teaching-learning in many aspects (Sulisworo & Toifur, 2016).

Lakshminarayanan and McBride (2015) referring to recent major study reports say that mobile computing devices and the use of social media created opportunities for interaction and collaboration. In support of this, and being more specific, Twum (2017) states that smartphones can improve students' understanding of abstract concepts in science and facilitate appropriate and relevant social relationships with learners through collaboration, exchange and sharing of information. Sulisworo and Toifur (2016), based on their research experience, concluded that mobile learning has the possibility to improve social skills.

Accordingly, the use of mobile technologies in STEM integrated learning, with a special reference to human value development, needs to be studied further since there is an increasing tendency for considering soft skills as an essential personal attribute required in the world of work.

Discussion

Within the past few years, electronic devices, applications and the internet have penetrated almost every aspect of the lives of human beings. The potentiality and effectiveness of using them with continuously advancing facilities to support classroom instructional processes has been studied by researchers in different dimensions. That has been stimulated more with the newfound emphasis of the education professionals on the importance of preparing students for the 21st century workforce and society. On that basis technology plays an important role in education. Especially in Science, Technology, Engineering, and Mathematics (STEM) education, technology is the visible face that nurtures teaching and learning processes (Akgun, 2013). On the other hand STEM has been identified as a 21st century skill (communication, collaboration, social and life skills etc) developer which favours learner centered contexts such as collaborative or cooperative learning, and problem or project based learning (PBL).

According to the available research evidence, educators and policy makers consider technology as a means to increase collaborative learning. Generally, technology integrated teaching-learning activities are conducted on an individual or group basis. When it comes to groupbased activities, they mainly have integrated educational technology into STEM-PBL or collaborative learning approaches. Such educational settings effectively assist students' learning in real-world situations. The research studies referred to here have revealed that well-designed STEM based collaborative learning activities, and PBL contexts with technological application, create more opportunities for individuals to establish strong social interaction while experiencing better learning. Commonly, at the point of social skill development through technology-based learning, sharing information, negotiating with peers and making decisions, enhances students' social interactions and awareness of communication and collaboration have been emphasized as the possible outcomes.

Through STEM and technology integrated group work and collaborative environments, students' active engagement is ensured and in turn it promotes quality social interaction (Akgun,2013; Chen & Hwang, 2017), develop healthy interpersonal connection between classmates by getting to know teammates. Additionally, being in a group each member becomes attentive of their teammates (Gomez-Lanier, 2018) and enhances helping behaviour

(Nemiro, 2019). Negotiation and decision making (Chen & Hwang, 2017; Chacko et al,2014) which are essentially required at individual level to be eligible for the 21st century workforce. Cross cultural understanding (Anastasiadis et al., 2018), intercultural leadership and intercultural knowledge: openness, empathy and verbal/non-verbal communication (Hikman & Akdere, 2017) are also targeted through collaborative learning contexts and those concepts have been identified as potential aids in developing well-rounded business leaders. Moreover, at a more personal level, students are encouraged to bear defeat and victory (Gros, 2007) while enhancing personal autonomy, responsibility and accountability (Arís & Orcos,2019).

Although there is a variety of digital devices and applications available at present, most of them are still not familiar as educational technological tools among educators. According to the literature, the most frequently found technological tools that integrate with STEM teaching – learning processes are digital storytelling, virtual reality, mobile devices educational robotics, flipped classroom and digital games. Sometimes they all have been treated as elements of ICT. The adoption of ICT by education has often been seen as a way to contribute to educational change (enable reform or better management of education systems), better prepare students for the information age, improve learning outcomes and the skills of learners (Assar, Amrani & Watson, 2010). Availability of physical and human resources, the level of technological literacy of the users, user friendliness of the application or the devices and many other factors may affect the preference and usage. It is apparent that detailed discussions on such issues in relation to STEM -value education are needed in future.

Another dimension that needs to be addressed is that though there are some technological devices and apps already present in schools and owned by students, still there are obstacles to their acceptance and usage in the classroom setting. Reviewing such prohibitive norms may motivate both teachers and students to incorporate digital resources in their school practices. On the other hand, it is accepted that modern technology in education is clearly beneficial and there are numerous proven advantages of using technology in education. However, there is also a potential for dangers and disadvantages to be accompanied with the benefits. In that sense, while the technology can be used for value development, it can also be a cause of value deterioration.

The research area on the educational use of digital technologies in STEM for the purpose of value development has not yet specifically gained the attention it needs. Hence, it seems that it still remains as an unexplored research territory which lacks well-defined boundaries. It will be a valuable research area to be studied in the future for the benefit of humanity.

Conclusion

Being the keys to social and economic development and improvements, education involves transmission of knowledge, developing skills, forming attitudes habits and values. In that process, a variety of approaches are taken by the educators and policy makers to enhance the quality of education. As a consequence, rather than depending individual subject teaching-learning, integrated teaching-learning strategies like STEM and STEAM are proven to be more efficient and effective in developing content knowledge, skills and values required by the future world. In a background that the impact of digital technologies in the lives of the 21st century is greatly felt by education integration of technology and STEM education has open up a new path for skill development. Through formal research studies and real life experiences it has proven that technology-supported teaching helps to move beyond traditional content delivery methods. Most specifically, effective and successful integration of technology into STEM based science instruction truly enhances STEM educational practices. So that students develop their knowledge and a broad mix of skills. Additionally, as the children gain access to the world

of digital culture via a variety of digital applications during the lessons they acquire digital literacy informally. And it is an important aspect of technology integrated teaching. Therefore, taking those benefits teachers and the students need to be encouraged to use technological applications in the teaching-learning process.

As a whole, the available research has focused mainly on development of communication and collaboration through technology integrated STEM learning. In addition to that enhancement of social interactions, cultural awareness and sharing were discussed in relation to value development. Only a few studies have discussed the concepts of STEM education, technology integration and value development within a single study. Hence, there would be uncovered dimensions for further studies. Moreover, psychological effects of integrating digital technologies and the factors which make the students use the content of violence in making their own digital applications are some of the points that have timely importance to be researched in the future.

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The Role of Teachers in the Desegregation of America's Schools: Looking Back to Guide a Way Forward

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This paper addresses the conundrum of providing quality education to marginalized students in America's classrooms. It also focuses on educational models with the greatest potential for delivering quality education to racialized students, particularly in the Southern United States. Additionally, it asks if educators have fallen victim to an overly simplistic assumption that Black students would automatically experience a higher quality of education within newly desegregated schools, when compared to what they experienced in their segregated schools. Specifically, the paper asks if desegregation has meant a poorer quality of education for Black students, and if the "way forward" might be achieved by looking to our past.

The paper begins by reflecting on current research on the desegregation of schools in the U.S., which suggests teachers' racial attitudes are a reflection of an unequal society. It discusses the impact of teacher biases, the negative perceptions of their racialized students, deficit thinking, and low expectations that guide both policy and practice. These factors have resulted in structural inequities that limit student access to the rigorous educational experiences needed to succeed in college and beyond. In many cases, these racialized students are taught by teachers with the least experience and who often personify an increasing cultural mismatch between middle class White teachers and inner-city Black students.

Interestingly, emerging research on Black segregated schools in America's South, while not diminishing the grave funding inequities between Black and White schools, does underscore the high quality of instruction, as well as an enriched and supportive academic environment that appears superior to the current desegregated education experienced by these marginalized students. Though this study does not support the re-establishment of segregated education, it does suggest that the quality of education received by Black students in their segregated schools was rarely replicated in the desegregated schools of America's South.

Key words: Desegregating Schools, Equitable Education Opportunities, Southern US Schools

تتناول هذه الورقة معضلة توفير تعليم جيد للطلاب المهمشين في الفصول الدراسية بأمريكا. كما أنه يركز على النماذج التعليمية ذات الإمكانيات الأكبر لتقديم تعليم جيد للطلاب الذين يعانون من العنصرية ، ولا سيما في جنوب الولايات المتحدة. بالإضافة إلى ذلك ، يسأل عما إذا كان المعلمون قد وقعوا ضحية الافتراض المفرط في التبسيط بأن الطلاب السود سيختبرون تلقائياً جودة أعلى من التعليم داخل المدارس التي تم فصلها حديثاً ، عند مقارنتها بما مروا به في مدارسهم المنفصلة. على وجه التحديد ، تسأل الورقة عما إذا كان إلغاء الفصل العنصري يعني تدني جودة التعليم للطلاب السود ، وما إذا كان يمكن تحقيق "الطريق إلى الأمام" من خلال النظر إلى ماضينا.

تبدأ الورقة بالتأمل في البحث الحالي حول إلغاء الفصل العنصري في المدارس في الولايات المتحدة ، مما يشير إلى أن المواقف العنصرية للمدرسين هي انعكاس لمجتمع غير متكافئ. ويناقش تأثير تحيزات المعلم ، والتصورات السلبية لطلابهم العنصريين ، والتفكير الناقص ، والتوقعات المنخفضة التي توجه السياسة والممارسة. أدت هذه العوامل إلى عدم المساواة الهيكلية التي تحد من وصول الطلاب إلى الخبرات التعليمية الصارمة اللازمة للنجاح في الكلية وخارجها. في كثير من الحالات ، يتم تعليم هؤلاء الطلاب الذين يعانون من العنصرية من قبل مدرسين ذوي خبرة أقل والذين غالباً ما يجسدون عدم توافق ثقافي متزايد بين معلمي الطبقة الوسطى والبيض والطلاب السود داخل المدينة.

ومن المثير للاهتمام ، أن الأبحاث الناشئة حول المدارس المنفصلة من السود في جنوب أمريكا ، مع عدم التقليل من التفاوتات الجسيمة في التمويل بين المدارس السوداء والبيضاء ، تؤكد على الجودة العالية للتعليم ، فضلاً عن البيئة الأكاديمية المثرية والداعمة التي تبدو متفوقة على التعليم الحالي غير المنفصل. من ذوي الخبرة من قبل هؤلاء الطلاب المهمشين. على الرغم من أن هذه الدراسة لا تدعم إعادة إنشاء التعليم المنفصل ، إلا أنها تشير إلى أن جودة التعليم التي يتلقاها الطلاب السود في مدارسهم المنفصلة عن بعضها البعض نادراً ما يتم تكرارها في المدارس المنفصلة في جنوب أمريكا.

Cet article aborde l'énigme de fournir une éducation de qualité aux élèves marginalisés dans les salles de classe américaines. Il se concentre également sur les modèles éducatifs les plus susceptibles d'offrir une éducation de qualité aux élèves racialisés, en particulier dans le sud des États-Unis. De plus, il cherche à soivoir si les éducateurs ont été victimes d'une hypothèse trop simpliste selon laquelle les élèves noirs bénéficieraient automatiquement d'une éducation de meilleure qualité dans les écoles nouvellement déségrégées, par rapport à ce qu'ils ont vécu dans leurs écoles ségréguées. Plus précisément, l'article demande si la déségrégation a entraîné une moins bonne qualité de l'éducation pour les étudiants noirs, et si la « voie à suivre » pourrait être atteinte en se tournant vers notre passé.

L'article commence par une réflexion sur les recherches actuelles sur la déségrégation des écoles aux États-Unis, qui suggèrent que les attitudes raciales des enseignants sont le reflet d'une société inégale. Il traite de l'impact des préjugés des enseignants, des perceptions négatives de leurs élèves racialisés, de la pensée déficiente et des faibles attentes qui guident à la fois les politiques et les pratiques. Ces facteurs ont entraîné des inégalités structurelles qui limitent l'accès des étudiants aux expériences éducatives rigoureuses nécessaires pour réussir à l'université et au-delà. Dans de nombreux cas, ces élèves racialisés sont enseignés par des enseignants qui ont le moins d'expérience et qui personnifient souvent un décalage culturel croissant entre les enseignants blancs de la classe moyenne et les élèves noirs du centre-ville.

Fait intéressant, les recherches émergentes sur les écoles ségréguées noires dans le sud de l'Amérique, tout en ne diminuant pas les graves inégalités de financement

entre les écoles noires et blanches, soulignent la haute qualité de l'enseignement, ainsi qu'un environnement académique enrichi et favorable qui semble supérieur à l'éducation déségrégée actuelle vécues par ces élèves marginalisés. Bien que cette étude ne soutienne pas le rétablissement de l'éducation ségréguée, elle suggère que la qualité de l'éducation reçue par les élèves noirs dans leurs écoles ségréguées était rarement reproduite dans les écoles déségrégées du sud de l'Amérique.

