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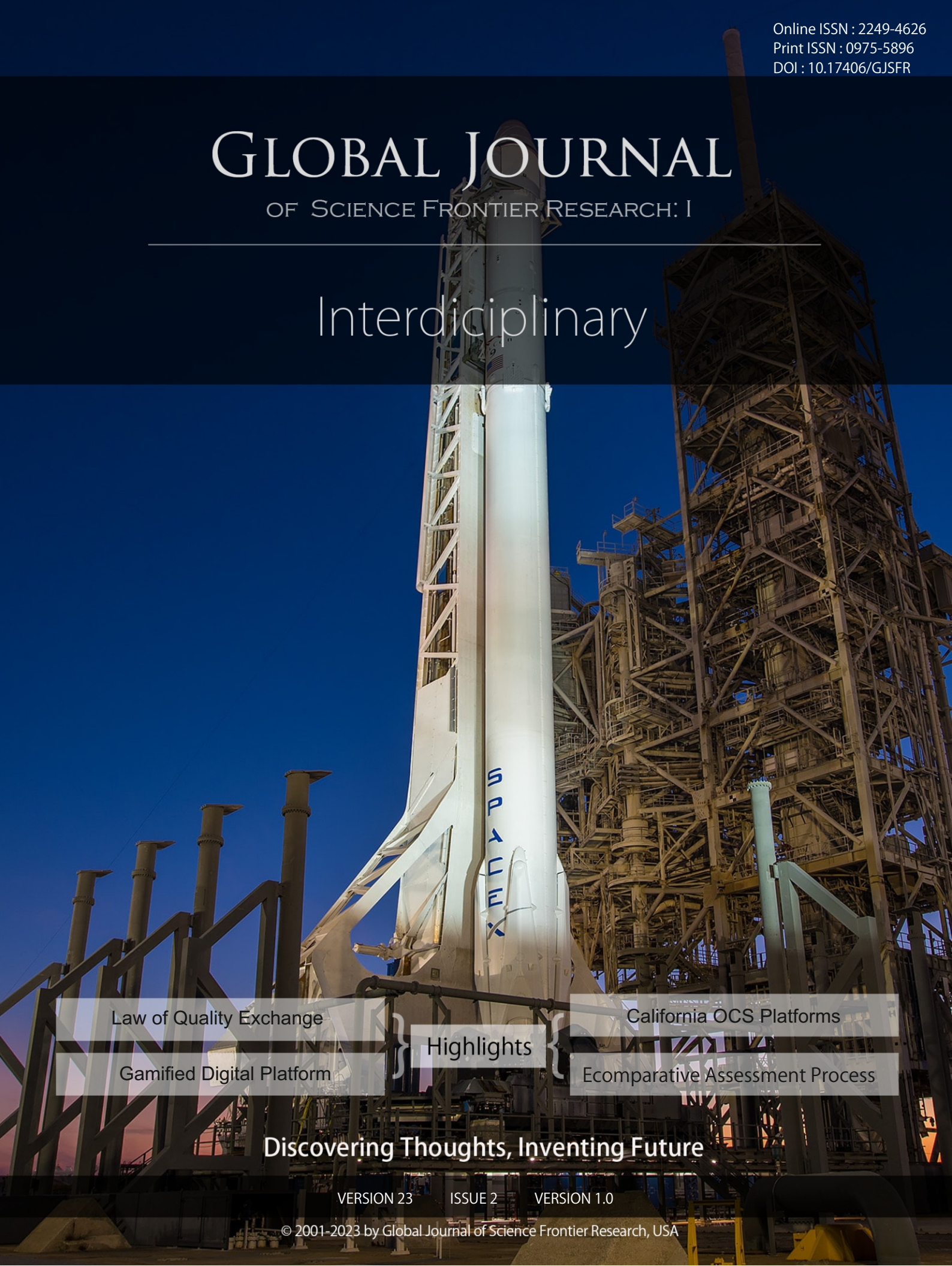

Law of Quality Exchange

Gamified Digital Platform

Highlights

California OCS Platforms

Ecomparative Assessment Process

Discovering Thoughts, Inventing Future

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By John B. Smith & Robert C. Byrd

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John B. Smith [α] & Robert C. Byrd [σ]

Abstract- This paper reviews the legal and regulatory regime for decommissioning oil and gas platforms on the United Kingdom Continental Shelf (UKCS) and in the North Sea and the process followed by UK regulatory authorities in approving an exception (derogation) to the requirement to fully remove all structures. This exception allows the footings, i.e., the lower base section of the jacket structure, of large steel jacketed platforms to remain *in-situ*. The paper provides details on how UK Platform Ninian North (Ninian) was removed and the Comparative Assessment of decommissioning options prepared by the owners of the platform that supported the decision by UK regulatory authorities to allow the jacket footings to remain *in-situ*. The paper notes that the U.S. Outer Continental Shelf (OCS) Oil and Gas Regulations allow partial removal of platform jackets under some circumstances and that there are eight California oil and gas platforms which have jackets that would qualify for partial removal, i.e., derogation, based on the criteria established for North Sea oil and gas installations. To obtain permit approvals from federal and state regulatory agencies to leave the lower portions of large California platform jackets *in-situ*, the owners of the platforms will need to clearly demonstrate partially removing the jackets is the best overall (optimum) decommissioning option. This can be demonstrated by preparing Comparative Assessments which evaluate platform decommissioning options using safety, technical, environmental, and economic (cost) criteria.

I. Introduction

This paper reviews the legal and regulatory regime for decommissioning oil and gas platforms on the United Kingdom Continental Shelf (UKCS) and in the North Sea and the process followed by UK regulatory authorities in approving an exception (derogation) to the requirement to fully remove all structures by allowing the footings of large steel jacketed platforms to remain *in-situ*.

To be granted an exception, the owners of the platforms are required to prepare a Comparative Assessment of decommissioning options demonstrating partial removal is the best overall (optimum) decommissioning option based on an assessment of technical, safety, environmental, societal, and economic (cost) factors. The requirements for Comparative Assessments are specified in Guidance Notes issued by UK regulatory authorities. To date, the jackets of five large platforms have been approved to be partially removed by UK regulatory authorities with their footings remaining *in-situ*. This paper summarizes the results of a Comparative Assessment prepared for Platform Ninian North (Ninian) that supported the decision by UK regulatory authorities to allow the jacket footings to remain *in-situ*. The paper notes there are eight California oil and gas platforms having jackets that would qualify for derogation consideration based on the criteria established for North Sea oil and gas installations. Based on the UK practice, the authors believe a strong case can be made for leaving the lower jacket structure (footings) of large California platforms *in-situ* by preparing Comparative Assessments of decommissioning options. The Comparative Assessments would likely show that partial removal of the large jackets is the optimum decommissioning option. It would also provide Federal and state regulatory agencies with project related technical, safety and cost information on decommissioning options that is not typically included in environmental impact assessment documents prepared to satisfy National Environmental Policy Act (NEPA) requirements but is critical to informed decision-making.

a) UK Legal and Regulatory Regime

The decommissioning of offshore oil and gas infrastructure on the UKCS is primarily governed by the Petroleum Act of 1998, as amended by the Energy Act of 2016. The Petroleum Act sets out the requirements for a formal Decommissioning Program which must be approved by the UK Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) before the owners of an offshore installation or pipeline may proceed with decommissioning. OPRED is a regulatory body within the Department for Business, Energy, and Industrial Strategy (BEIS).

The OPRED has issued Guidance Notes (UKBEIS, 2018) describing the regulatory requirements set out in the Petroleum Act and Energy Act, and the UK's obligations under international treaties, namely the United Nations Convention on the Law of the Sea 1982, which prohibits the disposal (dumping) of platforms and other man-made structures at sea without the express prior approval of the relevant coastal state. The International Maritime Organization (IMO) has issued guidelines and standards requiring signatory coastal states to ensure that unused oil and gas installations are removed in whole or in part where there is no

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1

reasonable justification for allowing the installation to remain on the sea floor.

The UK, along with 14 other European government bodies (contracting parties), is also a signatory to the Convention for the Protection of the Marine Environment of the North-East Atlantic 1992, more commonly known as the OSPAR Convention. Under OSPAR Decision 98/3, the topsides of all oil and gas installations and the jackets of platforms weighing less than 11,023 short tons[1](10,000 metric tons) must be returned to shore for recycling and disposal (OSPAR, 1998). In addition, all installations put in place after February 9, 1999 (when OSPAR 98/3 came into force) must be completely removed. However, OSPAR 98/3 also provides exceptions (derogations) on a case-by-case basis for removing certain installations that may be difficult to entirely remove due to technical and/or safety factors[1].

To obtain OPRED approval for a derogation, the owners of the installation must conduct consultations with stakeholders and prepare a detailed Comparative Assessment of decommissioning options to identify the optimum or best option. The OPRED also requires owners/operators to prepare an Environmental Impact Assessment (EIA) to analyze environmental impacts of decommissioning activities and potential mitigation measures which would be implemented to minimize those impacts. The installations that qualify for potential derogation consideration are:

- Steel constructions (excluding topsides) weighing more than 11,023 short tons installed before February 9, 1999, where the footing may remain in place.
- Gravity based concrete installations, floating concrete installations, and any concreteanchor-base installed before February 9, 1999.
- Other unused offshore installations when it is possible to demonstrate exceptional and unforeseen circumstances resulting from structural damage, deterioration, or similar difficulties.

To comply with OSPAR requirements, UK oil and gas regulations also require partially removed installations be removed to a minimum depth of 180 feet(55 m) below the ocean surface (Mean Low Water/MLW) to ensure navigation safety. We note that the US Coast Guard similar safe navigation reference depth is 85 feet.

Prior to granting a derogation, and as part of the consultation process, BEIS must provide notification to the OSPAR Executive and other contacting parties who may provide comments and issue an opinion on the proposed derogation. There is no requirement for an owner of an installation to prepare a Comparative Assessment nor for BEIS to consult with the OSPAR Executive and contracting parties for cases where full removal is the chosen option. Under sections 29 and 34 of the 1998 Petroleum Act, owners of facilities are perpetually liable for partially removed structures (UKBEIS, 2018). Owners are also required to develop a monitoring plan for structures like jacket footings approved to remain *in-situ* on the seabed.

b) UK Comparative Assessment Guidelines

The UK BEIS Guidance Notes for Decommissioning of Offshore Oil and Gas Installations and Pipelines include an annex with guidelines for conducting and preparing Comparative Assessments documentation (UKBEIS, 2018). The BEIS guidelines follow the requirements specified for comparative assessments set out in Annex 2 of the OSPAR Decision 98/3. The guidelines provide information on assessment criteria (safety, technical, environmental, societal, economic), topics to be considered, and decommissioning options. Listed below are some of the key provisions of the guidelines. Additional details on the provisions can be found in Annex 2 of the BEIS Guidance Notes.

i. *General*

- Operators must assess the impact of each option using established methodologies.
- The preferred option should be selected by focusing on the matters where the impacts of the options are significantly different.
- Options where the safety risks are intolerable or involve major unacceptable environmental impacts may be ruled out without further consideration.
- Balancing the safety and environmental impacts of the options, including the impact on climate change, will clearly be important.
- Proportionality must also be considered but it is unlikely that cost will be accepted as the main driver unless all other matters show no significant difference.
- The engagement of interested stakeholders in balancing the impacts of the options is strongly recommended.
- The studies and the assessment process that supports the chosen decommissioning option should be reviewed by independent experts.

ii. *Safety*

- In assessing and comparing the safety risks of different options the general principles of risk management used within the industry should be applied.
- The use of quantitative risk assessment (QRA) techniques should be employed [e.g., Potential Loss of Life (PLL)].

[1] All weights cited in this paper are reported as short tons (2000 pounds) except HLV lift capacities which are in metric tons (1000 kg or 2200 pounds).

- A comparison should be made with the risk levels generally supported by the Health & Safety Executive (HSE); HSE defines the maximum tolerable level of individual risk of fatality as 1 in 1,000 man-years.

iii. *Environmental*

- The assessment and comparison of the environmental impacts of different options should be based on an Environmental Appraisal carried out in accordance with the widely recognized techniques and standard methodologies for such evaluations.
- An assessment of the impact of all activities at the offshore location and at the onshore dismantling and disposal site should be carried out.

iv. *Technical Feasibility*

- Recognized Quantitative Risk Assessment techniques, engineering and operational analysis should be used in combination to provide comprehensive, robust, quantitative, and qualitative assessments of the options.
- A comparison should be made with accepted industry risk assessment criteria for marine operations.
- The assessment of the technical feasibility of different decommissioning options should be based on existing industry experience and available equipment.

v. *Societal*

- The engagement of interested stakeholders will be important to assess and take account of the views of different interest groups.
- The impacts on fisheries and fishing activity both historical and future potential will be of paramount importance.
- Employment and regional development opportunities should be considered.

vi. *Economic*

- In assessing alternative decommissioning options proportionality should be considered and costs should be balanced against the other assessment criteria.

c) UK Platforms Approved for Partial Removal

To date, a total of five steel-jacketed oil and gas platforms have been approved by OPRED to be removed with the footings of the jackets remaining *in-situ.* The jacket footings and drill muds and cuttings found at the base and surrounding the perimeter of the jacket were approved to remain *in-situ* based on the results of Comparative Assessments of decommissioning options conducted by the platform owners. The first large platform approved to be removed with the jacket footings remaining *in-situ* was Platform North West Hutton in 2009. This was followed by Platform Murchison in 2017, Miller in 2018, Brent Alpha in 2020, and Ninian in 2022. Table 1 provides information on the water depths of the platforms and the total combined and individual weights of the topside and jacket. Also shown are the estimated weights of the jacket footings approved to remain *in-situ*, the percentage of the total jacket weight remaining *in-situ*, and the height the remaining jacket footings rise above the original mudline of the seabed. As can be seen in the data, there is a wide variation in the percentage of total jacket weight (35-70 percent) remaining *in-situ* and the heights the remaining footings rise above the seabed. The variation is due to the different structural designs of the jackets and pilings securing the jackets to the seabed.

Table 1: UK Platform Jackets Approved to be Partially Removed with the Jacket Footings Remaining *In-situ*

Platform	Year Removed	Water Depth (ft)	Total Weight[1,,2] (tons)	Jacket Weight[3] (tons)	Jacket Weight Removed (tons)	Weight of Footings *In-situ (tons)*	Percent of Jacket Weight Remaining *In-situ*	Height of Footings[4] *(ft)*
NW Hutton	2009	472	41,480	19,257	10,141	9,116	47%	130
Murchison	2017	512	57,575	30,476	9,210	21,266	70%	144
Miller	2018	338	52,157.	20,485	13,363	7,122	35%	66
Brent Alpha	2020	460	50,310	31,657	9,382	22,274	70%	183
Ninian	2022	463	33,214	19,487	10,471	9,016	46%	254-290

[1] Combined weight of the topsides and jacket.
[2] Topside/jacket weights are estimated weights reported in decommissioning program documents.
[3] Includes piles, grout, concrete, anodes, marine growth.
[4] Height the remaining footings rise above the original mudline of the seabed.

As noted above, the OSPAR guidelines allow an exception (derogation) to the requirement to fully remove the footings of large steel jackets weighing more than 11,023 tons (excluding topsides). *"Footings"* are defined by OSPAR as those parts of a steel installation which are below the highest point of the piles which connect the installation to the seabed or, in the case of an installation constructed without piling, form the foundation of the installation, and contain amounts of cement grouting like those found in piled installations. The definition also includes those parts of a steel installation which are so closely connected to the footings as to present major engineering problems in severing them (OSPAR, 1998).The footings of large platforms are massive and can account for 35-70 percent of the total jacket weight (see Table 1).

II. Ninian Platform

Ninian was a drilling and production platform situated approximately 100 miles northeast of the Shetland Islands; the platform stood in 463 feet of water and the combined weight of the topside (13,727 tons) and the jacket (19,487 tons) was reported to be 33,214 tons (CNR, 2019). The topside of the platform was fully removed and transported to shore for recycling and disposal. The footings of the jacket (Figure 1) were approved to remain *in-situ* by OPRED based on the results of Comparative Assessment of decommissioning options conducted by the owners of the platform (CNR, 2017).

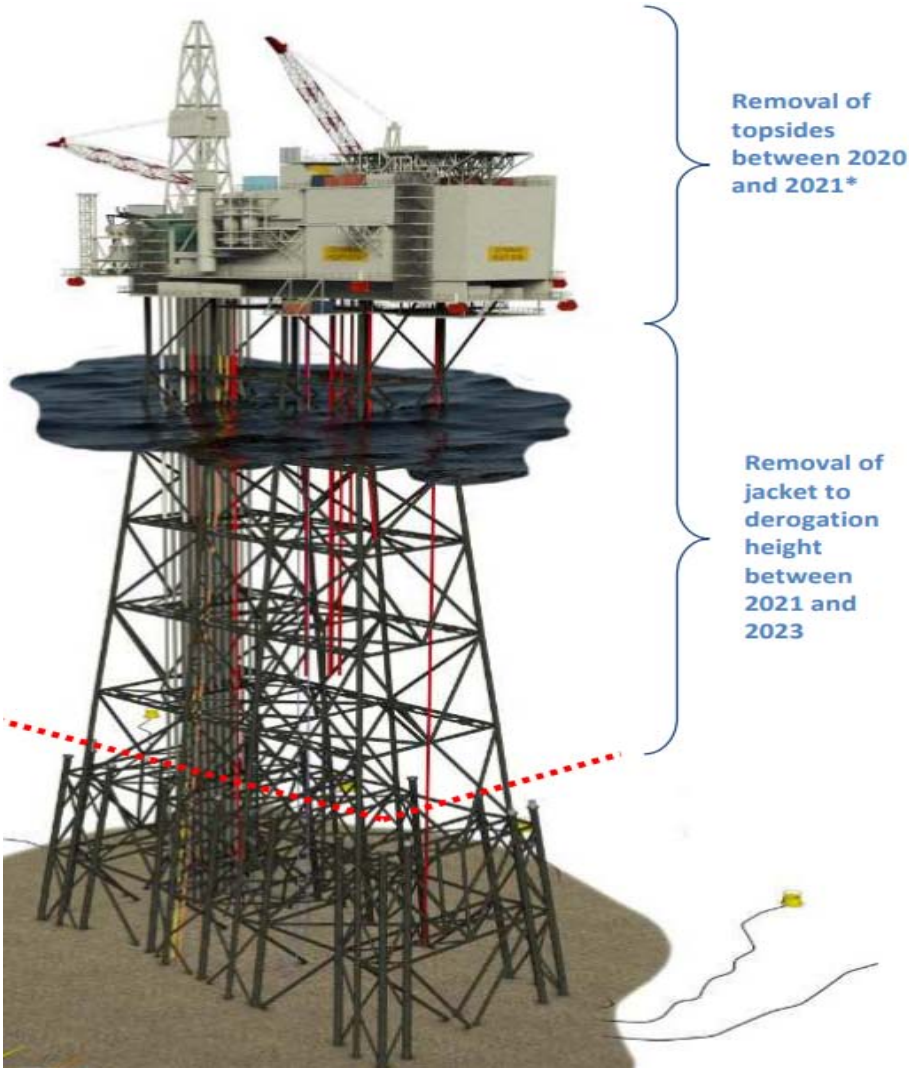


Figure1: Platform Ninian Jacket Showing Footings (CNR, 2019)

Topside Removal: The Ninian topside (15,653 tons) was removed in 2020 by the *Pioneering Spirit* in a single lift and transported by the *Pioneering Spirit* to an inshore location near the Peterson-Veolia yard in Dales Voe, Shetland, where it was transferred to the *Iron Lady,* a large cargo barge owned by Allseas measuring 656 feet in length and 164 feet in width (Allseas, 2022; Offshore Engineer, 2020). The topside was subsequently transported by the *Iron Lady* to the quay at the Peterson-Veolia yard where it was dismantled and recycled.

Jacket Removal: The Ninian jacket was secured to the seabed by 26 structural piles, 8 leg piles (46 in. diameter) and 18 skirt piles (60 in. diameter). The upper portion of the jacket (Figure 2) was removed in a single-lift (8,929 tons) during a 7-day campaign by the *Pioneering Spirit* in April 2022 (Offshore Engineer, 2022). Like the topside, the Ninian jacket was directly transported by the *Pioneering Spirit* to an inshore location where the jacket was transferred to the *Iron Lady.* The *Iron Lady* was then towed by tugboats to the quay of the Peterson-Veolia yard where the *Pioneering Spirit* assisted in offloading the jacket. Approximately 46 percent (9,016 tons) of the total jacket weight (19,487 tons) remains *in-situ.* The remaining footings rise to a height of 254-290 feet above the seabed (CNR, 2019).