В этой статье рассматривается проблема предоставления качественного образования маргинализированным учащимся в американских классах. В статье также основное внимание уделяется образовательным моделям с наибольшим потенциалом для предоставления качественного образования учащимся с расовой ориентацией, особенно на юге Соединенных Штатов. Кроме того, задается вопрос, не стали ли преподаватели жертвами чрезмерно упрощенного предположения о том, что чернокожие учащиеся автоматически получают более высокое качество образования в недавно десегрегированных школах по сравнению с тем, что они получили в своих сегрегированных школах. В частности, в документе задается вопрос, привела ли десегрегация к снижению качества образования для чернокожих студентов и можно ли найти “путь вперед”, обратившись к нашему прошлому.

Статья начинается с размышлений о текущих исследованиях десегрегации школ в США, которые предполагают, что расовые взгляды учителей являются отражением неравенства в обществе. Обсуждается влияние предубеждений учителей, негативное восприятие их расовых учеников, недостаточное мышление и заниженные ожидания, которые определяют как политику, так и практику. Эти факторы привели к структурному неравенству, которое ограничивает доступ учащихся к скрупулезному образовательному опыту, необходимому для достижения успеха в колледже и за его пределами. Во многих случаях этих расовых учеников обучают учителя с наименьшим опытом, которые часто олицетворяют растущее культурное несоответствие между белыми учителями из среднего класса и чернокожими учениками из бедных районов.

Интересно, что новые исследования сегрегированных школ для чернокожих на юге Америки, хотя и не уменьшают серьезного неравенства в финансировании между черными и белыми школами, подчеркивают высокое качество обучения, а также обогащенную и благоприятную академическую среду, которая, по-видимому, превосходит нынешнее десегрегированное образование, с которым сталкиваются эти маргинализованные учащиеся. Хотя это исследование не поддерживает восстановление сегрегированного образования, оно предполагает, что качество образования, полученного чернокожими учащимися в их сегрегированных школах, редко было воспроизведено в десегрегированных школах юга Америки.

Este documento aborda el enigma de brindar educación de calidad a los estudiantes marginados en las aulas estadounidenses. También se centra en modelos educativos que tengan el mayor potencial para brindar educación de calidad a estudiantes racializados, particularmente en el sur de los Estados Unidos. Además, se pregunta

si los educadores han sido víctimas de una suposición demasiado simplista de que los estudiantes negros experimentarían automáticamente una educación de mayor calidad en las escuelas en donde recientemente fue eliminada la segregación, en comparación con lo que experimentaron en sus escuelas segregadas. Específicamente, el artículo se pregunta si la eliminación de la segregación ha significado un empobrecimiento de la calidad educativa para los estudiantes negros y si el camino a seguir puede ser alcanzado mirando al pasado.

El artículo comienza reflexionando sobre la investigación actual acerca de la eliminación de la segregación racial de las escuelas en los EE. UU., que sugiere que las actitudes raciales de los maestros son un reflejo de una sociedad desigual. Discute el impacto de los prejuicios de los maestros, las percepciones negativas de sus estudiantes racializados, el pensamiento deficitario y las bajas expectativas que guían tanto la política como la práctica. Estos factores han resultado en desigualdades estructurales que limitan el acceso de los estudiantes a las experiencias educativas rigurosas necesarias que les permiten tener éxito en la universidad y más allá. En muchos casos, los maestros que enseñan a estos estudiantes racializados poseen una experiencia menor y a menudo personifican un desajuste cultural cada vez mayor entre los maestros blancos de clase media y los estudiantes negros del centro de la ciudad.

Curiosamente, la investigación emergente sobre las escuelas negras segregadas en el sur de Estados Unidos, aunque no disminuye las graves desigualdades de financiación entre las escuelas negras y blancas, sí subraya la alta calidad de la instrucción, así como un entorno académico enriquecido y de apoyo que parece superior a la actual educación no segregada que experimentan estos estudiantes marginados. Sin embargo, este estudio no respalda el restablecimiento de la educación segregada, sugiere que la calidad de la educación recibida por los estudiantes negros en sus escuelas segregadas rara vez se reprodujo en las escuelas no segregadas del sur de Estados Unidos.

Introduction

Calls for decoloniality and greater access to quality education for all children, while often focused on the Global South, have now become challenges for all nations who subscribe to UNESCO's *Sustainable Development Goals*. To this end there is a growing need to critically examine a broad scope of schools and curricula from a comparative perspective to assess the factors and forces which impact equitable access to quality education for all their children, worldwide. This study, which focuses on the ongoing challenge to desegregate schools within the Global North, underscores the importance placed on comparative research that seeks to identify educational systems that perpetuate existing societal inequalities, while also recognizing the education's potential to serve as agents of positive social change. Our focus on the challenges of providing equitable educational opportunities for children in the United States clearly reflects similar struggles within the Global South.

This study addresses the conundrum of providing quality education to marginalized students in America's classrooms while also focusing on educational models with the greatest potential for

delivering quality education to racialized students, particularly in the Southern U.S. Additionally, it suggests that educators may have unwittingly supported an overly simplistic assumption that Black and African-American students would automatically experience a higher quality of education within newly desegregated schools, when compared to what they experienced in their segregated schools. In particular, the authors ask if desegregation has meant a poorer quality of education for Black and African-American students and if the “way forward” might be achieved by looking to our past.

The study begins by reflecting upon current research on the desegregation of schools in the U.S. that suggests that teachers’ racial attitudes are a reflection of an unequal society. It discusses the impact of teacher biases, the negative perceptions and deficit thinking regarding racialized students, and concomitant low expectations that guide both policy and practice. These and other factors have resulted in structural inequities within schools that limit student access to the rigorous educational experiences needed to succeed in college and beyond. Moreover, in many cases, these racialized student populations are taught by teachers with the least experience and who often personify an increasing cultural mismatch between middle class White teachers and inner-city Black and African-American students.

A Historical Sketch: Desegregating Florida’s Teachers

Twenty years after the landmark 1954 *Brown* Supreme Court decision outlawing segregated schools in the U.S., the Southern state of Florida, ignoring the request for “all deliberate speed,” finally attempted to desegregate its schools by first desegregating its teachers. In this process, teachers’ names were randomly drawn from a “fishbowl” and assigned to a particular district school. These teaching assignments were to reflect a newly desegregated public school system. As Emmons (2008) suggests, this process came with much “weeping and wailing” by teachers, most often White, when they learned of their assignment to a desegregated school (p. 151). Moreover, this process often revealed blatant hostility toward Black and African-American teachers assigned to schools with a majority of White students. For example, “One white principal called his new black teachers together to announce that they were not welcome in the school and that he could not guarantee their safety in the community, so they were ‘excused’ from any after school or extracurricular activities” (p. 151). This encounter was certainly not a positive approach to school desegregation within Florida’s schools.

Moving beyond the desegregation process for Florida’s teaching staff, Starck, Riddle, Sinclair and Warikoo’s (2020) research found it was often assumed that teachers would simply reflect egalitarian attitudes regarding interracial harmony within a newly desegregated school system. Unfortunately, their research also documented decades of continued racial inequality within schools, where the majority of White students simply perpetuated racial inequality (p. 281). Moreover, scholars such as Sims (2016) suggested that teachers also reflected biased and racist perceptions regarding their Black and African-American students by infusing both deficit thinking and low expectation within their classes. One result of these educational inequities, according to

Sims, was to "...limit student access to the rigorous educational experiences needed to succeed in college and their future careers" (p. 77). Similar concerns occurred in Jones and Menchetti's (2001) research that identified that racialized anger from teachers was directed towards their marginalized students. They also found that teachers continued to maintain unfounded "lower expectations based on race, gender, and the appearance of the child" (p. 632).

However, there were also some positive outcomes within this desegregation exercise, enumerated by UNESCO (2020), which underscored positive outcomes when teachers displayed cultural competence within their classrooms. To this end, it was suggested that teachers could serve as "agents of change, with values, knowledge and attitudes that permit every student to succeed" (p. 19).

Unfortunately, Townsend (2000) identified numerous cases where racialized student communities were taught by the least experienced teachers who also had a "limited knowledge of, exposure to, and understanding of, their cultural backgrounds" (p. 383). This suggested the problem of "cultural mismatches" between middle class White teachers and their Black and African-American students in both urban and rural schools. For Pierre (2019) this cultural mismatch often led to escalating negative classroom behavior, followed by significant punitive punishment and suspensions instead of a negotiated understanding that provided for remediation or rehabilitation (p. 38). Unfortunately, this cultural mismatch can also be accompanied by lower levels of content quality provided to marginalized students. For example, a comparison of eighth grade algebra delivered to Black and African-American minority and White majority students suggested that instruction in predominantly minority schools transmitted less content than that presented within White majority classrooms. In one instance, "...in schools that are predominantly Black and African-American, teachers on average spend 72% of class time over the year covering algebra and advanced content, while in predominantly minority schools the corresponding percentage is 82%" (Sparks, 2020, p.2).

Another contested issue is the value and need of racial role models within the classroom. In this case, while racial and ethnic role models remain important, scholars such as Eitle and Eitle, 2004; Jones and Menchetti, 2001; Sims, 2016, and Townsend, 2000 suggest that the greatest need is for trained teachers who might also serve as significant positive role models within the classroom. However, at the end of the day, what remains most critical for all students is access to quality instruction delivered by highly qualified educators, as demonstrated by their content knowledge and pedagogical skills. This issue is discussed in more detail when the authors examine the quality of education provided within Black segregated schools of the U.S. South.

Theoretical Perspectives on Educational Inequities

Before analyzing the role of teachers in the desegregation of America's schools, it is important to examine select theoretical perspectives that will help explain the processes of both segregation and

resegregation. Moreover, while the challenges of school desegregation remain significant impediments to providing quality education within the U.S., this is a problem experienced worldwide. When summarizing both the global and local impact of educational equity issues, Christie (2020), a South African scholar, posits that “there is a powerful accumulation of research showing that inequities in schooling follow predictable patterns of social class, race, gender, region, and language” (p. 3). To explore these issues, this study suggests multiple theoretical perspectives that may help to explain the inequities that plague education systems worldwide. To this end, the study suggests examining four theoretical and sometimes overlapping paradigms that identify sources of blame for existing educational inequities. First, we can blame a society infused with Eurocentric and/or racist perspectives. Second, we can blame victims’ inferior genetics and home life. Third, we can blame dysfunctional schools and their cultural disconnect with the community. Finally, the authors focus on theoretical perspectives that suggest that schools, instead of being agents of social change, enhance the reproduction of societal inequities.

Blame a Racist Society for School Inequities

In the U.S. and beyond, and elsewhere, concepts of elitism and White privilege function to negate access to quality education for all. According to Ford (2014), White privilege and elitism refer to “unearned advantages and benefits that accrue to White people,” while “elitism promotes deficit thinking and... the belief that certain persons or members of certain groups deserve favored treatment by virtue of their perceived superiority, as in intellect, academic skills, social status, or financial resources” (p. 112). When infused within schools, these discriminatory social structures negate the contribution of people of color while underscoring inaccurate educator perceptions that racialized students are behaviorally and/or academically deficient (Artiles and Trent, 1994).

When viewed globally, the lens of “internal colonialism” assists with the examination of inequities within nations located in both the Global South and North. Moreover, the theory of internal colonialism helps to explain the persistence of both political and economic inequities that are reflected in unequal rates of development and exploitation of minority groups. Internal colonialism, for Christie (2020), helps to explain the racial effects of poverty and isolation on indigenous communities, as well as the subordinated status of racial and ethnic groups (often the result of enslavement, colonialism and/or military occupation). The inequitable treatment of Black and indigenous communities within the U.S. is quite similar to the “decoloniality” struggles within South Africa designed to move beyond their historic and racist policy of apartheid.

Blame the Victim for School Inequities

Though theories based on genetic inferiority, including works by Jensen (1969) and Herrnstein and Murray (1994) occurred during the latter half of the twentieth century, their message that blamed students and their families for academic failings due to genetic inferiority and poor home conditions remains. Certainly, while factors such as an unhealthy childhood and less educated or illiterate parents can affect a student’s life chances, these factors should not be used to define a

culturally deficient home, nor to limit academic expectations. Not surprisingly, critics challenged Jensen's work that argued that 80% of the variance in IQ scores was explained by genetic factors. Scholars, such as Kagan (1969), argued that Jensen's research had not considered the influence of developmental and environmental interactions on intelligence. Unfortunately, genetic inferiority has also been used to explain the disproportionality of racialized children in (non-gifted) exceptional education classes. For example, Herrnstein and Murray (1994) used genetic inferiority theories to justify the elimination of compensatory education programs such as Head Start, arguing that since genetic/biological factors could not be overcome, children must simply learn to accept their (racial) place in the intellectual hierarchy. Based on these racist theories, Herrnstein and Murray recommended diverting funds wasted on genetically inferior students (usually minority children in exceptional education classes) to those in gifted and talented classes (mostly White). This approach, they defended, would provide a better return on investment for society. Fortunately, scholars such as Masten (1994) countered with theories of resiliency, not of deficit. These perspectives suggested focusing on the strength and resilience of children in racialized and poverty-based communities instead of assumed weaknesses.

Blame Dysfunctional Schools That Promote Inequities

This argument blames dysfunctional schools for the disconnect between home and school cultures that cause racialized children and children living in poverty to fail academically. This theoretical perspective blames schools' inability to provide an education free of racist and classist perspectives for unequal educational opportunities for all. It also blames schools for their inability to provide a linkage between traditional school practices and marginalized home cultures (Artiles & Trent, 1994; Vogt, Jordan & Tharp, 1987; Serwatka, Deering and Grant, 1995).

1. Moreover, this theoretical perspective blames the negative impact of biased testing and labeling for many inequities found in schools. While not ignoring the need for appropriate assessment of academic and social needs, the process that identifies students for exceptional or gifted education programs, for example, may be skewed by improper and biased testing, labeling and referral processes. For Artiles and Trent (1994) and Gay (2000), testing has been used to identify what was "wrong" with a child, so that they could be labeled, referred, and made eligible for special education services. These tests, along with teacher perceptions and student referrals, often served as key factors in the disproportional representation of children by race in tracked and exceptional education programs. Unfortunately, these tests might simply serve as a litmus test for the degree of acculturation to the dominant culture, rather than the innate talents and skills of particular students. Serwatka et al. (1995), for example, suggest that the failure to identify African American students as gifted may be due, in part, to the content of the tests used, a content that reflects a challenges each country faces when attempting to provide more equitable education for all White, middle class lifestyle, as well as the lack of "African American professionals involved in the referral and diagnostic process" (p. 494).

Blame Schools that Reproduce Societal Inequities

A fourth theoretical approach to understanding why inequities persist in schools is based on the notion that schooling tends to reproduce societal inequities instead of serving as agents of social change, an extension of the previous discussion on dysfunctional schools. The argument that schools reproduce societal inequities is based on decades of research, beginning with the work of Bourdieu (Bourdieu, 1976; Bourdieu, 1986; and Bourdieu & Passeron, 1977). Briefly, this perspective suggests that schools simply transmit the inequities present within society that are perpetuated and sustained by the interests of the dominant class. Moreover, conflict theorists such as Rosenthal and Jacobson (1968) and Rist (1970), who have built upon the works of Karl Marx, suggest that control of society is based on oppression, domination, and subordination by the ruling class/elite, much of which is initiated within schools. Thus, we find embedded in multiple facets of modern schooling, from teaching styles to the formal curriculum, vehicles designed to convey what the dominant class believes constitute appropriate knowledge and behaviors; approaches designed to maintain the power of domination over others.

To expand upon these theoretical applications within education, Sanguiliano Lonski (2020) suggests that “traditional school curriculum functions as the primary reproducer of societal beliefs and assumptions” (p. 4). Moreover, when we consider how state standards are legitimized, taught, and tested within approved curricula, it becomes clear how the dominant middle class, White-European culture distorts cultural diversity. Developed under the guise of equality within standardization, all students, regardless of race, ethnicity, language or socioeconomic status, are expected to learn the same material and to conform to the same cultural expectations. For Sanguiliano Lonski, this form of “colorblind racism” that assumes equity emerges through standardization ignores the systemic violence and inequity towards students of color (p. 19).

Methodology

While there are a myriad of factors that impact access to quality education for all students, the authors have chosen to focus on the role of teachers. In particular, to examine the disproportional representation of PK-12 teachers and students in Florida over time, web-based, publicly available databases of demographics were accessed through the Florida Department of Education (FLDOE). For the 1996-1997 and 2016-2017 academic years, the racial demographics of public school teachers for grades PK-12 and students in the state public school system were obtained for every county school district in the state of Florida. Next, descriptive statistics in the form of percentage racial composition were calculated in the demographic categories for base levels of comparison in the state-designated racial categories of White, Black and African-American, Hispanic, and a combination of Asian-American, Multiracial, and Indigenous Peoples designations (classified in this manuscript as Other).

After calculating the base-level percentages to determine the racial composition in the state of Florida in the 1996-1997 and 2016-2017 academic years for both teachers and students, the

researchers were able to numerically demonstrate the relative differences in what would be expected for the racial composition of teachers mirroring that of the student population, and what the true difference was. In order to determine the degree of overrepresentation or underrepresentation of teachers in each racial demographic category, as compared to their students, a Relative Percent Difference (*RD*) was calculated using the following formula:

$$RD = \frac{\text{teacher percentage in category} - \text{student percentage in category}}{\text{student percentage in category}} \times 100$$

Through this calculation, a positive value indicates an overrepresentation of teachers from a particular demographic as compared to their students, and a negative value indicates an underrepresentation of teachers from a particular demographic as compared to their students. *RDs* with relatively large positive or large negative values indicate more egregious over representations and under representations, respectively. In this manner, *RD* values were calculated for each of the aforementioned racial categories for both the 1996-1997 and 2016-2017 academic years, as recorded in Table 1.

However, while *RD* data can show degrees of disproportionality, it cannot determine what are allowable variations between the teachers and their students. Clearly, teacher and student populations are not expected to reflect exact racial proportionality, as represented in racial and ethnic population percentages. Therefore, it was necessary to go beyond the *RD* to explore, if indeed, the demographic differences were, or were not, within allowable bounds. For institutions in the United States, the threshold for these boundaries is determined by the United States Office of Civil Rights. In 2010, this agency determined a 20% threshold of allowable over- and underrepresentation in issues regarding racial composition to be the standard of allowability in the country. Using this standard, and aligning with previous research by Ford and King (2014), Equity Index (*EI*) intervals were calculated to indicate readily allowable bounds on composition. Letting $p = \text{percent composition of race of students}$, an *EI* interval is calculated as follows:

$$EI = (p - 0.20p, p + 0.20p)$$

For example, in the 2016-2017 academic year, 22.3% of the student population were comprised of Black and African-American. Calculating the *EI*:

$$EI = (22.3 - 0.20(22.3), 22.3 + 0.20(22.3))$$

$$EI = (17.8, 26.8)$$

Thus, if between 17.8% and 26.8% of teachers in the academic year racially identified as Black and African-American, then this would be within the allowable margins for the United States Office of Civil Rights. However, data indicate that only 13.6% of teachers in the 2016-2017 academic year identified as Black and African-American, and thus we see an egregious underrepresentation of teachers in this racial category. Full results of all *EI* intervals alongside the *RD* values are displayed in Table 1.

PK-12 Teachers and Students in Florida

With the key issue of qualified role models in mind, this study now compares the racial identities of PK-12 teachers and students throughout Florida over the past two decades (see Table 1). From a comparison of data for the 1996-97 and 2016-17 school years, there appears to be a rather significant disproportionality, with White PK-12 teachers overrepresented compared to White student enrollment, while Black, African-American and Hispanic teacher populations remained underrepresented when compared to enrollment of students by race and ethnicity. For example, in the 1996-97 school year a preponderance of teachers identified as White (78.7%), while the White student population in Florida's public schools was only 56.7%. Calculating the Equity Index (*EI*), based on allowable bounds determined by the United States Office of Civil Rights, (45.4%, 68.0%), it becomes clear that White teachers, comprising 78.7% of all teachers, are significantly overrepresented in Florida's PK-12 schools in 1996-97, when compared to the percent of White students (56.7%). This overrepresentation of White students is reflected in a Relative Percent Difference (*RD*) of +38.8. Unfortunately, the level of this disproportionality has increased over the past two decades, when White teachers represented 69.6% of all PK-12 teachers while White students represented 38.7% of all PK-12 students in Florida's public schools during 2016-17 (an *RD* of +79.8).

Table 1

Percent of PK-12 Population of Florida Teachers and Students by Race or Ethnicity. Equity Index (EI) and Relative Percent Difference (RD): 1996-1997 and 2016-2017

Student/Teacher Race/Ethnicity	1996-1997		2016-2017	
	Student %	Teacher %	Student %	Teacher %
White	56.7	78.7	38.7	69.6
Student EI	(45.4, 68.0)		(31.0, 46.4)	
Teacher RD	+ 38.8		+ 79.8	
Black/African-Am.	25.3	14.1	22.3	13.6
Student EI	(20.2, 30.4)		(17.8, 26.8)	
Teacher RD	- 44.3		- 39.0	
Hispanic	15.9	6.7	32.4	14.4
Student EI	(12.7, 19.1)		(25.9, 38.9)	
Teacher RD	- 57.9		- 55.6	
Other	2.0	8.3	6.8	2.5
Student EI	(1.60, 2.40)		(5.4, 8.2)	
Teacher RD	+ 315.0		- 63.2	

Source: Florida Department of Education. (1998). *Profiles of Florida School Districts 1996-97*:

Student and staff data. Tallahassee, Florida. Florida Department of Education, Staff in Florida's Public Schools, Fall 2016, Elementary Classroom Teachers by Race/Ethnicity and Gender, 2016-17, Survey 2 – Preliminary. Secondary Classroom Teachers by Race/Ethnicity and Gender, 2016-17, Survey 2-Preliminary. Other Teachers by Race/Ethnicity and Gender, 2016-17, Survey 2-Preliminary. Division of Accountability, Research and Measurement.

Regrettably, patterns of disproportionality were maintained when the percentage of Black and African-American teachers is compared to the percentage of Black and African-American students enrolled in Florida's PK-12 public schools over the past two decades. When examining the populations of Black and African-American teachers and students in Florida, a disproportional underrepresentation of Black and African-American teachers has occurred. In 1996-97, 25.3% of all students, but only 14.1% of all teachers were identified as Black or African-American, (an *RD* of -44.3), while during the 2016-17 school year the percentage of Black and African-American teachers was recorded at 13.6%, while Black and African-American students comprised 22.3% of the student population (an *RD* of -39.0). Although this does show a slight decrease in the lack of Black and African-American teachers in Florida's classrooms, the degree of underrepresentation is still severe and outside of the bounds determined by the United States Office of Civil Rights. Additionally, the decrease in underrepresentation is only by a half of a percentage point. This can be viewed as negligible at best when considering the change over a twenty-year period. Regrettably, the low percent of Black and African-American teachers has held constant in the state of Florida for twenty years, affirming the significant need for change.

When comparing these disproportional percentages of White and Black and African-American teachers and students, it is also necessary to review the enormous growth of the Hispanic population within Florida over the past two decades. The percentage of Hispanic students within Florida's public PK-12 schools increased from 15.9 % to 32.3% (from 1996-97 to 2016-17), while the percentage of Hispanic teachers increased from 6.7% to 14.4%. This underrepresentation of Hispanic teachers, when compared to Hispanic students, is represented by an *RD* of -57.9 in 1996-97 and -55.6 in 2016-17. While these numbers do show a narrowing in the gap between the percentage of Hispanic teachers and the Hispanic student population, the degree of underrepresentation is still appalling in accordance with the standards of the United States Office of Civil Rights. The number of teachers identifying as Hispanic in the state of Florida entering the workforce has not kept pace with the growing Hispanic student population. Again, as with the African-American conundrum, we find that there is a significant lack of role models for the racialized students of Florida.

Looking Back to Move Forward: Reflections on Black¹, Segregated Schools in America's South

¹ As segregated schools in the American South were referred to as "Black," as compared to Florida Dept. of Education's current term of "Black and African American," our discussion of historic Black schools in

Emerging research on Black segregated schools in America's South, while not diminishing the significant funding inequities between Black and White schools, does underscore a high quality of instruction. It also describes an enriched and supportive academic environment that appears superior to the theoretically desegregated education now experienced by these marginalized students. Though this study does not support the re-establishment of segregated education, it does suggest that the quality of education received by Black students in their segregated schools was rarely replicated in the desegregated schools of America's South.