Figure 2: Pioneering Spirit Removing the Ninian Jacket (Source, Allseas)

a) Platform Ninian Comparative Assessment

This section summarizes the results of the Comparative Assessment prepared by Canadian Natural Resources International (CNR) to assess the decommissioning options for the Platform Ninian jacket and the drill cuttings pile that had formed at and surrounding the base of the jacket (CNR, 2017). A derogation case for the jacket and drill cuttings pile was submitted to OSPAR for review and subsequently approved by BEIS. The jacket decommissioning options included full and partial removal, the latter option of which also involved leaving the footings of the jacket *in-situ*. A total of five drill cuttings options were assessed:

1. Recover to the surface, treat, and release liquids offshore, transport solids to shore.
2. Recover to surface, slurry to shore.
3. Recover to surface, reinject in offshore disposal well.
4. Disperse drill cuttings on the seabed.
5. Leave *in-situ.*

The Comparative Assessment recommended the Ninian jacket be partially removed to the top of the footings (between 254-290 feet below sea level) using multiple lifts, with the footings remaining *in-situ* (CNR, 2017). This option resulted in a significant reduction in risks to project personnel, environmental impacts, and total costs compared to the full removal option. The assessment also recommended the drill cuttings remain *in-situ* to degrade naturally over time. This option was considered superior to recovering or dispersing the drill cuttings on the seabed based on the lack of proven technology for recovering the drill cuttings, the adverse environmental impacts resulting from dispersal of the drill cuttings, and cost considerations. Each decommissioning option was assessed against the safety, technical, environmental, societal, and total cost criteria established by OSPAR and BEIS to identify the best overall (optimum) decommissioning option. Both quantitative and qualitative data were used to support the assessment. The results of the Comparative Assessment for the Ninian jacket are summarized in Table 2 and described in more detail below. The Environmental Statement prepared by CNR for decommissioning the Ninian platform determined there would be no significant adverse effects on the environment from leaving the jacket footings and drill cuttings pile *in-situ* (CNR, 2017a).

Table 2: Platform Ninian Comparative Assessment Results (CNR, 2017)

Criteria/Metric	Full Removal	Partial Removal	Summary of Key Results
Safety			
• Risk to personnel Potential loss of life (PLL)	2.5 x 10^{-2}	1.0 x 10^{-2}	Full jacket removal increases PLL by 150 percent compared to the partial removal option. For full removal, the PLL is 2.5 x 10^{-2} per annum, or 1 in 40 years; the PLL for partial removal is 1.0 x 10^{-2} per annum or 1 in 100 years.
• Risk to other users of the sea	0	2.3 x 10^{-5}	Full removal eliminates the risk to other users. Partial removal creates a long-term hazard to fishermen from the potential snagging of fishing gear on the remaining footings. The PLL for fishermen is extremely small, 2.3 x 10^{-5} per annum or 1 in 43,103 years.
Technical			
• Technical feasibility	25%	100%	Full removal is much more technically challenging than partial removal.
• Use of proven technology and equipment	33%	100%	The techniques and equipment required to remove the footings do not have a proven track record. This increases the probability of a forced deviation (excursion) from planned operations.
• Ease of recovery from excursion	75%	100%	Full removal is more likely to result in an excursion which can cause a delay or extension of removal operations and an increase in costs compared to partial removal.
Environment			
• Environmental impacts	66%	100%	Full removal results in greater offshore and onshore environmental impacts than partial removal due to the larger volume of steel removed and processed.
• Energy consumption (Gigajoules)	297,654	530,148	Energy usage is higher for partial removal due the energy required to manufacture new metals equivalent to the weight of the footings remaining *in-situ*.
• Air Emissions CO2 equivalent (metric tons)	24,277	31,064	There is no significant difference in emissions to the atmosphere between full and partial removal.
Societal			
• Commercial impact on fisheries	100%	94%	There is no significant difference on fish catch between full and partial removal; the obstruction caused by the footings has a footprint of less than 2.5 acres and is situated in an area where the level of fishing activity is low to moderate.
• Socioeconomic impact on amenities	100%	100%	The socioeconomic impact of full and partial removal on amenities are equivalent.
• Socioeconomic impact on communities	100%	100%	The socioeconomic impacts of full and partial removal are equivalent.
Economic			
• Total project cost	53%	100%	Full removal increases removal costs by 46% compared to the partial removal option.

i. *Safety*

The safety assessment determined full removal of the jacket would result in a 150 percent increase in risk to project personnel compared to the partial removal option. For full removal, the Potential Loss of Life (PLL) was calculated to be 2.5 x 10^{-2} per year (1 in 40 years); the PLL for partial removal was 1.0 x 10^{-2} per year (1 in 100 years). The PLL for full removal was much higher than the maximum tolerable PLL limit of 1 x 10^{-3} per year (1 in 1,000 years) established by the UK Health and Safety Executive (HSE) and violated the UK regulatory principle that risks should be reduced to as low as reasonably possible (ALARP). The increase in risk for full removal was due in-part to the larger number of lifts required to fully remove the jacket compared to the partial removal option. This increased the overall length of time to complete the removal work thereby increasing the exposure risk to personnel participating in decommissioning activities. The Comparative Assessment acknowledged partial removal of the jacket

would create a long-term hazard to fishermen from the potential snagging of fishing gear on the remaining footings. The PLL for fishermen was calculated to be extremely small, 2.3×10^{-5} or 1 in 43,103 years.

ii. *Technical*

The technical assessment determined full removal of the Ninian jacket would be much more complex and technically challenging than partial removal; it also determined the techniques and equipment required to remove the large Ninian footings did not have a proven track record. The use of novel or unproven techniques increases the probability the removal techniques could fail, necessitating an excursion (deviation) in planned operations resulting in a delay or postponement of operations and an increase in costs. Among the technical challenges were:

1. *Jacket stability:* Progressive cutting of the jacket renders the remnant jacket less rigid and potentially unstable, increasing the potential for collapse of the structure.
2. *Cutting tool deployment:* Below the derogation height (top of the pilings) there were numerous diagonal cross members within the complex steel lattice framework of the jacket that would be difficult to access, cut and remove using remotely operated vehicle (ROV) deployed mechanical and abrasive cutting tools. This increased the potential that inherently risky diver intervention services would be required to assist in positioning or retrieving cutting equipment.
3. *Failed cuts:* Diamond wire and abrasive water jet cutting techniques are prone to operational difficulties that can lead to incomplete cuts. Failure to make the complete cuts required to free each jacket section for lifting could result in the crane and other equipment on the heavy lift vessel (HLV) being exposed to a severe risk of damage due to the loss of stability and structural integrity of the section being removed.
4. *Pile severing:* The Ninian jacket was secured to the seabed by 26 piles (8 leg piles and 18 skirt piles) many of which were grouted with cement (CNR, 2017). Failure to obtain internal access to the piles would require excavation of large pits around the piles to provide access for divers to deploy mechanical or abrasive cutting tools to externally sever the piles, thereby exposing divers to significant risks from collapse of the pit walls.
5. *Dropped objects:* Cutting the footings into sections would result in unstable loads that when lifted by the HLV crane and loaded onto vessels or cargo barges would increase the potential for dropped objects and risk of injuries and fatalities to project personnel.

iii. *Environmental*

The environmental assessment noted the full removal option resulted in greater environmental impacts than partial removal. The primary factors differentiating the two options were the scale of operations and the physical presence of jacket footings left *in-situ*. The full removal option involved removing nearly 20,000 tons of steel, nearly double the tonnage removed in the partial removal option. The full removal option therefore required a larger vessel spread and resulted in more vessel traffic and anchoring activity than the partial removal option. Full removal also required the footings to be removed to a depth of nine feet (UK regulatory requirement) below the seabed resulting in disturbance of the drill cuttings pile and the potential release of hydrocarbon contaminants in the marine environment. The drill cuttings pile would not be disturbed under the partial removal option. Full removal also resulted in more onshore impacts (increased noise, traffic, emissions, landfills). The assessment also acknowledged the potential environmental impacts associated with the release of contaminants from the jacket and shell mounds as they degrade naturally in the marine environment. The impacts were determined to be insignificant.

iv. *Societal*

The results of the assessment showed there was no significant difference on impacts on commercial fisheries between the full and partial removal options. The assessment noted the obstruction caused by the footings had a footprint of less than 2.5 acres and was situated in an area where the level of fishing activity is low to moderate. The assessment also showed the socioeconomic impact on amenities (i.e., employment, public services) to be equivalent for full and partial removal options.

v. *Economic*

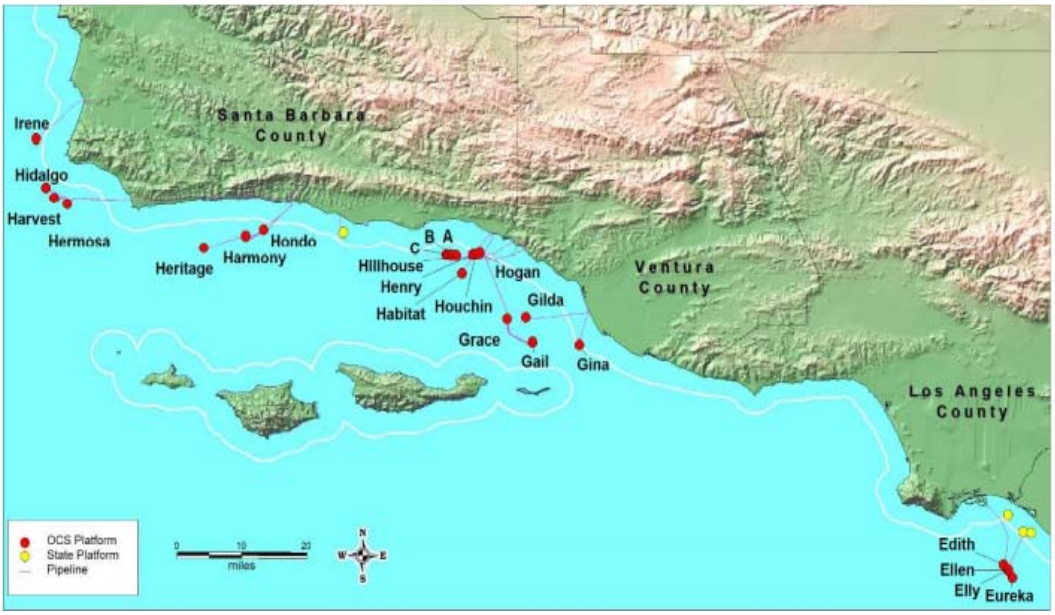
The economic assessment determined full remove would increase total project costs by 46 percent compared to the partial removal option. The significant increase in costs for the full removal option was driven by the larger tonnage of steel required to be removed, and the longer duration and complexity of operations compared to partial removal.