When asking which education models might have the greatest potential for providing quality education to racial and ethnic minorities in the US, it might be overly simplistic to expect Black and African-American students to experience the same, or higher, quality instruction within their newly desegregated school assignments. Moreover, we need to question assumptions that desegregated schools would inherently provide a better education than the segregated schools that they replaced. Clearly, few would question the physical inequities present in segregated schools for Blacks, as compared to schools reserved for Whites, which included unequal funding for school buildings, educational materials and teacher salaries. Sims' (2016) research underscores this perspective. "Resources in segregated schools, especially in rural areas, were limited. Buses, books, athletic uniforms, and band instruments were handed down from the White school" (p.73). However, we should not conclude that these inequities suggested an inferior quality of instruction in Black segregated schools. Though few records remain, as most Black schools were torched along with their contents at the initiation of desegregation in the South, we are fortunate that some scholarship has captured and recorded the oral histories of students who were educated in some of these segregated schools (Pellegrino, Mann & Russell, 2013, 2008).

This study now examines the perspective that the "way forward," with regard to providing quality education for all students, might be found by looking to the past. For example, Patterson, Mickelson, Petersen, and Gross's (2008) research captured oral testimonies from students who attended a segregated school for Black children. They found that "According to the alumni, Douglass School was the heart of the Black community and was integral in providing cohesion to a community divided by geography and church affiliation...the one institution in the Black community where everyone came together, where teachers and parents worked together to ensure that their children received a high quality education" (p. 312).

Moreover, the research of Pellegrino et al. (2013) has identified three emerging themes regarding the educational experiences of Black students who attended segregated southern schools. First, "participant recollection of attending black schools was of an overwhelmingly positive experience....Second, the schools provided and demanded academic rigor. And third, although

the South will use the term Black, and not the broader term now used, "Black and African American."

black schools were not equal in significant ways-including overall funding for facilities, resources, and supplies-compared to white schools, those we examined managed to provide a rich and dynamic educational experience..." (p. 361).

Hale's (2018) research extends these perspectives by highlighting the power and quality of curriculum offered within these segregated schools. Hale suggests that "Determining the curriculum of Black schools was a politically potent weapon in the fight to combat segregation, particularly as many of Jim Crow's harmful effects were perpetuated through stereotypes, misinformation, and a complete dismissal of Black history and culture in public schools" (p. 448). This perspective was also reflected by Sims (2016) who found that "Despite limited resources, the education was described as very rigorous. The curriculum included literature from Black Americans like Benjamin Banneker and Booker T. Washington. Teachers were credited with making concepts come alive" (pp. 73-74).

When looking back upon the history of desegregating America's schools, the unacknowledged quality of teachers within the Black segregated schools of the American South remains a remarkable strength. For example, one graduate from the segregated Douglass High School in the state of Kansas was recorded as saying, "teacher pedagogy exemplified high expectations and included a culturally relevant and rigorous curriculum" (Pellegrino, et al., p. 365). Moreover, of particular interest was the fact that teachers stressed academic success as a means of "competing within a dominant white society" (p. 366). Research has also reflected upon the strong school spirit and sense of community, where both "teachers and administrators in black schools provided a nurturing learning environment designed to facilitate student academic success" (p. 368).

Perhaps unfortunately for Blacks and African Americans, "School changed utterly with racial integration. Gone was the messianic zeal to transform our minds and beings that had characterized teachers and their pedagogical practices in all-black schools. Knowledge was suddenly about information only" (Pellegrino, et al., p. 369).

Thus, to move forward, it may be necessary for educators to revive the invaluable quality of instruction delivered by dedicated, professional teachers in the segregated schools of America's South. This perspective recognizes the quality of education that was often lost to Black and African-American children as they transitioned to a desegregated school system. It may also be of value to expand these analyses to include a more global perspective. For example, when comparing periods of desegregation in the U.S. with the post-apartheid era in South Africa, it would be beneficial to share the challenges of integrating America's schools with the current move toward decoloniality throughout the African continent. Scholars need to examine how these nations can move beyond the negative impact of racial segregation and apartheid to achieve equitable access to quality education for all children, regardless of race, ethnicity, language, or socio-economic status. Moreover, all nations would benefit from the transformation of their education systems

from ones that reproduced societal inequities to those that are agents of positive social change.

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Responding to the Critiques of Global Citizenship Education: Concept Conflations, Normative Framework, and Sustainable Practices

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Global Citizenship Education (GCE) is an important initiative aiming to solve global issues via education (United Nations, 2012), but it has been critiqued for both concept conflation and its normative beliefs in standardization and private accountabilities (Zhou, 2022). This paper distinguishes fundamental concepts of GCE to reveal the real purpose and principle of GCE —democracy and social justice. The paper further explains and justifies the ‘subjective’ purposes and principles of GCE by introducing an analytical framework that addresses questions such as ‘what is fair?’ and ‘what is a democratic way for coping with global issues?’, which are important but unspecified in a normative framework. By bringing together the normative and analytical frameworks we are able to examine sustainable practices of GCE and to help people at the local level to understand why GCE is important and how to apply it in practice. The normative-analytical framework of GCE provides a possibility to transcend the neoliberal ideologies in GCE. It could also help understand major social justice oriented pursuits of the Sustainable Development Goals (SDGs) of the United Nations (UN). This paper will provide significant implications for understanding the principles, importance, and sustainable practices of GCE.

Keywords: Global Citizenship Education, National Citizenship, Normative-Analytical Approach, Neoliberalism, Democracy and Social Justice, Sustainable Development Goals

تُعد التربية على المواطنة العالمية (GCE) مبادرة مهمة تهدف إلى حل القضايا العالمية من خلال التعليم (الأمم المتحدة ، 2012) ، ولكن تم انتقادها بسبب دمج المفاهيم ومعتقداتها المعيارية في التقييم والمساءلة الخاصة. تميز هذه الورقة المفاهيم الأساسية للحملة العالمية للتعليم لتكشف عن الهدف الحقيقي ومبدأ الحملة العالمية للتعليم - الديمقراطية والعدالة الاجتماعية. تشرح الورقة وتبرر كذلك الأغراض والمبادئ "الذاتية" للحملة العالمية للتعليم من خلال تقديم إطار تحليلي يعالج أسئلة مثل "ما هو العدل؟" و "ما هي الطريقة الديمقراطية للتعامل مع القضايا العالمية؟" ، وهي مهمة ولكن غير محدد في إطار معياري. من خلال الجمع بين الأطر المعيارية والتحليلية ، يمكننا دراسة الممارسات المستدامة للحملة العالمية للتعليم ومساعدة الناس على المستوى المحلي على فهم سبب أهمية الحملة العالمية للتعليم وكيفية تطبيقها عمليًا. يوفر الإطار المعياري والتحليلي للحملة العالمية للتعليم إمكانية تجاوز الأيديولوجيات النيوليبرالية في الحملة العالمية للتعليم وفهم المساعي الرئيسية لأهداف التنمية المستدامة (SDGs) للأمم المتحدة (الأمم المتحدة). ستوفر هذه الورقة آثارًا كبيرة لفهم مبادئ الحملة العالمية للتعليم وأهميتها وممارساتها المستدامة.

L'éducation à la citoyenneté mondiale (GCE) est une initiative importante visant à résoudre les problèmes mondiaux par l'éducation (Nations Unies, 2012), mais elle a été critiquée à la fois pour la confusion des concepts et ses croyances normatives en matière de normalisation et de responsabilités privées. Cet article distingue les concepts fondamentaux de GCE pour révéler le véritable objectif et le principe de la GCE - la démocratie et la justice sociale. Le document explique et justifie en outre les objectifs et principes "subjectifs" de la GCE en introduisant un cadre analytique qui aborde des questions telles que "qu'est-ce qui est juste ?" et "qu'est-ce qu'une manière démocratique de faire face aux problèmes mondiaux ?", qui sont importantes mais non spécifiés dans un cadre normatif. En réunissant les cadres normatifs et analytiques, nous sommes en mesure d'examiner les pratiques durables de GCE et d'aider les gens au niveau local à comprendre pourquoi GCE est important et comment l'appliquer dans la pratique. Le cadre normatif-analytique de GCE offre la possibilité de transcender les idéologies néolibérales de GCE et de comprendre les principaux objectifs de développement durable (ODD) des Nations Unies (ONU). Ce article fournira des implications importantes pour comprendre les principes, l'importance et les pratiques durables de GCE.

Образование глобальной гражданственности (ОГГ) — важная инициатива, направленная на решение глобальных проблем с помощью образования (Организация Объединенных Наций, 2012 г.), но она подвергалась критике как за смешение концепций, так и за ее нормативные убеждения в стандартизации и частной ответственности. В данной статье выделяются фундаментальные понятия ОГГ, раскрывающие настоящую цель и принцип ОГГ — демократию и социальную справедливость. Далее в документе объясняются и обосновываются «субъективные» цели и принципы ОГГ путем введения аналитической основы, отвечающей на такие вопросы, как «что справедливо?» и «каков демократический способ решения глобальных проблем?», которые важны, но не определены в нормативной базе. Объединив нормативные и аналитические рамки, мы можем изучить устойчивую практику ОГГ и помочь людям на местном уровне понять почему ОГГ важно и как его применять на практике. Нормативно-аналитическая основа ОГГ дает возможность выйти за рамки неолиберальных идеологий в ОГГ и понять основные направления Целей устойчивого развития (ЦУР) Организации Объединенных Наций (ООН). Этот документ окажет существенное влияние на понимание принципов, важности и устойчивой практики ОГГ.

La Educación para la Ciudadanía Global (ECG) es una iniciativa importante que busca resolver problemas globales a través de la educación (Naciones Unidas, 2012), pero ha sido criticada tanto por la combinación de conceptos como por sus creencias normativas en la estandarización y las responsabilidades privadas. Este artículo distingue los conceptos fundamentales de la ECG y revela el propósito real y el principio de la ECG: la democracia y la justicia social. El documento explica y justifica los propósitos y principios 'subjetivos' de la ECG mediante la introducción de un marco analítico que aborda preguntas como '¿qué es justo?' y

'¿cuál es una forma democrática de hacer frente a los problemas globales?' que son importantes pero no especificados en un marco normativo. Al reunir los marcos normativo y analítico, podemos examinar las prácticas sostenibles de la ECG y ayudar a las personas a nivel local a comprender por qué la ECG es importante y cómo aplicarla en la práctica. El marco normativo-analítico de la GCE brinda la posibilidad de trascender las ideologías neoliberales en la ECG y comprender las principales metas de los Objetivos de Desarrollo Sostenible (ODS) de las Naciones Unidas (ONU). Este artículo proporcionará implicaciones significativas para comprender los principios, la importancia y las prácticas sostenibles de la ECG.

Introduction

Global Citizenship Education (GCE) has been an important educational initiative to promote the common good and to solve global issues (United Nations, 2014). However, GCE was critiqued as 'contradictory in itself' because of connotations with its foundational concepts like 'citizenship' and 'national citizenship' (Zhou, 2022; Zhou et. al., 2022). This article points out that the distinctiveness of the concept would be helpful for understanding the real purpose and principle of GCE — democracy and social justice.

Furthermore, GCE has been critiqued as holding a normative belief in social justice that incorporates a neoliberal epistemology — as advocating for simple and same standards and private accountabilities, which has caused serious pushback from many local movements (Brown, 2008). While it is argued here that a normative framework is not enough for exploring a full and diverse picture of GCE, it is important to address questions like how to *analyze* and make sense of the 'subjective' principles like 'what is fair' and to justify with evidence questions such as 'what is a democratic way for coping with global issues' which are lacking from the normative framework. This paper incorporates an analytical framework that focuses on explanations and justifications (Brown, 2008) and constructs a logical analytical reasoning to help people at the local level to understand why GCE is important and how to apply it in practice.