b) California Decommissioning Overview

There are a total of 27 oil and gas platforms located off the coast of California, 23 on the federal Outer Continental Shelf (OCS) which are located beyond three nautical miles offshore, and four in state waters (Figure 3). The OCS platforms are in water depths ranging from 95 to 1,198 feet, and range in size from small structures like Gina having a total weight of 1,400 tons, to ultra-large structures like Heritage and Harmony having estimated removal weights ranging from 69,000 to 87,000 tons (TSB Offshore, Inc., 2016). At the close of

2022 eight (Gail, Grace, Harvest, Hermosa, Hidalgo, Habitat, Hogan, Houchin) of the 23 OCS platforms were on terminated leases and in the early stages of being decommissioned (Tab.3)The full removal of Platforms Gail (739 ft. wd.), Harvest (675 ft. wd.), and Hermosa (603 ft. wd.) would each establish a world water depth record (approximately 500 ft. wd.) for fully removing conventional oil and gas platform jackets from the seafloor (Chevron, 2022).

In contrast to the North Sea and the Gulf of Mexico (GOM) where numerous oil and gas platforms have been decommissioned, there is little or no infrastructure available in California to support large oil and gas platform decommissioning operations. There are currently no heavy lift vessels (HLVs) stationed on the U.S. west coast that have capability to remove the large OCS platforms efficiently and safely. The HLVs would need to mobilize from the North Sea, GOM, or other distant locations at great expense (Smith and Byrd, 2023). There are also no port-based facilities in California that have the capability to offload and process the topside components and jackets of the large OCS platforms. Absent the construction of new or expanded materials disposal facilities, the dismantled topside and jacket sections are likely to be loaded onto cargo barges and towed to materials disposal yards in the GOM or overseas locations.



(Source, MRS Environment, Inc.)

Figure 3: California OCS Oil and Gas Platforms

Table 3: Federal OCS Platforms Located Offshore California

Platform	Year Installed	and Age in Years	Operating Status 2nd Qtr. 2023	Water Depth (feet)	Estimated Removal Weight (short tons)	Wells Drilled	OCS Operator[1]
San Pedro Bay – Los Angeles County							
Eureka	1984	38	Producing	700	33,377	50	BOC
Elly[2]	1980	42	Producing	255	9,400	0	BOC
Ellen	1980	42	Producing	265	11,655	63	BOC
Edith	1983	39	Producing	161	8,556	18	DCOR
Eastern Santa Barbara Channel – Ventura and Santa Barbara County							
Hogan	1967	55	Leases terminated	154	5,098	39	BWEG[3]
Houchin	1968	54	Leases terminated	163	5,615	35	BWEG[3]
A	1968	54	Producing	188	4,896	52	DCOR
B	1968	54	Producing	190	4,959	57	DCOR
C	1977	45	Producing	192	5,718	38	DCOR
Henry	1979	43	Producing	173	4,006	23	DCOR
Hillhouse	1969	53	Producing	190	5,834	47	DCOR
Gina	1980	42	Producing	95	1,380	12	DCOR

Gilda	1981	41	Producing	205	11,293	63	DCOR
Habitat	1981	41	Leases terminated	290	9,611	20	DCOR
Gail	1987	35	Leases terminated	739	37,057	28	BWEG[4]
Grace	1979	43	Leases terminated	318	13,074	28	BWEG[4]
Western Santa Barbara Channel – Santa Barbara County							
Hondo	1976	46	Shut-in	842	29,478	28	XOM
Harmony	1989	33	Shut-in	1,198	86,513	34	XOM
Heritage	1989	33	Shut-in	1,075	69,192	48	XOM
Santa Maria Basin – Santa Barbara County							
Harvest	1985	37	Leases terminated	675	35,150	19	FMC
Hermosa	1985	37	Leases terminated	603	30,868	13	FMC
Hidalgo	1986	36	Leases terminated	430	23,384	14	FMC
Irene	1985	37	Shut-in	242	8,762	26	FMC

[1] Beta Operating Company, LLC (BOC); Dos Cuadras Offshore Resources, LLC (DCOR); Beacon West Energy Group, LLC (BWEG); ExxonMobil Corp. (XOM): Freeport McMoRan Oil, Gas, LLC (FMC)
[2] Platform Elly is a production handling and processing platform for Platforms Ellen and Eureka.
[3] BWEG is ConocoPhillips Agent for monitoring and maintaining Platforms Hogan and Houchin.
[4] BWEG is Chevron's Designated Agent for decommissioning purposes.

c) Federal and State Decommissioning Regulations

The U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE) and Bureau of Ocean Energy Management (BOEM) regulate OCS oil and gas leasing, development, and decommissioning activities under the authority granted by the OCS Lands Act and its implementing regulations found in Title 30, U.S. Code of Federal Regulations. Under the OCS regulations (30 CFR §250.1700-1754; BSEE,2020), when a platform is no longer useful for operations, operators are required to:

1. Permanently plug all wells.
2. Remove all platforms and other facilities to a depth of 15 feet below the mudline.
3. Decommission all pipelines.
4. Clear the seafloor of all obstructions on the lease or pipeline right-of-way.

The OCS regulations (30 CFR §250.1728) require platforms and other facilities (including templates and pilings) to be removed to a depth of at least 15 feet below the mud line. The regulations also allow BSEE to approve an alternate removal depth if any one of the following conditions is met:

1. The remaining structure would not become an obstruction to other users of the seafloor or area, and geotechnical and other information demonstrates that erosional processes capable of exposing the obstructions are not expected.
2. The company responsible for decommissioning determines, and BSEE concurs, the use of divers is required, and seafloor sediment stability poses safety concerns.
3. The water depth is greater than 2,624 feet (not relevant offshore California where water depths of platforms are less than 1,198 feet).

The regulations also allow BSEE to grant a departure from the requirement to remove a platform if the structure is converted to an artificial reef. To grant a departure from removing an OCS platform, the following conditions must be met:

1. The structure becomes part of a State artificial reef program.
2. The responsible State agency acquires a permit from the U.S. Army Corps of Engineers and accepts title and liability for the structure.
3. U.S. Coast Guard navigational safety requirements for the structure are satisfied.

d) Partial Removal Benefits

In the North Sea oil and gas platform jackets installed before 1999 weighing more than 11,023 tons can be approved by regulatory authorities to remain *in-situ* if Comparative Assessments of decommissioning options conducted by the owners of the facilities demonstrate partial removal is the best overall (optimum) option taking into consideration safety, technical, environmental, societal, and economic criteria. There are a total of eight OCS platforms (Eureka, Gail, Harvest, Hermosa, Hidalgo, Harmony, Heritage, and Hondo) located offshore California that would qualify for derogation consideration based on their jacket/pile weight (>11,023 tons) and date of installation (prior to 1999) if they were in the North Sea (Table4). The OCS platforms are in water depths ranging from 430 to 1,198 feet and have estimated jacket/pile removal weights ranging from 12,950 to 55,250 tons.

Table 4: California OCS Platforms that Would Qualify for Partial Removal Consideration in the UK and North Sea Under OSPAR (TBS, 2016)

Platform	Year Installed	Water Depth (ft)	Topside Removal Weight (tons)	Jacket/Pile Removal Weight (tons)	Total Removal Weight[1] (tons)	Number of Piles	
						Main	Skirt
Eureka	1984	700	8,000	21,000	33,377	24	0
Gail	1987	739	7,693	22,300	37,057	8	12
Harvest	1985	675	9,024	20,016	35,150	8	20
Hermosa	1985	603	7,830	19,500	30,868	8	20
Hidalgo	1986	430	8,100	12,950	23,384	8	8
Harmony	1989	1,198	9,839	55,250	86,513	8	20
Heritage	1989	1,075	9,826	46,370	69,192	8	26
Hondo	1976	842	8,450	15,100	29,478	8	12

[1] Includes conductor weight.

Decommissioning plans for four of the platforms (Gail, Harvest, Hermosa, Hidalgo) are expected to be submitted to BSEE for review and approval in the near term (BSEE, 2022). The platforms are in water depths ranging from 430 to 739 feet and have estimated jacket/pile removal weights ranging from 12,950 to 22,300 tons. Platform Ninian, in comparison, was in 403 feet of water and had an estimated jacket/pile removal weight of 19,487 tons. The full removal of jackets of Gail (739 ft. wd.), Hermosa (603 ft. wd.), Harvest (675 ft. wd.) and Hidalgo (430 ft. wd.) and the other deep-water platforms will be technically challenging due to the massive size of the jacket footings, the structural complexity of the jackets, and the numerous piles (16 to 28 per platform) securing the jackets to the seabed. To date, there have been no projects where jacket footings of this size and water depth have been removed from the seabed.

The safety, technical, environmental, and economic benefits resulting from partial rather than full removal of the Platform Ninian jacket were documented in the Comparative Assessment of decommissioning options prepared for the removal of the structure (see Table 2). Similar benefits are likely to be achieved if the jacket footings and drill cuttings of large California platforms are approved to remain *in-situ* rather than being fully removed. Highlighted below are some of the likely benefits that could be achieved by partially removing the jackets of large California platforms.

i. *Worker Safety*

- Partial removal significantly reduces the potential risks of deaths and injury to project personnel.

ii. *Technical*

- Partial removal is much less complex, requires less time, uses proven technology, and is much less likely to be impacted by adverse weather/ oceanographic conditions and technical issues resulting in postponement, delay, or extension of removal operations.

iii. *Environmental*

- Partial removal results in a significant reduction in environmental impacts, both offshore and onshore.
- Partial removal obviates the need to use explosives, which may be required if the legs and piles of the jacket cannot be completely severed internally using mechanical and abrasive cutting tools.
- Partial removal results in a large reduction in construction related emissions. A study of a large California platform (Harvest) estimated partial removal (reefing the jacket *in-situ*) would result in up to a 10-fold reduction in emissions (Smith and Byrd, 2021).
- Partial removal retains established marine habitats having high ecological value. Scientific studies show California platforms are among the most productive marine habitats globally (Claisse et al., 2014); the studies also show approximately 90 percent of the fish biomass and secondary fish production would be retained if the upper portion of the jacket was removed to a depth of 85 feet below the ocean surface and the remaining structure is left standing *in-situ* (Claisse, et. al., 2015).

iv. *Economic*

- Partial removal results in a significant reduction in total project cost.
- Studies in the UK show removal costs would be reduced 37-75 percent (CNR, 2019; CNR, 2014; BP, 2011).
- Studies show the cost savings could range from $60 million to $160 million or more if a large California platform was converted to an artificial reef (Smith and Byrd, 2020).
- Under the California Marine Resources Legacy Act (AB 2503) 80 percent of the cost savings would go to the State to fund ocean conservation if a partially removed jacket is converted to an artificial reef.

III. Summary and Conclusions

There are 27 steel-jacketed oil and gas platforms located offshore California, eight of which have jackets that would qualify to be considered for partial removal (derogation) under OSPAR if they were in the North Sea. To date, five large platforms have been approved to be partially removed on the UKCS with their jacket footings and drill muds and cuttings remaining *in-situ*. The derogated jackets were approved to remain *in-situ* by UK regulatory authorities based on the results of Comparative Assessments of decommissioning options conducted by the owners of the facilities demonstrating partial removal of the jackets was the best overall (optimum) decommissioning option taking into consideration technical, safety, environmental, societal, and economic criteria. Of the eight California platforms that would qualify for partial removal consideration in the North Sea, four (Gail, Harvest, Hermosa, Hidalgo) are expected to be removed by the end of the decade. The full removal of platform jackets will be technically challenging and establish new world water depth records for conventional steel-jacketed structures. To date, there have been no projects where jacket footings of this size and weight have been removed from the seabed.

Based on the practice followed in the UK, the authors of this paper believe a strong case can be made for allowing the jacket footings of the platforms to remain *in-situ* at or below a safe navigation depth acceptable to the U.S. Coast Guard, likely 85 feet, irrespective of whether the jacket is converted to an artificial reef. To obtain permit approvals from federal and state regulatory agencies to leave the footings of the jackets and drill cuttings *in-situ*, the owners of the platforms will need to clearly demonstrate that partially removing the jackets is the optimum decommissioning option. This can be demonstrated by adopting the practices that have been followed in the UK and North Sea under OSPAR for preparing Comparative Assessments of decommissioning options. The authors recommend the operators of large OCS platforms offshore California and in the Gulf of Mexico who propose to partially remove platform jackets prepare Comparative Assessments to support their decommissioning applications. The Comparative Assessments can also be prepared to support the case for allowing partial removal of smaller platform jackets and allowing pipelines and drill muds and cuttings to remain *in-situ*.

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On Centromeres' Evidential Values in Physical Cosmology

By Yang I. Pachankis

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GJSFR-I Classification: *FOR Code: 0202*

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Yang I. Pachankis[1]

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I. Introduction

In the matters on the origins of life, there is an ambiguity in causal inference concerning cosmology. Scientific and epistemic endeavors are extensive from human activities, and are anthropological in nature. No scientific theories claim or would claim the origins of life marking the origin of the universe. Therefore, physical inferences on cosmological causalities are inverted in nature, with the observers or discoverers in the bottom of the causal chains [1, 2].

Intriguingly, the dilemmas of physical cosmology are no different from the theological logics in knowing your creator. No matter how the universe began, materials from the vicinity must have come from cosmic origins; homophony of structures may be the key to locate the physical reference sampling points for causal inference [3].

The homophony is found between the fifth cosmic force and human DNA epigenetics. There is a nuclear structural similarity between the breakage fusion bridge (BFB) in DNA transcription, division, and replication cycles [4, 5], and the asymptotic momentum between the charged spinning black hole and white hole on NGC 3034 [6]. It is hypothesized that both nuclear processes are regulated by antimatter electromagnet-tism, namely the quasitopological electromagnetism with annihilation activities [7].

The article synthesizes the evidence from existing literature and previous experiments in astrophysics and cosmology. The evidence suggests that there might be homogenous material components between white holes and centromeres, which may only be revealed by scission point transitions with fusion activities. The transition links the fifth cosmic force.

II. Methods

The methods follow an analytic framework on proton-motive force (PMF) in the transmembrane fusogenic domain in organizing the paths with existing literature [8, 9]. The analytic framework, therefore, constitutes bioenergetic nuclear oscillation analysis.

Albeit meiosis is easily understood in terms of the nuclear fission process, there is a knowledge gap in the origins of biomaterial capacities for mitosis. The null hypothesis is thus derived from the black hole and white hole thermonuclear binding research [10] that the exotic fissile biomaterial originated from white hole oscillation by the fifth cosmic force. A constructive perspective is adopted to the null hypothesis, treating the finite multiplication in breakage-fusion-bridge-breakage mechanism the consumption of biomaterial capable of mitosis [4].

The first subsection explores the logically deductible limit in chromatid research from the premise. With the analyses of the dipole momenta regarding cell division plane, further research on the source of asymmetry at the prophase is structured in the second subsection. Gamma-ray-induced fast-neutron polymerization and apoptosis rates' correlations have been analyzed in the second subsection, in relation to centromere's functions in transitioning between fission and fusion in DNA activity cycles. The third subsection reverts the causal reference to causal inference from the DNA basis of bioenergetic activities fueling consciousness and cognitive activities.

a) Fission Limit in Finite Telophase Division

All three electromagnetic (EM) dynamics are possible in telophase for separation: 1) electron-electron repulsion, 2) positron-positron repulsion, and 3) electron-positron annihilation. The former two's differences with the latter only preside with energy emission levels during telophase, and inductive to the dipole movements in anaphase, metaphase, prometaphase, and prophase, respectively [11]. Polarity on the orientation of cell division plane involves cell division axis, an intracellular signaling network, mitotic spindle controlled by cellcortex polarity-related molecules, partitioning defective (Par) complex functioning as a master polarity determinant, and cell

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geometry in degree of freedom [12]. The perpendicular elongation of Src kinase-inactive cells (SYF-KD) long axes to direct-current electric field vector suggests a pro-annihilation force by induced electric field gradient, possibly counteracted by the strong and weak forces [12]. It implies that the depreciation of the biomaterial during mitosis fission may be caused by annihilation during telophase. The double-helix DNA structure may therefore be interpreted as a result of EM force field maintained by cortical polarity, and regulated by the weak force between the coupled strands, where chained critical fission underlies the mutation processes.

Telophase annihilation can only be a direct-current inducing environment, and only an alternating-current environment in anaphase may shift towards the electrodynamic equilibrium, driven by the growing weak force / strong force ratio in metaphase with the Par complex [13], resulting from microtubule bombardments on the nuclear area in prometaphase[11]. With anaphase the shortest stage of mitosis [11], chromatid separation by Cut2 fission yeast Schizosaccharomyces pombe is accompanied with Cut1-associated continuing replication until the metaphase-anaphase transition, halted by immunoblotting anti-Cut2 antibodies and immunoprecipitated anti-HA antibodies acting on both [14].

The transitions in anaphase can be critical for fission-fusion phase transitions in the breakage fusion bridge (BFB) breakage cycle. Large-scale genome rearrangement and assembly by polymerase chain reactions (PCRs) experiment has corroborated with this assertion [15]. Pentameric ligand-gated ion channel (pLGIC) and hydrodynamic pH scattering correlations with allosteric regulation underlie the proton-gating of the process [16], which is explanatory of the Par protein behaviors [13] with the variable of PMF in vectorization, with hydroxyl anions [9, 17]. Gloeobacterviolaceus (GLIC) potentially senses pH environment with a protein-lipid mechanism, and proton-sensing residues located in opposite loop F, which may bypass the classic agonist-binding site [16]. In particle physics terms, flavor symmetry and isospin in liquid-liquid interactions govern the complex process in one-pore and two-pore fusogenicity inside and outside of the cell membrane respectively. The fission-fusion transition in DNA multiplication and proton-gating phenomenon imply an asymmetry at the prophase, possibly contributed by cations [18].

b) Centromere in Telomere Breakage Fusion Bridge

The epigenetic expressions in centromere are key to the prophase asymmetry, and causally relevant to the asymptotic transitions between fusion and fission. If annihilation underlies the separation-breakage in the BFB and BFB-Breakage cycles [4, 5], determination of the scission point and subsequent fusogenetic activities are dependent on the material components of the centromere. Most centromeres do not appear to have well-defined lncRNA genes with distinctive genic features such as promoters, splice sites, and polyadenylation signals [19], and they form in both repetitive and non-repetitive regions of DNA [5]. The collection of evidence implies that not only centromeres' formation is determined by asymptotic momenta, but also that the asymptotic momenta are determined by the post-annihilation environment similar to the functions of EM fields in many fusion devices with the foundations of Maxwell [20].

Bystander effects may be crucial for chromosome segregation accuracy. Transcription cannot happen without centromeres nucleating the assembly of the kinetochore, for sister halves to attach to spindle microtubules [21]. Position-dependence of spindleforces and poles determine the length of spindles and subsequently kinetochore behaviors, especially in metaphase steady-state [22]. This supports the possibilities of aftershock from electron-positron annihilation in telophase to the prometaphase nuclear envelope opening and pole-spindle rearrangements [11, 23]. With mitotic centromere transcription linked to the active kinetochore, such a process with bystander effects may be contributed by the limited centromere transcription capacities [21].