Although there have been research studies in the field of comparative education that have compared GCE in different countries, few of them analyzed the core components of GCE in depth. This paper provides a normative-analytical framework to examine the principles, importance, and sustainable practices of GCE. This paper argues that GCE is not only "a form of intervention" in global issues with a normative framework that directs what should be done and what is right and fair, but it seeks agency of implementation (Torres, 2017, p.4-10) and embeds an analytical framework seeking "ways to promote solidarity beyond particular interests of specific forms of identity" (Torres, 2017, p.12, Zhou & Green, 2019). With the combined normative and analytical framework suggested by this paper, it is argued that GCE could be used in countries across the world to advocate for principles of democracy and social justice, to explain how to incorporate the interests and aims of different agents, and to pursue 'sustainability' as defined by the United Nations. Thus, this paper aligns with one of the main purposes of comparative education: to establish generalized statements about education that can be applied all over the world.

The normative-analytical framework offered here is explained to echo the major pursuits of 'sustainability' as defined in the Sustainable Development Goals (SDGs) of the United Nations (UN) — safeguarding long-term ecological sustainability, satisfying basic needs, and promoting intragenerational and intergenerational equity (Holden et al., 2014). The normative and analytical

framework of GCE will thus be tied with sustainable practices of GCE which could have a possibility to transcend the neoliberal ideologies in the SDGs.

The Emergence of Global Citizenship Education and Conflations with other Concepts

The world has been increasingly interconnected through global trade, cultural exchange, and environmental influences which are rapidly progressing (Merryfield, 2008). However, conflicts between different religions, cultures, and ethnicities are disturbing global peace (Lacina & Lee, 2013). Under this circumstance, the program of Global Citizenship Education was proposed by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in the 2014-2021 Global Education First Initiative (GEFI), as a general consensus and a uniform response to “resolve the existing and emerging global challenges menacing our planet” (United Nations, 2012).

GCE emerged to respond to post-national globalization, in which the traditional global positions and political representations of nation-states have been disrupted by transnational social movements (Torres, 2017). Thus, GCE highlights “political” aspects aiming to address the complex power relationship, systems, and structures that cause the problem of “inequality and injustice” (Andreaotti, 2006). Echoing the political aim, a central goal of GCE is stated as a cultivation of the recognition to overcome oppression, domination, and exploitation (Torres, 2017). GCE therefore implants a democratic core in its pursuits and advocates for reinforcing the robustness of representative and participatory democracies worldwide (Torres, 2017).

Partly because of its recent emergence, GCE has been conflated with two of its foundational concepts — ‘citizenship’ and ‘national citizenship’, which has led to critiques of GCE being contradictory in itself. These differences should be pointed out in order to confront these critiques and reveal GCE’s real purpose and principles (Zhou, 2022). Indeed, GCE employs a traditional understanding of citizenship, which is a legal identity built on a set of civic virtues specific to a nation-state, and demands necessary material bases such as residency, health care, and more (Torres, 2017).

However, global citizenship studies innovate the traditional understanding of ‘citizenship’ in two ways. Firstly, GCE expanded civic minimums and virtues to a global level so that it could embrace virtues that can produce the common good, to maintain conditions and achieve objectives that are to human advantage as a whole (Rawls, 1971, p.233, Zhou & Green, 2022a). Secondly, citizenship requires the necessary material bases, while global citizenship does not. Rather than merely a legal statement, global citizenship is more a sense of belonging to a community of humanity and universal values (Marshall, 2005, p.76-91, Zhou & Green, 2022b). Moreover, GCE upholds concern for people of special material situations, such as aboriginal communities, refugees, stateless people and cross-cultural challenges (Torres, 2017, p.13).

Similarly, GCE is also distinctive from its precursor ‘national citizenship’, which focuses on national benefits. GCE acknowledges that national interests are dependent on global conditions through activities like global trade, cultural exchange, and environmental influences. GCE is aware of the interconnectedness between the local and the global and the existence of the notion of ‘collective good’ (Zhou et. al., 2022). With a relative perspective, GCE could activate the motivation of nation-states to tackle problems like global peace and sustainability of the planet, including their key effects such as growing inequality, global poverty, neoliberal globalization, banking education, and environmental crises (Torres, 2017, p.4-9). Therefore, GCE expands from a national to a global level and not only broadens but also complicates the responsibilities of a

nation-state — to deal with the shared problems that transcend the traditional nation-state and come up with collaborative solutions (Torres, 2017).

Meanwhile, however, GCE is not an alternative to or substitution for national citizenship. Instead, global citizenship was proposed with a hope and goal to add values and support to the process of “citizenship making” of a nation, but to also “insert GCE models based on principles of liberty and equality for all” as a supplement (Torres, 2017, p.10). GCE aims to improve the social engagements of people of any country, while also acknowledging the perspective from a wider global sense. GCE also promotes the robustness of representative and participatory democracies worldwide (Torres, 2017, p.10, Zhou & Green, 2019).

The Normative/ Neoliberal Goals of Global Citizenship Education

Democracy and social justice have been revealed as the two important focuses of GCE from the comparison between GCE and its foundational concepts — citizenship and national citizenship. However, GCE has been redefined with distinctive characteristics and principles of diversity, equality, and participatory democracy, all on a global level. It becomes more apparent that GCE argues a normative and constructive nature — a belief in people’s agency and the participation and principles of democracy and social justice for all humans (Zhou et. al, 2022). These arguments about the nature and principles that re-define GCE also have ‘normative framework’ implications for GCE.

Consistent with a normative framework, GCE also has identified ways to evaluate what is right and wrong, just and unjust, fair and unfair (Brown, 2008). For example, GCE has clear normative goals on constructing a social justice society, and it firmly upholds the democratic principles to promote a wide range of human involvement as necessary in GCE implementation. However, a problem in a normative framework is that the evaluation of justice is highly subjective — this judgement depends on a self or social-interest or culture, so it may vary on what is just and fair (Brown, 2008). For example, social justice in how to treat people from other cultures may be different between a city having a homogenous group and a cosmopolitan city. Besides, though GCE has a normative idea that it is necessary to create a link between theory and practice (UNESCO, 2014), the challenge inside this goal cannot be addressed by merely the normative framework.

A mere normative framework of GCE, it is argued here, is not enough. It is important to address questions like how to *analyze* and make sense of the ‘subjective’ principle of ‘what is fair’ and to justify with evidence, ‘what is a democratic way for coping with global issues’ which is lacking from the normative framework. This may be achieved by incorporating logical analytical reasoning and an ‘analytical framework’ that focuses on explanations and justifications of the GCE framework (Brown, 2008).

There are two sides that an analytical framework of GCE can help to address — firstly, why the GCE norms could influence stakeholders’ (people, governments) interests and the international order. An important way to understand this question is to acknowledge that not only there are questions of what is fair and how to treat people, which are culturally dependent, but the flexibility and variance in the understanding of justice also influence how one may cope with global issues and what could be done in practice to shape a better future (Zhou, 2021). The cooperation of different nation-states will be their key understandings and explanations of GCE’s principles of democracy and social justice. The awareness of cultural dependency will offer more possibilities for cooperation among different stakeholders.

Secondly, the analytical framework of GCE asks how we, with our individual and cultural interest, can cultivate the spirit of solidarity across the lines of difference (Torres, 2017, p.16; Zhou, 2021). This question involves the tension between global solidarity and global competition and encompasses a hard balance of how to promote universality (e.g. collective identity, interest, participation, and duty) while respecting singularity (e.g. individual rights and self-improvement)” (UNESCO, 2014, p.15). An attempt for pinpointing the tension would make GCE more persuasive for nation states to adopt and a concrete ground for implementation.

As a concept of the widest global scale, GCE cannot just claim what is right (the normative framework) but needs also to pinpoint how to incorporate the interests and aims of different agents (e.g. international organizations, welfare states, and schools), especially for those with low socioeconomic status, to learn from each other, to collaborate among a rich diversity of society and beliefs, and to negotiate for collective experiences and a solidarity (Zhou, 2021). Besides, GCE should not be a ‘dominated citizenship education’ which has one single dominant ideal of social justice and defines citizenship with liberal assimilation and socialization. Rather, GCE could be a form of “transformative citizenship education” which empowers individuals to be autonomous agents to construct their citizenship and reflect their diverse cultures to attain global structural equality (Banks, 2009, p.129-139).

The Normative-Analytical Framework of Global Citizenship Education for Sustainable Practices

GCE is not only “a form of intervention” into world issues using a normative framework directing what should be done and what is right and fair. It also seeks agency of implementation (Torres, 2017, p.4-10) which has an analytical framework embedded inside it. GCE seeks “ways to promote solidarity beyond particular interests of specific forms of identity” (Torres, 2017, p.12), and which echo sustainability’s major pursuits in the Sustainable Development Goals (SDGs) of the United Nations (UN) — safeguarding long-term ecological sustainability, satisfying basic needs, and promoting intragenerational and intergenerational equity (Holden et al., 2014). The normative - analytical framework of GCE connected with sustainable practices of GCE, could have a possibility to transcend the neoliberal ideologies in the SDGs. In this regard, GCE can be analyzed and provide insights to better re-define and implement the SDGs.

With an “epistemology of curiosity” — an endless demand to seek for cultural principles that make more harmonious lives and cultural exchanges that are closer to social justice (Torres, 1998), GCE’s practices strive to cultivate people’s “values, attitudes, and skills that promote mutual respect and peaceful coexistence” and a sustainable future (UNESCO, 2014, p.5) with a variety of sustainable practices.

In schools, efforts of sustainable practices are made around multiculturalism and the GCE curriculum. For example, as part of “character education”, students are encouraged to identify “the sense and sources of identity”, especially the competing forms of national, regional, ethnic, or religious identity (Pike & Selby, 2000). To maintain the participatory nature of GCE, teachers are trained to teach students to broaden and complicate understandings of their responsibilities and rights on the shared problems and solutions that transcend the traditional nation-state (Torres, 2017; Zhou & Li, 2022). Teachers highlight movements towards democratic thinking about global interconnectedness and discuss the different hopes and critics on globalization and sustainability (Rhoads and Szelényi, 2011).

Guided by the sustainable goals, some teachers are also encouraged to incorporate what Gutman (1987) describes as the elements of “virtues for democratic education”. Three dimensions of virtues of human social life are taught that are related to sustainable goals. First is the political and civic aspects. The virtues education teaches students about the political virtues that include the capacity to analyze and criticize. Second are the economic and occupational aspects. The economic virtues incorporate work ethic, and the capacity to delay self-gratification. Lastly is the social and cultural aspects. The social virtues encourage autonomy and open-mindedness. These comprehensive aspects are all important skills to help achieve the sustainable goals of education.

Relating to the three aspects of human life, GCE promotes a sustainable aim of education — to cultivate global citizens who can develop cross-cultural collaborative solutions for global issues (such as climate change, social inequality). Global citizens are crucial to constructing a peaceful and inclusive world since they could understand the interconnected society and culture and would feel responsible for solving shared global problems, which has been proven as the key for one’s success in a transformative multicultural learning and working experience (Torres, 2017; Rhoads and Szelényi, 2011; Zhou, 2022).

Another approach by which GCE embeds sustainable practices in schools is the necessity of considering the complex local power interaction and pragmatic peace policies. Rather than prescribing from an upper-level institutional force, GCE promotes coordination efforts and more collaborative efforts to make sense and progress on pursuing normative democracy and social justice goals. GCE recognizes that institutions are not “neutral” (MacLeod et. al., 2016). Instead, violent and unjust governments, for example, function as intermediary institutions that transmit the power/ agendas of the government.

Though SDGs were agreed by all UN members, their implementation relies heavily on action and collaboration by all actors through a dialogue between the local and the global, especially under conditions like global pandemic emergencies (Zhou & Li, 2021). This local-global dialogue is a solution and a fundamental principle in GCE. GCE has been incorporated with formal approaches with the normative pursuits and analytical reasoning process. The global issues in the subject area are taught and demands ‘transformative pedagogy’ that promotes active and participatory learning and an open environment in the classroom for universal values (Zhou, 2022).

Replying to these demands, education programs such as study abroad or educational travel have been considered as ways to help both the international students and the students of the local to experience a broader vision of other countries and cultures (Stoner, Tarrant, Perry, Wearing & Lyons, 2014, p.149-163; Zhou & Li, 2022). Also, the demands of implementing SDGs inspire schools to teach about peace and social justice from GCE. For example, schools create displays on human rights, launch peacebuilding programmes, and issue a student newspaper addressing global issues (UNESCO, 2014) Universities have also developed GCE to address the social, economic, and political issues of our times (Jorgenson and Shultz, 2012) by supporting study centers like Haverford College’s Center for Peace and Global Citizenship to serve as a “clearinghouse for service and internship programs” (Schattle, 2008, p.76).