Reference planes for linearity in the dynamics are essential for structural understandings. Although resistance force exists in kinetochores' counteractions to spindle force, with approximated linearity with movement velocity on a molecular scale [22], however, the repetitive nature of centromeres lacks of linear reference models [21]. This can be contributed by the scission point functions of centromeres on fusion transitions and the force proximal to the fifth cosmic force. Relative biological effectiveness (RBE) in neutron exposures [24] and the structureless quark residues from electron-positron annihilation [25] further complicate field analyses. Gamma-ray-induced fast-neutron polymerization can be a nuclear chemical substitute for further studies [26], supported by the lack of bystander effect with direct neutrons, regardless of photons, and its reinstallment by gamma rays, or high doses of photons, in controlling irradiation in cells [24].

c) Consciousness and Epistemic Evidence

Formation of a newly structured understanding for reference planes may better bridge the gaps between quark spins and Higgs mechanism. The first step is the falsification of Riemann hypothesis concerning the critical line of $\frac{1}{2}$ for a new dimension vista [27]. If the PMF constitutes the hidden autonomous dimension to our consciousness, hence epistemic activities and cognition, the dimensional ascension of consciousness to the non-unique critical line of nontrivial zeros [27] dissects the introspective bioenergetic plane and projective cosmic plane.

If the scientific approach to cosmology is inevitably subjective epistemology, the epigenetic consciousness to the origins of life is equivalent to the origin of death wish in psychoanalytic terms, just as moths to the sources of fire. The finite fission capacities of genetic biomaterials are determined by the cosmic origins of materials that constitute the fundamental blocks. The false-positive result on the fifth cosmic force in Figure 1 does not exclude the possibilities of material forms beyond the existing component blocks of life; therefore, fulfilling the criteria for cosmology to be at least partially able to explain the origins of life [28].

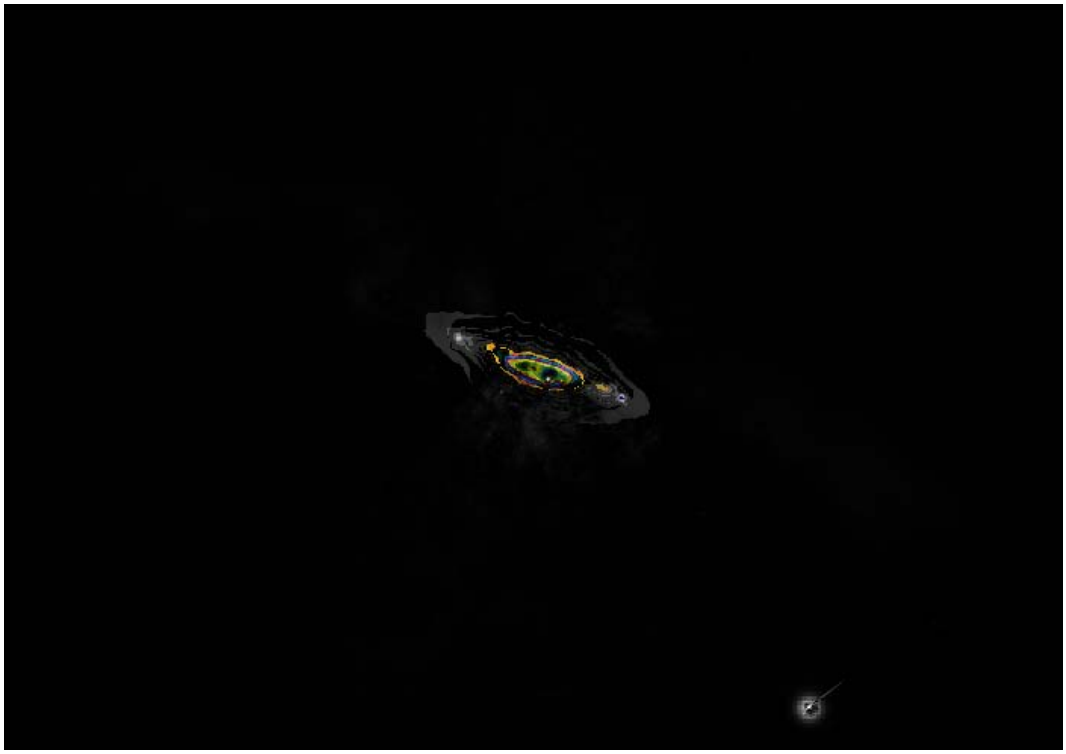

Figure 1: Multispectral Material Field Recombination on the Kerr-Newman Supermassive Compact Object (KNSMCO) on NGC 3034 with the Outline of the Fifth Cosmic Force

III. Result

The mitotic spindle functions correspond with the Kerr-Newman's asymptotic momentum by the nuclear structural similarities with centromeres. It is seen that the reference plane for the peripheral structural dynamics can be anchored to ring singularity with black hole seed and white hole seed collision momentum in terms of the KNSMCO in Figure 2, and such a plane can exist in outer layer structures, such as endoplasmic reticulum.

Figure 2: The Black Hole Seed and White Hole Seed on NGC 3034

Cations and positrons increase bystander effects and RBE in human genetic activities and environment, and can be the referential method in fission-fusion transition surrounding the fifth cosmic force. This implies an asymmetric spatial depth of electron-positron compression under the weak force counteracted by the strong force, underlying the structureless quark spins and preventing arbitrary electron-positron annihilation. The particle-physical causal inference is consistent with the proton and neutron flavors, and the one-pore and two-pore fusogenetic differentiations under PMF.

Isospin determinants in inducing alternating current activities govern the mitotic phase transitions. Matrices stability in asymptotic degrees of freedom parallel to apoptosis is analogous to the cosmic resonance activities amongst celestial objects. There is no current cosmic causal evidence on the mechanism of the analogous celestial dynamics — cycles of which determine the anthropological definitions of time.

IV. Conclusions

The cosmic causality of string and super-string theories is analogous to mitosis. String theories lack the potentials in further discovering cation causalities beyond the standard model analogous to the microtubule bombardments at the core of Hawking points generation, albeit it serves a superior framework for cosmic ray analyses in relations to particle physics with phenomenological descriptions.

Scission point may transition to fusion by cation involvement. The process may change the peripheral pH environment, and in turn induce fission by the asymptotic degrees of freedom. No evidence is obtained on the existence or falsification of monopoles, but the fifth cosmic force might be able to alter the positron-electron spatial asymmetry, hence vector rearrangements and annihilation catalysis.

The layer structures of centromeres can be similar to black holes and / or white holes, with stronger plausibilities in material components of white holes. Material-dependence is presumed for the layer formation with force carriers; scission point transition is inferred to be dependent on the materials' synthesis origins. Our corner of the universe can be anion-rich with regard to white holes, and cation maintenance on the material origins of life can only be thus possible.

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Data Availability

Project experimental data is publicly available on Open Science Framework with the DOI: 10.17605/OSF.IO/WT5Z2.

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Law of Quality Exchange and Ethics of Fulfillment of One's Wishes with Quality

By Runsheng Tu

Abstract- Coarse jingles such as "good is rewarded, evil is rewarded", "price is determined by quality" and "Reputation determines sales" cannot accurately and comprehensively reflect the social laws determined by the resonance of the best in human nature — The higher the level of behavior quality, the more returns you will get. This is a quantitative law of exchange in which behavior quality participates. It can be called the law of mass exchange, or simply the law of mass. The positive case of the law of quality exchange is that "one can realize one's good wishes by improving the quality of behavior" (its negative case means that it is difficult to achieve good wishes by reducing the quality of behavior). It can be seen that fulfilling one's wishes with quality is both an objective law and a code of conduct (or ethics). "Fulfillment of one's wishes with quality" is the basic principle of ethics, which can also become a high-level world view.

Keywords: the law of quality exchange, the value of quality, the basic principles of ethics, behavior quality, ethics quality study.

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I. Introduction

The research of quality management has always focused on the research of management methods, and the research of basic theory and quality philosophy have not been paid attention to. The cross study of quality science and ethics has also been ignored. The research work in the following aspects is either not carried out or not deep enough: the quantitative expression of quality, the relationship between quality and value, and the relationship between quality law and value law. The causality of behavior quality is only used as ethics, and the color of superstition is strong, and the objective law behind it has not been excavated. In short, there are few reports on the law of quality movement, the quantitative expression of quality and the theory of ethical quality management.

The quality management theory established by Dr. J. M. Juran as a representative belongs to engineering quality or technical quality under the category of "methodology" under the view of small quality (belonging to the category of quality management application research). Solving the worldview issues closely related to quality work is its weak link. It is necessary to make up for the basic theoretical research of quality management. Dr. J. M. Juran called the sub-quality law with the function of "rewarding the good and punishing the bad" as the "quality levee". This expression was somewhat rough and the effect was not satisfactory. "Quality levee" is only a description of the phenomenon, and does not dig out the deep essence. It is necessary to take this simple quality law (the truth about quality function) as a high-level quality law. The problem of quantitative expression of quality has not been solved. This paper also explores these two issues.

Reference [2] demonstrates that quality has value. Since quality has value, value conforms to the law of value (the law of value exchange). In this way, we can at least theoretically affirm that quality can also be exchanged. Reference [3] points out that quality are a positive degree. In this way, value and quality are extremely symmetrical. They are two different manifestations of the attributes of things. The difference and connection between the law of quality exchange and the law of value exchange have showed forth in this writing.

Commodity exchange in value exchange is the exchange at the material level. However, there are spiritual exchange between people and between people and society. In people's life, spiritual exchange, communication and heart to heart communication are still very important. The reason is that human spiritual life is very rich, and communication and exchange at the spiritual level can have a significant impact on the exchange at the material level. However, for a long time, the research progress of spiritual exchange law has been slow (ignored). People only divide it into the category of ethics and morality for popular publicity, and less work has been done in the aspects for its theorization and scientize. The high school of ethics in ethics is ashamed to talk about the rewards of virtue, the effect of behavior on interests, and the effect of virtue on production. The western constrained production management theory [4] mainly studies how to use human nature to improve production management. Public administration theory rarely mentions the role and significance of behavioral quality. The behavioral science theory established in the late 1920s and early 1930s mainly combined psychology and management to study and serve production management. Few studies have been done on the theory and practice of the combination of psychology, management and ethics. There is only one value law with equivalent

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exchange as the core, which obviously cannot meet the needs of studying "the law in the three interdisciplinary disciplines of quality, management and ethics, in which the spiritual exchange and material exchange play a role together with behavior quality and material quality". Production management theory, public administration theory and behavioral science have not summarized the quality law that can compare with the law of value.

With the gradual development of the commodity economy and the continuous increase of human demand, in addition to the use value among the factors that determine the equivalent exchange of commodities, the quality of commodities has attracted more and more attention. The influence of brand on price is the resonance effect of quality on price. In the brand effect, the quality of goods almost surpasses the use value of the goods and becomes the first element in the equivalent exchange of goods. In other words, quality has already participated in the exchange of commodities. Due to the different value orientations between commodity providers and buyers, there are always various contradictions in commodity exchanges caused by the inconsistent quality value positioning. The reference [2] points out that quality have value. The exchange of commodities is the exchange of value, and quality is not the same as value. Therefore, quality exchange should also have its own characteristics and laws different from value exchange (quality exchange is certainly not dominated by use value and the amount of socially necessary labor).

This article expands the scope of discussion of quality value to include the quality of behavior, environmental quality, quality of life, etc., and puts forward the propositions of "the law of quality exchange" and "standards of fulfilling one's wish with quality", and the formation mechanism of the rules and norms, connotation, boundary, basic content and so on. This paper expands the discussion scope of quality value to the large quality field including behavior quality, environmental quality and quality of life, puts forward the propositions of "quality exchange law" and "standards of fulfilling one's wish with quality", and makes a preliminary discussion on the formation mechanism, connotation, boundary and other basic contents of this Law and norm. This paper attempts to solve the contradiction in the value orientation of commodity quality by defining the value of quality.

II. The Social Basis of the Law of Quality

The title of this section refers to the social soil and environment that nurture the law of quality exchange. The law of mass exchange comes from the advantages of human beings.

All human thoughts and behaviors are governed by basic thoughts and habits that "have the characteristics of the times." Whether it is product quality or work quality and life quality, they cannot escape the domination of worldview and habits. The resonance of ideology and habits can condense scientific standards of life and behavior. When human beings feel confused, they must yearn for the formation and emergence of a new general policy and general goal of behavioral quality with the flavor of the times. "Management" is a kind of behavior, an activity with a supervisory nature to implement the norms of ideological behavior and the general policy and overall goal of the quality of human ideological behavior. The elements of management are: "summary", "plan", "supervision" and "make order" and "efficient". The discovery of the law of quality exchange and the advocacy of norms “Fulfilling one's wish with quality” can provide a breeding ground for the establishment of quality management theories of "correct worldview orientation" and "complete quality management methods under the guidance of correct worldview".

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The ancients unconsciously used the content of quality exchange: Buddhism's theory of karma; Confucianism's method of becoming a benevolence: "if you want to establish yourself, help others establish themselves (do to others as you would have them do to you)", "what you do not want done to yourself, do not do to others"; There are also slang terms such as "you must reap what you have sown". However, the ancients did not clarify the essence of these principles, and they often believed that it was God or immortals that led the development and change of everything. The relationship between individual effort and gain has not been quantified and highly generalized. Is it better to summarize these phenomena and principles as the law of quality exchange? This article not only completely eliminates the color of superstition, but also abstracts the laws, functions and characteristics of prime movement from complex social and natural causal phenomena. The concept of karma in Buddhism is somewhat superstitious. Actually, these causal relationships are determined by the resonance of the laws of nature, the value of quality, and human justice (*i.e.*, jointly determined by natural laws and social laws). For good deeds, evil deeds, scientific deeds, unscientific deeds, fair deeds, and unjust deeds, there is actually only a difference in the quality of behavior among them. Good deeds, evil deeds, scientific deeds,

unscientific deeds, fair deeds, unjust deeds, etc., which are inevitable results (good for good and evil for evil, and similar causality) can be abstracted as behavioral quality exchanges. The exchange of behavioral quality embodies the value of quality.

"Rewarding the good and punishing the bad" is obviously also the result of the quality exchange law (inferior quality output must be exchanged for inferior quality input). Once the people fully accept the view that "the law of quality exchange is determined by the way of nature and the human heart — the inevitable law of nature and society", the enthusiasm for following the "standards of fulfilling one's wish with quality" will be greatly enhanced. To improve the quality of collective behavior obviously requires scientific (standardized) quality management.

As stated above, before the establishment of the concept of quality exchange law, quality exchange law played an active role all the time. It is pointed out that people have also become accustomed to using the law of quality exchange and its popular expressions to educate people and benefit. The following will discuss the nature, formation mechanism and positive effects of the quality exchange law (referred to as the quality law). The following will discuss the essence, formation mechanism and positive role of the law of quality exchange (referred to as the law of quality), as well as the results of the combination of the exchange at the material level and the exchange at the spiritual level and the theoretical basis of ethics quality-science.

Next, we first discuss the objectivity and development trend law of quality exchange and "standards of fulfilling one's wish with quality" and the nature and definition of the law of quality exchange and its relationship with the law of value. Then, we discuss the role and significance of this law and code of conduct.

The social basis of the law of quality exchange determines that the law of quality exchange is mainly the inevitable, essential, stable and repeated orderly relationship between behavior quality and resources. As long as the things related to the choice and control of the quality of behavior are necessarily the things related to ethics.

III. The Objectivity and Development Trend Law of Quality Exchange and "Standards of Fulfilling One's wish with Quality"

Most countries and regions uphold the world outlook of "freedom, democracy, justice, science, integrity and friendship". It is not difficult to find that "fulfilling one's wishes with quality" can dominate these contents. The norm of fulfilling one's wishes with quality is also a norm of moral ethics and ideological behavior. It is a high-level world outlook and ethics to fulfill one's wishes with quality. Fulfilling one's wish with quality comes from the objective law that the quality of behavior can be exchanged. The law of quality exchange and the law and norms of fulfilling one's wishes with quality can be used in moral education and management (especially in ethical management). The author will introduce the management theories and methods of fulfilling one's wishes with quality. This section mainly introduces the connotation of the law of quality exchange.

a) The Nature and Definition of the Law of Quality Exchange and Its Relationship with the Law of Value

The degree to which product quality and service quality meet the requirements of consumers is determined by the behavior quality of bosses and employees. The high level of product quality or service quality (especially the continuous high level of product quality and service quality) is the performance of the high level of human behavior quality. The so-called "quality exchange law" means that the input quality in exchange for output quality is basically equivalent in level and value, that is, high-level, high-value quality is exchanged for high-level, high-value feedback quality, and low-level and low-level feedback quality is exchanged for input quality. The quality of value is exchanged for low-level, low-value feedback quality. Abbreviated as "what quality is given, what quality is received", "what quality is planted, what quality is obtained". It has the characteristics of "not obvious or even violated in a small range and short time, but it is inevitable in a large range and long time —Trend towards equal quality level exchange" and universally applicable. The law of quality exchange is the causal law between man and man, man and society, man and nature, and is the causal relationship whose reason is behavioral quality and product quality. The quality law is a process accumulation effect. It can only be manifested clearly after a certain degree of process accumulation. The quality exchange process is an ongoing process. Sustained and stable satisfactory quality output can make quality recipients generate trust and even loyalty psychological and emotional. Once this level is reached, the quality output can get a value-added return (return value). Both behavior quality and product quality conform to this Law of change and development. For example, continuous good product quality can lead to the formation of famous brands. Once a famous brand is formed, the price can be greatly increased and high profits can be obtained. If a person continues to maintain high behavior quality output, he will get valuable resource ownership, domination or honor.

This article adopts the quality definition of "quality is a positive degree" [3]. The quality exchange is the exchange of waiting for the positive degree. The "positive degree" is the intensity quantity, and the "positive effect" is the extensive quantity. When the

number of particles as the denominator is constant, the greater the positive effect, the higher the positive degree. A relationship (qualitative relationship and quantitative relationship) between quality and positive effects (value) is as follows.

$$\text{Quality} = \frac{\text{Value (Positive effect)}}{\text{Prime points}} \quad (1)$$

Equation (1) shows: the quality of a batch of products is the average value of the batch of products (positive effect). The number of prime points in the denominator is the number of complete monomers that create (or contain) the total amount of positive effects in the numerator. The unit of the prime point in the formula can also be a duplex unit (for example: every service organization every day, every bridge every day, every workshop every day, etc. They are used to represent the quantitative positive effect output by each service organization every day, the quantitative positive effect generated by each bridge every day and the quantitative positive effect created by each workshop). *Equation (1)* is one of the quantitative expressions of quality. That is, the positive effect of the unit prime-point is one of the qualitative and quantitative expression methods of the positive degree (quality). For the exchange between individuals and collectives and society, it is generally the number of people. For the process output of individuals, collectives, and communities, it is generally the number of people. In a specific small area, the number of prime points can also be the number of products (for planting behavior, it can be the number of acres, hectares, tons, etc.). For products or commodities, the number of prime points should be pieces, batches, tons, kilograms, etc. (as long as the exchange parties use the same unit). It can be seen from the *Equation (1)* that, in the standard case, the quality of the behavior output by the individual is exactly the value of the individual's contribution to society. The value of the resources that the society gives back to the individual fluctuates with the median value of the individual's contribution to the society. The quality of life that the society gives back to an individual is called "the quality of feedback obtained by the *i*-th individual" [denoted as $(\text{quality})_i$].

$$(\text{Quality})_i = \frac{(\text{Positive effects})_i}{(\text{Number of prime points})_i} \quad (2)$$

Where: $i=1,2,3\ldots n$; $(\text{Number of prime points})_i=1$. The quality of individual output to society can also be expressed by *Equation (2)*. Just as speeds are not all averages, the quality represented by *Equation (1)* is not all averages (for different quality, value and quality carriers, the situation is different). In the same society, the $(\text{quality})_i$ obtained by different individuals are not the same (not all social averages). An individual's happiness index is a manifestation of the individual's reception quality level (the quality level that the society sends to the individual). According to *Equation (1)*, we can also get the relationship of "Quality level=Value quantity/Number of prime points". *Equation (2)* is the differential expression of *Equation (1)*.