Besides, community-based approaches have also been built as effective ways to achieve the shared goals of GCE and SDGs. Practices include designs of “fair and harmonious spaces for children and young people from diverse ethnicities, cultures, socio-economic status and identities”. Communities encourage art and music allowing for self-expression, dialogue with other cultures, and a shared sense of belonging. Also, youth networks were built for understanding and

communications across cultures and communities” (UNESCO, 2014, p.14). Moreover, many non-profit organizations embraced GCE and have also coordinated events and initiatives to instill awareness and responsibilities of the interdependence of the world, as well as facilitated the national school curriculum on global issues (Schattle, 2008, p.77-81; Zhou, 2021).

As a thread to all these sustainable practices, GCE advocates critical and transformative perspectives on global issues and promotes active involvement in thinking, feeling, and doing (Enright & O’Sullivan, 2012). This critical, democratic, and pragmatic principle of GCE overcomes the neoliberal and productivism ideologies in SDGs and embraces “collaborative action” for the collective good and the global solutions for global challenges” (UNESCO, 2014, p.9).

Conclusion

Global Citizenship Education (GCE) is especially applied to ensure participatory practices and for critical sustainability. Its goals, as set by UNESCO, are for a normative framework to pursue social justice and to solve the current urgent global issues. However, two critical reasoning epistemologies — normative and analytical — are both needed to construct a full understanding and legitimacy of GCE (Bjola, 2008). Thus, this paper encourages the adoption of a normative-analytical framework to fully illustrate and analyze GCE’s democratic principles and its nature for sustainability practices.

GCE has normative pursuits (democracy, multiculturalism, and social justice) but also demands explanation and analysis of the internal logic of the democratic principles — why and how the concept of GCE should be theorized, studied, and analyzed in a specific political context. Once GCE obtains analytical theorizations to help people understand (from various aspects) and practice (within diverse contexts) the normative goals (like social justice and democracy), GCE becomes especially useful to persuade and establish a more just and participatory system of global cohabitation to shape the future globalization.

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Developing the Critical Thinking Skill of Secondary Science Students in Sri Lanka

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Vieira and Tenreiro-Vieira (2014) says scientific literacy and critical thinking are key components of science education aiming to prepare students to think and to function as responsible citizens in a world increasingly affected by science and technology. Therefore, students should be given opportunities in their science classes to be engaged in learning experiences that promote to develop critical thinking, resulting in their ability to know how to take responsible action in contexts and situations of personal and social relevance. As stated by the National Evaluation and Research Services in Sri Lanka (2008 :57) critical thinking skill is necessary for grades 10 and 11 students and it can be promoted using scientific method under explanation of scientific phenomena. The editors of encyclopaedia britanica (2020) put the scientific method is important to the development of scientific theories, which explain empirical laws in a scientifically rational manner. In this basis, the goal of the research was developing critical thinking skill of grade 10 science students of my classroom based on the curriculum framework assigned in Sri Lanka. The action research was conducted with 12 grade 10 students. An interview schedule was used to identify the problems faced by the students in science phenomena explanation. Behaviours according to demonstrated student's critical thinking was observed using participant observations and reflective journal writing. The intervention plan consisted of 5 steps as observation, reflection, action, evaluation and modification. The conclusion was the critical thinking skill of grade 10 students can be developed with the application of explanation of scientific phenomena. As a whole, the action research is important for teachers in teaching science for the development of critical thinking skill in students. The recommendations of the action research could be used to direct the policy based on the solutions for the contemporary issues of science education.

Keywords: Critical thinking skill, Secondary Science

يذكر فييرا وتينريرو فييرا (2014) أن محور الأهمية العلمية والتفكير النقدي هما عنصران أساسيان في تعليم العلوم ، ويهدفان إلى إعداد الطلاب للتفكير والعمل كمواطنين مسؤولين في عالم يتأثر بشكل متزايد بالعلوم والتكنولوجيا. لذلك ، يجب منح الطلاب فرصًا في فصول العلوم للمشاركة في تجارب التعلم التي تطور التفكير النقدي ، مما يؤدي إلى قدرتهم على معرفة كيفية اتخاذ إجراءات مسؤولة في السياقات والمواقف ذات الأهمية الشخصية والاجتماعية. كما ذكر من قبل التقييم الوطني وخدمات البحث في سريلانكا (2008: 57) ، فإن مهارة التفكير النقدي ضرورية لطلاب الصفين العاشر والحادي عشر ويمكن تعزيزها باستخدام المنهج العلمي لشرح الظواهر العلمية. تعتبر الطريقة العلمية مهمة في تطوير النظريات العلمية التي تشرح القوانين التجريبية بأسلوب عقلائي علميًا. لذلك ، كان الهدف من بحثي هو تطوير مهارة التفكير النقدي لطلاب العلوم في الصف العاشر استنادًا إلى إطار المنهج الدراسي المعين في سريلانكا. أجريت الدراسة البحثية الإجرائية على 12 طالبًا في الصف العاشر. تم استخدام جدول المقابلات للتعرف على المشكلات التي يواجهها الطلاب في شرح الظواهر العلمية. تمت ملاحظة السلوكيات التي تم تحديدها لإثبات التفكير النقدي للطلاب باستخدام ملاحظات المشاركين وكتابة المجالات العاكسة. تتكون خطة التدخل من خمس خطوات: الملاحظة والتفكير والعمل والتقييم والتعديل. الاستنتاج الذي توصلت إليه دراستي هو أنه يمكن تطوير مهارة التفكير النقدي لطلاب الصف العاشر من خلال تطبيق خطة تدخل لتطوير تفسير الظواهر العلمية. توضح الورقة أيضًا أن البحث الإجرائي يمكن أن يكون وسيلة مهمة لمعلمي العلوم لتطوير مهارات التفكير النقدي لدى الطلاب.

Vieira et Tenreiro-Vieira (2014) affirment que la culture scientifique et la pensée critique sont des éléments clés de l'enseignement des sciences, visant à préparer les élèves à penser et à fonctionner en tant que citoyens responsables dans un monde de plus en plus affecté par la science et la technologie. Par conséquent, les élèves devraient avoir la possibilité, dans leurs cours de sciences, de participer à des expériences d'apprentissage qui développent la pensée critique, ce qui leur permet de savoir comment agir de manière responsable dans des contextes et des situations d'importance personnelle et sociale. Comme indiqué par les Services nationaux d'évaluation et de recherche au Sri Lanka (2008 : 57), la capacité de réflexion critique est nécessaire pour les élèves de 10e et 11e année et elle peut être encouragée en utilisant une méthode scientifique pour expliquer les phénomènes scientifiques. La méthode scientifique est importante dans le développement des théories scientifiques, qui expliquent les lois empiriques d'une manière scientifiquement rationnelle. Par conséquent, le but de ma recherche était de développer la capacité de pensée critique de mes étudiants en sciences de 10e année en se basant sur le cadre du programme d'études assigné au Sri Lanka. L'étude de recherche-action a été menée auprès de 12 élèves de 10e année. Un programme d'entretiens a été utilisé pour identifier les problèmes rencontrés par les étudiants dans l'explication des phénomènes scientifiques. Les comportements identifiés pour démontrer la pensée critique des élèves ont été observés à l'aide des observations des participants et de la rédaction d'un journal réflexif. Le plan d'intervention comportait cinq étapes : observation, réflexion, action, évaluation et modification. La conclusion à laquelle mon étude est arrivée est que la capacité de pensée critique des élèves de 10e année peut être

développée avec l'application d'un plan d'intervention pour développer l'explication des phénomènes scientifiques. L'article démontre également que la recherche-action peut être un moyen important pour les enseignants de sciences de développer la pensée critique chez les élèves.

Виейра и Тенрейро-Виейра (2014) заявляют, что научная грамотность и критическое мышление являются ключевыми компонентами научного образования, целью которого является подготовка учащихся к мышлению и функционированию в качестве ответственных граждан в мире, на который все больше влияют наука и технологии. Таким образом, на уроках естественных наук учащимся следует предоставлять возможность участвовать в обучении, которое развивает критическое мышление, что приводит к их способности знать, как предпринимать ответственные действия в контекстах и ситуациях, имеющих личное и социальное значение. Как утверждает Национальная служба оценки и исследований Шри-Ланки (2008:57), навык критического мышления необходим учащимся 10 и 11 классов, и его можно развивать, используя научный метод для объяснения научных явлений. Научный метод играет важную роль в развитии научных теорий, объясняющих эмпирические законы научно рациональным образом. Поэтому целью моего исследования было развить навыки критического мышления у моих учеников 10-го класса, изучающих естественные науки, на основе учебной программы, разработанной в Шри-Ланке. Экспериментальное исследование было проведено с 12 учащимися 10-х классов. Расписание собеседований использовалось для выявления проблем, с которыми сталкиваются студенты при объяснении научных явлений. Поведение, идентифицированное как демонстрация критического мышления учащегося, выявлялось с использованием наблюдений за участниками и рефлексивного ведения дневника. План вмешательства состоял из пяти этапов: наблюдение, размышление, действие, оценка и модификация. Вывод, к которому пришло мое исследование, заключался в том, что навык критического мышления учащихся 10-го класса можно развить с помощью плана вмешательства для разработки объяснения научных явлений. В статье также показано, что исследование действий может быть важным способом для учителей естественных наук развития у учащихся навыки критического мышления.

Los autores Vieira y Tenreiro (2014) afirmar que la alfabetización científica y el pensamiento crítico son componentes clave de la educación científica, con el objetivo de preparar a los estudiantes para pensar y funcionar como ciudadanos responsables en un mundo cada vez más afectado por la ciencia y la tecnología. Por tanto, se deben otorgar oportunidades a los estudiantes en sus clases de ciencia para participar en experiencias de aprendizaje que les permita desarrollar su pensamiento crítico, resultando en sus habilidades

para saber como tomar acciones responsables en contextos y situaciones de relevancia personal y social. De acuerdo a lo declarado por los Servicios Nacionales de Evaluación e Investigación de Sri Lanka (2008: 57), la habilidad de pensamiento crítico es necesaria para los estudiantes de los grados 10 y 11 y puede ser promovida utilizando el método científico para explicar fenómenos científicos. El método científico es importante en el desarrollo de teorías científicas, que explican empíricamente las leyes de manera científica y racional. Por lo tanto, el objetivo de esta investigación fue desarrollar la habilidad de pensamiento crítico de mis estudiantes de ciencias de décimo grado con base en el marco curricular asignado en Sri Lanka. El estudio de investigación-acción se llevó a cabo con 12 estudiantes de décimo grado. Se utilizó un programa de entrevistas para identificar los problemas que enfrentan los estudiantes para explicar los fenómenos científicos. Los comportamientos identificados para demostrar el pensamiento crítico de los estudiantes fueron obtenidos mediante observaciones de los participantes y escritura reflexiva en un diario. El plan de intervención consistió en cinco pasos: observación, reflexión, acción, evaluación y modificación. La conclusión a la que se llegó con el estudio fue que la habilidad de pensamiento crítico de los estudiantes de grado 10 se puede desarrollar con la aplicación de un plan de intervención para desarrollar la explicación de fenómenos científicos. El documento también demuestra que la investigación-acción puede ser una forma importante para que los profesores de ciencias desarrollen habilidades de pensamiento crítico en los estudiantes.

1. Introduction

One of the questions for consideration at the 3rd WCCES Symposium was, How can autonomous and critical thinking be applied in teaching and research to promote and sustain academic freedom? This study addresses how critical thinking skills for science subjects can be applied. In her book, 'Mind in the Making: The seven essential life skills every child needs', author Ellen Galinsky explains the importance of teaching children critical thinking skills. A child's natural curiosity helps lay the foundation for critical thinking. Critical thinking requires us to take in information, analyze it and make judgements about it, and that type of active engagement requires imagination and inquisitiveness. As children take in new information, they fill up a library of sorts within their brain. They have to think about how the new information fits in with what they already know, or if it changes any information we already hold to be true. We use critical thinking skills every day. They help us to make good decisions, understand the consequences of our actions and solve problems. These incredibly important skills are used in everything from putting together puzzles to mapping out the best route to work. It's the process of using focus and self-control to solve problems and set and follow through on goals. It utilizes other important life skills like making connections, perspective taking and communicating. Basically, critical thinking helps us make good, sound decisions.

This research paper is structured under five headings: the significance of the research problem; the review of relevant literature; the methodology adopted for study, and the data analysis. The fifth section, followed by the conclusion, calls for a deliberative space for WCCES.

Significance of the research problem

It has been identified through a number of researches that critical thinking skill is important for students in learning Science subjects. But it has been further identified through many research studies that the main difficulty in developing critical thinking is the assumption of teachers that it is impossible to do (Fitzpatrick & Schulz, 2015; Yang, Lee, Hang & Lin, 2016, Meyer & Lederman, 2015). As stated by the Sri Lankan National Evaluation and Research Services, critical thinking skill is essential for grades 10 and 11 science students (NETS, 2008). However, very few of the 2018 students who appeared for G.C.E. (O/L) were qualified for the G.C.E. (A/L) Science stream as specified in the Science evaluation analysis reports. The reason for this is that the critical thinking skill required in science had not been developed in grade 10 students, as stated in the National Evaluation and Research Services. Due to this situation I decided to conduct action research in my classroom regarding, the development of the critical thinking skill of my science students.

As Ennis (1987: 10) puts it, "Critical thinking is the process of reasoning, that is, making decisions based on what one believes." Causation and decision-making can also be considered as key features of critical thinking, using the scientific method to curiously identify phenomena observed in the day-to-day environment, to evaluate those causes logically and critically, and ultimately to acquire new knowledge critically. The Code of Science Examinations and Assessment Guidelines for Grades 10 and 11 (2008) states that approvals are the process of obtaining conclusions.

The activities related to the Grade 10 Science Teacher Training Manual in line with the Science syllabus prepared by the National Institute of Education for the use of Grade 10 students in the school system of Sri Lanka since 2015 have been important in using the scientific interpretation of everyday environmental phenomena as self-activity. Accordingly, identifying real world events through direct observation and using the knowledge gained in practice to explain them using a scientific method is the scientific identification of environmental phenomena.

2. Literature Review

According to Bailin and Battersby (2010), students need to be provided with an environment in which to speak and share ideas. Researchers have found that students' learning is more successful when they have the opportunity to express themselves. As Pimm (1987) puts it, the TPS-Think-Pair-Share strategy improves students' personal communication skills and improves their students' internal cognitive processes. The use of the Think-Pair-Share strategy in presenting self-actualization activities related to the subject of science is useful because this strategy is important for making critical assumptions in scientific research as well as for guiding critical thinking about the methods of conducting experiments. In this way it was possible to get a clear idea of what constitutes critical approvals. Bailin (2002) argues that critical thinking is related to judgment. He says it's not a familiar order. Bailin (2002: 368) states that "critical thinking is tied to a creative work with a definition that requires an appraisal theory that includes a

specific task, question, problem situation or challenge, that is, problem solving." As Battersby (2010) points out, the strongest factors in inquiry and attitude are open-mindedness, reasonableness, curiosity, and respect Fitzpatrik and Schulz (2015) further point out that cognition and its impact on critical thinking affect each other. As stated in the Grade 10 Science syllabus which has been in operation since 2015, the main aim of the 6-11 Science curriculum is to draw logical conclusions about the world around us. This means using the scientific method to develop the skills required to understand the scientific basis of natural phenomena and the universe through the development of the qualities of scientific thought. Following is the Bacon (1620) scientific methodology as presented by Klein (2012).

01. Observation of Phenomena
02. Analysis of the Phenomenon
03. Establishing Assumptions (Creating a New Statement)
04. Developing plans to test hypotheses (creating a plan, a working system.)
05. Testing Assumptions (Planning, Setting Up an Action System)
06. Reporting of test observations
07. Accepting or refuting assumptions
08. Presenting Conclusions (Creating an Abstract Connection System)

3. Methodology

3.1 Research objectives

The objectives of my research study are:

- Identifying critical thinking skill of present grade 10 students.
- Identifying the problem faced by them in engaging with scientific phenomena.
- Planning and implementing an intervention through explaining scientific phenomena done by them to develop critical thinking skill.
- Finding the successfulness of the intervention done to develop critical thinking skill of grade 10 students.

3.2 Research method

The action research method was selected as the most suitable for this research study because the research aims to find a solution to a specific problem that has arisen in a particular context. Also, action research requires the seeking a quick solution to a problem by activating the study under a natural environment in a specific environment rather than simply normalizing the research findings. Based on a practical problem that arises in the relevant field, active research is initiated. No attempt is made to control the research context here. A feature of the research method is that it has a high level of utility orientation or functional orientation as required. Other forms of this research are called classroom research, self-reflection approach, and task research.

3.2.1 Utilization of a pioneering research model to develop a pioneering research plan

The steps in the dynamic research model presented in Whitehead and MacNiff (2006) are observation, retrospection, activation, evaluation and modernization.

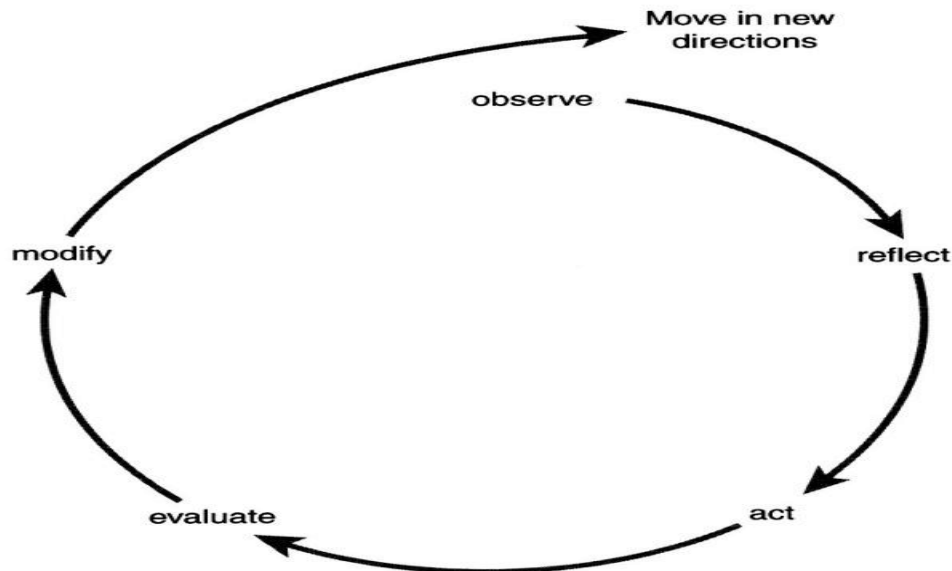


Diagram 1. Action-reflection model

Source: Whitehead and MacNiff (2006) TOPICS 5

This model is known as "action-reflection" and, as mentioned above, consists of five steps or interventions that complete the cycle from design to innovation in a new and improved direction, that leads to a new cycle. It was decided that this model could be used appropriately for the research purposes of this study, considering that monitoring, retrospection, and activation, although in other models, are also evaluated and modified. Because of this, each intervention required an evaluation and, accordingly, a modification as presented by Whitehead and MacNiff (2006) in the research model above.

3.3 Research Sample

The research sample comprised 12 students studying Grade 10 Science who obtained less than 40% marks in the subject of study, that is, Critical Approval Ability.

3.4 Data collection strategies and equipment

Table 1 (below) indicates the relationship between data collection equipment, sample and research objectives

Data Collection Tool	Sample	Research Objective Number
Diagnosing Test	Students	01,04
Interview Schedule	Students	02
Observation Schedule for critical thinking	Students	03
Evaluation Sheet for critical thinking	Students	03
Reflectional Journal	Students, Teachers	03,04

Data Analysis Strategies

Analysis of the various contexts explaining structures was done based on quantitative data through simple number analysis, and qualitative data through simple contextual structured qualitative analysis. The findings are separately specified as per the research objectives, analyzing the data.

Data analysis methods used the contextual analysis method for qualitative data analysis and the simple numerical analysis method for quantitative data analysis. Qualitative data analysis used the descriptive data analysis method. According to Mayring (1983), this is an attempt to identify the structures of the information gathered as the reason for using context analysis for qualitative data analysis. Accordingly, the explanatory structures were structured and presented in such a way that the specific features of the information gathered in the contextual analysis were further clarified to be relevant to the research. Data Analysis and Data Interpretation were used to identify the critical approval ability of Grade 10 students. The following three (3) criteria were considered in awarding the marks. The relevant data are shown in Table 2.

- 1 Ability to create a new statement
- 2 Ability to create a plan action system
- 3 Ability to create an abstract connection system

Table 2:
Observational Schedule

Related Behaviour	Name of the student											
	A	B	C	D	E	F	H	J	K	L	M	N
The ability to create critical approvals	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
01 Observe the phenomenon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
02 Analysis of the phenomenon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
03 Establishing the assumptions (creating a statement)	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
04 Planning to test assumptions (create a plan, an active system)	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
05 Testing assumptions (installation of an active system)	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
06 Reporting the observations in test.	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
07 Accepting or rejecting the assumptions	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
08 Presenting the conclusions Create an abstract connection system.	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Sum of the behaviours	3	3	3	2	2	2	2	2	2	2	2	2

Key: ✓- Shows behaviour ✗- Doesn't show the behaviour

According to the analysis of Table 2 data, all students were able to observe and analysis the phenomenon. But assumptions have been established by students A, B and C only. Moreover, the quantitative and the qualitative data on the critical approval ability clarify the inability of all students to perform any of the other six behaviours. Because of the all 12 students' inability to obtain a higher mark, their critical approval ability levels do not reach 40%.

3.5 The intervention cycle – intervention to develop critical approval ability.

Activity 01: In order to identify the necessary interventions for each of the 12 students to develop critical approval ability, the inabilities that caused all 12 students to not obtain 40% marks were specified in two groups as follows:

- Students A, B, C: Planning to test assumptions (create a plan, an active system), Testing assumptions (installation of an active system), Reporting the observations in test., Accepting or rejecting the assumptions, Presenting the conclusions, (create an abstract connection system).
- Students D, E, F, G, H, I, J, K: Establishing the assumptions (creating a statement) , Planning to test assumptions (create a plan , an active system), Testing assumptions (installation of an active system), Reporting the observations in test., Accepting or rejecting the assumptions, Presenting the conclusions, create an abstract connection system.

Having identified the behaviours needing to be developed, the next step required the removal of barriers by working on solutions to the problems faced by each student.

Activity 02: Specifically, this required consideration of the problems faced by each student in engaging in self-activities at a level where the ability to form critical approvals should be developed, and the intervention of the teacher to provide solutions to those problems for each student.

01 Considering the problems of the principles of science.

After analysing the students' problems, it was easy to plan the teacher's intervention for each student in relation to the Principles of Science when developing critical approval ability. Necessary plans were made by adapting the data analysis from these students' behavioural observations to the ability to obtain critical approval. Students' problems with the principles of science were seen to be coherent and plans were drawn up. As a result, students were introduced to the scientific method in the introductory program on activities conducted.

02 Considering issues related to home responsibilities.

An example of activity here was provided for Student N who had to support the mother's shop after school hours to maintain the family's economic status, thus indicating that students' learning inabilities could be due to home responsibilities. This also affects engaging in self-activities. As a solution to this problem Student N's home was visited and the situation inquired about. A well-wisher was prepared for the school who could sponsor the student as a remedy for the situations identified there.

03. Consider the problem of spending time on Mathematics subject evening classes.

During their interviews Students J,L, and M made statements such as “ Miss , the Mathematics teacher said that we must participate for the evening class as the syllabus has not yet completed. So we have two evening classes for the week”. In fact all the students in the class had this problem. Afternoon classes were held on Tuesdays and Thursdays after school hours to cover missed subject time in Mathematics as the Mathematics teacher was on maternity leave. The action taken to minimize the need to spend time in evening classes was to discuss with the Mathematics teacher how to free up Tuesdays evening classes. As the researcher is capable in conducting Mathematics lessons for Grade 10 students she covered the necessary Mathematical contents during relief periods. Thus all the students were released from Tuesday evening Mathematics classes.

04. Considering the problems related to the Students’ Diary.

After recognizing that Students J, H, A & B had difficulties in maintaining the Students’ Diary, the in-charge teacher’s Nature diary was provided as an example. Students’ diaries were also checked and necessary assistance was provided.

05. Considering the problems related to the Reflective Journals.

All students reported that there was need for clarity regarding reflective learning. Only M, N, L, J and K students were considered for development of their ability to reach critical approvals. The opportunity was provided to watch educational videos promoting self-study and provide experience in reflective learning. It was used to guide students to their mindfulness of the activities they had done to make observational notes. Also the reflective journal model was introduced to record reflective notes.

In this way, the teacher intervened to give solutions to the problems faced by the students who were weak in their analytical ability, considering the problems faced by each student in performing the self-activism related to their ability to develop with critical approval. Then the student intervention diary was introduced to support implementation of the second intervention

Activity 03: The activity for introducing and maintaining the use of the students’ diaries, provided familiarity with reflections. It included observations and reflective analysis. The students were directed to use a reflective journal. Reusing the lesson on the introduction of the scientific method carried out in the classroom, the intervention activity 03 was completed in two hours each for four hours after the school time.

Observations

The first step of this intervention was observation. All twelve sample students were observed in order to develop their analytical skills using the observation code 02 for the second time.

Students J and K found it difficult to form assumptions regarding a given activity. They did not have the knowledge to assume that a new expression is a creation. Therefore, they did not show any behaviour beyond that. Students E, H and L were able to form assumptions but found it difficult to make plans to test assumptions. Students were able to analyse the phenomenon despite the difficulty of creating a new plan or operating system to test hypothesis. Students made assumptions, made plans to test hypotheses and tested hypotheses well.

At the end of Phase 2 above, the students were given the opportunity to re-engage in activities through reflection. During the 40 minutes in the classroom, I noticed students calming down and focusing on the work sheets they had received to answer the following questions: What I did? What happened? How I did it? Why I did it? What it looked like? What I learned?

Thus, the students began to use the task sheet more enthusiastically than usual, asking themselves questions. It seemed that they were interested in building a test set using the laboratory equipment provided as per the given phenomenon activity. They had questions regarding the task sheet given to them. I gave them the opportunity to answer each of those questions and use as much time as they needed.

Reflection for Action

The teacher-researcher's reflective notes were relevant in determining whether the adoption of the scientific method in the classroom required special intervention for development.

I focused on the twelve sample students more than usual, because I saw several times that they were not as interested in the scientific method of activities in the classroom as the other students. Students L, J and K students started behaving more restlessly. Prompting a question always on my mind, why are these kids not so interested in activities? For activities related to the development of respiration and movement of living beings, I asked, Why were Students D, F, M, N, E, H, L, J and K unable to form assumptions about the use of the growth dimension as well as in showing that plants and animal breathe?

I thought again and again about the activities that were done in the classroom to show the growth and movement of living being. Why did several children behave uneasily in this activity? It was difficult for them to make assumptions because it was difficult for them to create a new statement using critical thinking.

Making assumptions means making new statements using critical thinking. By giving opportunity to do this activity by assigning them to challenge environmental phenomena from a scientific point of view, I could see how students are interested in forming hypotheses that have not been addressed before. I guessed that these student kids were more willing to discover.

The solution that the teacher-researcher guessed from the analysis of the reflective notes was that it would be appropriate to explore whether it would be possible to develop students' critical approvals by assigning an environmental phenomenon as a challenge. The students were freed from the domination of the teacher and became the owners of their own learning by the teacher giving them the opportunity to carry out those assignments in a self-regulatory manner, and by conducting a re-examination. Thus the use of the Students' Diary as a self-activation led to Activity 04.

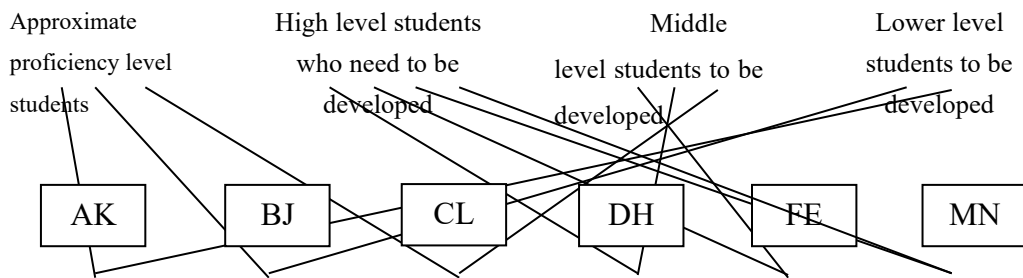
Activity 04: Providing the opportunity to prepare the report 'Why did that happen?' voluntarily through the use of the students' diary.

Here the 12 sample students were instructed to use a Student's Diary as their critical approval ability was at a level to do so with guidance on preparing the report 'Why did that happen?'. In this case, the use of the Students' Diary was closely related to familiarity in the use of the scientific method. As previously explained in Grade 10 Science syllabus, an

objective of the Science Curriculum for Grades 6-11 is for the Scientific method to be used in order to create critical conclusions and to study about natural phenomena with the scientific foundation of the universe. All students were introduced to the scientific method in the classroom which was then discussed by observing the environmental phenomena highlighted in the report ‘Why did that happen?’ Students were given two weeks to complete Activity 04 as a self-activity.

Activity 05: Providing opportunities for scientific observation and presentation of everyday phenomena under the ‘Why did it happen?’ theme.

Think – Pair – Share learning technique was used and the students were given the opportunity through it. The grouping of each pair of two students was done as according to the think-pair-share learning method



Students were then given the opportunity to come to the correct approval for problems related to scientific phenomena under the theme of ‘Why did it happen?’ through to interacting with their peers as shown in the diagram above, in accord with where their approximate proficiency level students was considered to be – high, middle or lower Lower level students to be developed . One finding was that the motivation of Student B student to inquire and file inquiries into scientific phenomena was commendable.

Activity 06 - Assessment, Evaluation and Modernization

Evaluation

Students were given two weeks to observe the day-to-day phenomena encountered under the test from a scientific point of view, to provide presentation opportunities, and to prepare a report.

Modification

In maintaining the student diary and using the scientific method, consideration was given to whether the notes kept in the student diary were made in a scientific manner. Student J, H, A and B’s diaries were scientifically identified and errors were noted. The teacher's nature diary was provided as an example to facilitate the writing of notes. The accuracy of the notes kept in the student diaries was checked and the necessary support provided. There was also a tendency for students to visit the teacher during their free time and seek advice.

3.6 Analyses related to the observational protocol that includes observable behaviours to develop students' ability to form critical approvals

This observational protocol was used three times throughout the research. That is, before the intervention cycle, during the intervention cycle, and after the intervention cycle. The

observation protocol was used on three occasions to examine the attempts made by students in the behavioural sample to determine their ability to reach critical approvals. The observations obtained there are tabulated as follows.

Table 03

Analysis related to the observation code of conduct that includes observable behaviours for the development of students' critical approvals

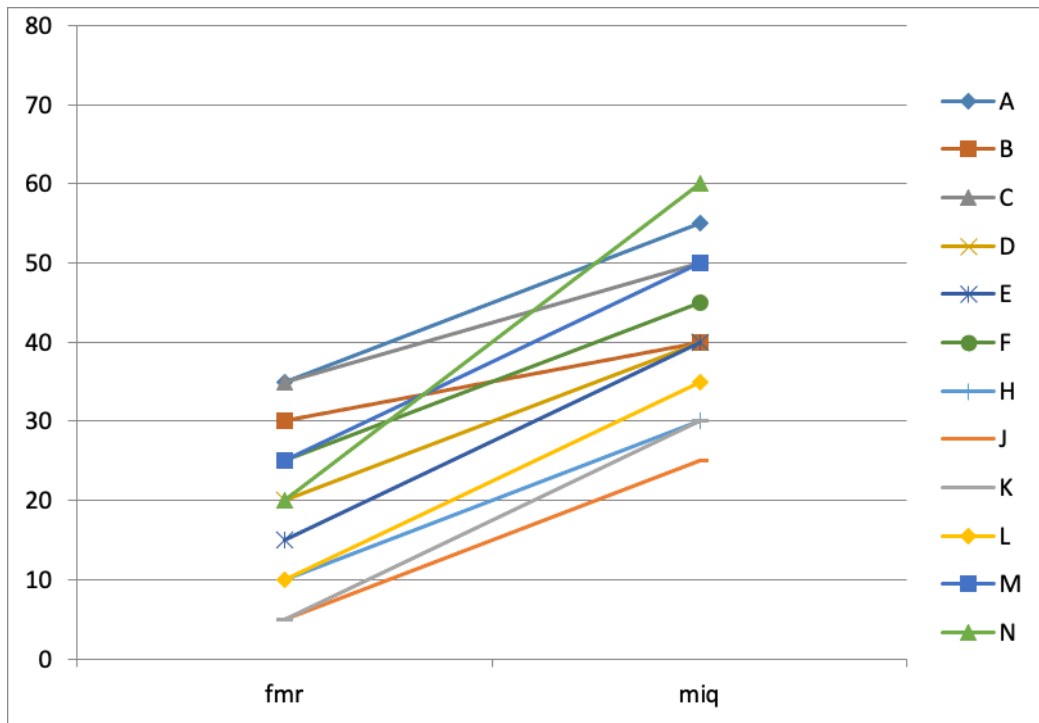
Related Behaviour	Name of the student											
	A	B	C	D	E	F	H	J	K	L	M	N
The ability to create critical approvals												
01 Observe the phenomenon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
02 Analysis of the phenomenon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
03 Establishing the assumptions (creating a statement)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
04 Planning to test assumptions (create a plan , an active system)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
05 Testing assumptions (installation of an active system)	✓	✓	✓	x	✓	✓	✓	x	x	✓	✓	✓
06 Reporting the observations in test.	x	✓	x	x	x	✓	x	x	x	x	✓	x
07 Accepting or rejecting the assumptions	x	x	x	x	x	x	x	x	x	x	x	x
08 Presenting the conclusions ^create an abstract connection system	x	x	x	x	x	x	x	x	x	x	x	x
Sum of the behaviours	5	6	5	4	5	6	5	4	4	5	6	5

Table 04 shows the comparison of the scores obtained by the students in the pre-intervention exposure test and their ability to reach critical approvals post-intervention test.

Student	Marks scored for critical thinking test before the intervention	Marks scored for critical thinking test after the intervention	Difference of the percentage of the marks before and after the intervention
A	35	55	20
B	30	40	10
C	35	50	15
D	20	40	20
E	15	40	25

F	25	45	20
H	10	30	20
J	05	25	20
K	05	30	25
L	10	35	25
M	25	50	25
N	20	60	40

Figure 01 shows the difference between the scores obtained in the pre-intervention detection test and the post-intervention test in relation to the students' ability to gain critical approval.



As shown in Figure 01, out of the twelve students in the sample, the ability to obtain critical approvals was developed with some similarity. But when H and K are considered, the development of Student K student is higher than that of Student H. Students B, C and E are the most developed of the students. Students C and M show higher levels of development in critical approvals. Out of all the students in the sample, the highest development is that of student N.

Table 05

Table 5 shows the maximum marks, highest growth and average marks obtained by the students in relation to the ability to obtain critical approvals in the pre-intervention exposure test and the post-intervention test.

	Before	After	Growth			
A	35	55	20			
B	30	40	10			
C	35	50	15			
D	20	40	20			
E	15	40	25			
F	25	45	20			
H	10	30	20			
J	5	25	20			
K	5	30	25			
L	10	35	25			
M	25	50	25			
N	20	60	40		Highest Growth	Maxium Marks
Average	19.58333	41.66667	22.08333			

According to Table 5, the average of the twelve (12) students in terms of their ability to reach critical approval in the pre - intervention detection and post - intervention tests increased from 19.58333 to 41.66667 by 22.08333%. The maximum score increase related to the possibility of obtaining these critical approvals is 40%. That maximum score growth was reported from Student M who scored 20% in the previous test. The maximum marks recorded were 60% from Student N.

4. Conclusions

The conclusions of this research are: Identifying the Present HOCS Status, dividing to levels of students whose HOCS to be developed, direct intervention of the teacher in the problems faced by the students in self-activities, using extra ordinary directions for the motivation of the students and the higher order cognitive skills of grade 10 students can be developed with the applications of differently suitable higher order cognitive methodology.

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