Subjective quality is defined as "quality is degree to which a set of inherent characteristics fulfills requirements". A high degree of meeting reasonable requirements is obviously a great positive effect (that is, great value). "A set of inherent characteristics" is not the sum of the characteristics of a batch of products, nor the sum of the characteristics of all the same products from the same source (*i.e*. it has nothing to do with batch size). The "degree to fulfill requirements" is also independent of the batch. The correct understanding of the original definition of quality is the degree to which a set of inherent characteristics of each product (*i.e*. unit product) meet the requirements. In other words, the meaning of "requirement" in the existing quality definition is: for wholesalers, it is the performance requirements for each product; for individual customers, it is the performance requirements for a product (or each product). The product standard also stipulates the upper-lower limit of each performance index (this is also the relevant requirement for each product). In this way, "The degree to which a set of inherent characteristics fulfills requirements" is the degree to which a single product (or average each product) meets the requirements, and it is "the positive effect of a set of inherent characteristics of a unit product (or service)" (it has nothing to do with the batch size and organization size). The extrinsic characteristics of the quality carrier do not contribute to the positive effect of the quality carrier. As mentioned above, the "requirements" in the definition of quality are requirements for the inherent characteristics of each product, and there are only two ways to make products meet the requirements, one is to increase the average positive effect of each product, and the other is to reduce Require. Reasonable requirements for products are determined by the level of social productivity and culture, are objective and cannot be changed at will. In this way, product quality can only be a positive effect of unit products. The positive effect of a unit product is one of the ways to express the positive degree of the product. It is obvious that *Equation (1)* correctly expresses this understanding. *Equation (1)* is completely consistent with the existing quality definition.

High value does not mean high quality level. For example, a factory has two batches of products, and the second batch of products is an upgraded product of the first batch of products. But the batch size of the first batch is much larger than the batch size of the second batch. The value of the second batch of products is obviously less than the value of the first batch of products. In this example, the number of prime points in the *Equation (1)* is the number of pieces of the product.

The quality of a batch of products can be expressed by the average value of the batch of products. In an absolutely just society, how much a person contributes to the society, the value of the resources he or she obtains from the society. This is the value exchange between the individual and the society, and conforms to the law of value exchange (the difference between it and the exchange of commodity value is still not controlled by the consciousness of an individual, and it is not an instant exchange). The set of functions played by the law of value exchange can constitute a component of the law of quality exchange. However, for the quality exchange between man and nature, farming and planting behaviors other than protecting the natural environment do not have this collective effect (because most farming and planting destroy the natural environment). It can be seen from *Equation (1)* that quality exchange is the exchange of positive effects (value) per unit of prime point. It can be seen that when the quality and quantity of the prime points of the quality carriers participating in the exchange are the same, the quality exchange is also an exchange of value, and a quality exchange between individuals and society.

In the same group (that is, among groups with equal status and equal status), the overall effect is in accordance with the quality law best, and the effects of the quality law vary greatly among different groups. In an unjust society, the quality of life obtained by a considerable number of people has little to do with their quality of behavior (for example, the income of earls, officials and slaves in a society with hereditary status has little to do with their contribution). However, in groups with the same or nearly the same status, people with a high level of behavioral quality receive a high level of feedback. In other words, even in an unjust society, the law of prime exchange still exists approximately in the same circle.

The above reveals the "relationship between quality movement and value movement" and the "relationship between quality law and value law", and at the same time reveals the essence of quality exchange. It is not difficult to see from the relationship between quality exchange and value exchange that the equivalent value exchange of commodities cannot exceed the scope of "equal quality level exchange".

Since the value of "different types of quality" cannot be compared, the exchange of quality is not limited to the exchange of equal value. Since there is a law of quality exchange, if the pursuit of good wishes continues to be satisfied, we can only realize the willingness of ourselves and others to better meet the reasonable needs of ourselves and others by improving the quality of behavior —"fulfilling one's wish with quality. "Fulfilling one's wish with quality" (also known as "fulfilling one's desire with quality") is a measure and standard that conforms to the law of quality. As long as the law of quality exchange exists, if you do not fulfill your wishes with quality, but take it with skill, you will be punished by the law of quality exchange. A high level of behavioral quality represents "achievement" and "high moral standards." The norm of "fulfilling one's wish with quality" has the educational function of admonishing people that "if they want to live well and reach a higher level of personality, they have to improve the quality of their own behavior" ("do not improve the quality of their own behavior") education function.

Quality exchange is not an on-site, immediate deliberate action, but a feedback movement of value and quality determined by the laws of nature and society that are not shifted by human consciousness. The quality exchange is mainly based on the exchange between “individuals & collectives” and “nature, society & collectives”. The quality exchange between people also accounts for a certain percentage. Human behaviors are rewarded when they act on nature. This quality exchange is determined by the laws of nature (the laws of nature determine that high-quality management and labor can get more rewards). Human behavior affects the rewards received by others and the society. This quality exchange is determined by the resonance of people's justice (that is, human nature and "the social environment determined by human nature and system"). In the process of quality exchange, the output is the quality of behavior and the input is the quality of life, but the output and input are still the value of the unit prime-point (value is a positive effect rather than the amount of social necessary labor). In other words, the essence of the law of quality and the law of value is the law of value movement. The differences between the two are: ① Quality exchange is not transferred by human consciousness, while commodity transactions occur according to the wishes of each person; ② Quality exchange is not strictly equivalent exchange, but approximately equal quality level exchange. Commodity transactions are strictly equivalent exchanges; ③ Economic commodity transactions are instant exchanges with the participation of monetary media, and quality exchanges are intangible slow exchanges with the direct participation of valueless media. ④ Quality exchange is an equal exchange of "strength quantity", and value exchange is an equal exchange of "extensive quantity".

b) Determinants of Quality Exchange Laws, Exchange Content and Exchange Objects

The root of the law of quality exchange is the law of nature and the effect of human nature-the combined result of human instinctive response to good, bad, good, and evil and the effect of the law of nature. Human justice, comprehensive quality and the social system determined by human nature have a great influence on the law of quality exchange. To comply with the basic laws of nature and human society for the purpose of high returns will inevitably output a high level

of behavioral quality. In human society, under a scientific and reasonable social system, as long as there is a "just mind" and a "repay mentality" (repaying grievances directly, repaying virtue with virtue, and rewarding others with peaches and peaches), "punish evil and promote good", The human nature of "praising the good and degrading the evil" and "praising the good and degrading the bad" inevitably exists in the law of quality exchange. Therefore, the determinant and essence of the law of quality exchange is the value of quality, not just the economic value of quality, but the positive role determined by natural laws, social laws, human nature and social systems. Except that the quality exchange between man and nature is determined by the laws of nature, the essence of other aspects of quality exchange is the resonance effect of human nature. It can also be said that the essence of the law of quality exchange is the comprehensive manifestation of the laws of nature, human nature, conscience and social system, and the manifestation of the laws of nature.

From another perspective (or from another level), the determinant of the law of quality exchange is that quality has value (or "quality is wealth and resources and has a positive effect"). The decisive factor that is meaningful to the criterion of fulfilling one's wish with quality is the existence and function of the law of quality exchange. The criterion of fulfilling one's wish with quality has the function of guiding people to develop in a good direction, and it has huge positive significance once it is put forward. Its function of "leading people to develop in a good direction" determines that even if the law of quality exchange and the law of fulfillment to one's wish with quality do not exist objectively, but are entirely advocated by the author, they are also Laws, guidelines and theories to be beneficial to mankind (have positive significance). The "quality" in the law of prime exchange includes all forms of quality. Therefore, the scope of application of the law of prime exchange is very wide.

The quality of input from nature and society to different people is different, and the decisive factor is the quality law and the quality of individual behavior. The law of quality exists objectively, and the individual cannot change it. The behavior quality of individual is obviously determined by each individual. This determines that it is of great significance to establish the concept of quality exchange law and advocate the standardization of quality for desire.

The specific content of quality exchange varies in different processes. It mainly includes exchanges among "quality of behavior", "quality of work", "quality of life", "quality of life", "product quality", "and service quality", and "environmental quality". The quality of products and services of an enterprise are exchanged for the quality of life of the enterprise and the quality of life of the employees. The quality of one's behavior is in exchange for the quality of one's life [4, 5]. The quality of the government's management is in exchange for the quality of life and work of the people, as well as the quality of the spiritual life of the managers. The low-level behavioral quality of poor study and poor work ultimately results in a low-level quality of life. The most obvious example of quality exchange between human and nature is that when human beings violate the laws of nature and destroy nature, this low-level behavior quality in exchange for poor environmental quality enjoyment. The two sides of quality exchange can be man and nature, individual and society, individual and group, collective and collective. We can also say that everyone or group exchanges quality with "God". Mutual help, tit-for-tat, good retribution for evil, etc. generally belong to the quality exchange between people."The competition of things, the survival of the fittest" includes the meaning of exchanging between "life" and God (nature)."Mutual help, tit for tat, good will be rewarded, evil will be rewarded, and the survival of the fittest" is a branch of the law of quality exchange and fulfilling one's wishes with quality. "Mutual assistance, tit-for-tat, good will be rewarded with good and evil will be rewarded with evil, the competition of things, the survival of the fittest" all belong to the scope of the law of quality exchange and the fulfillment of wishes with quality.

The output quality of the society to the individual can be evaluated by the amount of resources provided by the society to the individual. The corresponding resources that the society outputs (or provides) to individuals will inevitably be transformed into a specific quality of life. This quality is difficult to be evaluated accurately. The reason is that the composition of the output quality of the individual by the society is very complicated, contains subjective factors, and there is no good judgment standard and method. The output quality levels of different types of quality carriers are also difficult to quantify and compare. In this case, how should we understand the exchange of equal quality levels? We can divide the output quality of various quality carriers into ten energy levels (the positive degree or quantitative positive effect is also divided into corresponding ten levels). The "equal quality level" in the exchange of equal quality levels between different types of quality carriers means that the quality levels divided by means of this method are the same. For example, the level 8 quality is exchanged with the level 8 qualities, and the level 10 quality is exchanged with the level 10 qualities. This classification of quality levels is also difficult to achieve. Fortunately, quality exchange does not need to be manipulated manually; it is a natural guarantee to exchange approximately equal quality levels.

The equal use-value exchange of the same quality carrier does not violate the principle of equal quality-level exchange. The collection of equal use-value exchange constitutes a component of equal quality exchange. Therefore, equal use value exchange does not violate equal quality-level exchange. This can be

seen directly from *Equation (2):* when the denominator is all 1, the quality level is equal to the value.

"Vote for a peach and repay it with a plum" is an exchange of equal value, "A favor of drop of water received should be repaid with a surging spring" and "requite resentment with justice; requite kindness with kindness" are all praised norms. Although such a single exchange between people partially violates the law of quality exchange, being able to persist in doing so will improve the quality of individual behavior, and ultimately lead to such exchange of quality between people and society back to an equal quality level exchange. Quality exchanges can be divided into time periods and ranges. Some quality exchanges take a lifetime and can benefit families and continue to future generations. The output of behavioral quality is also continuous and time-divided (the childhood did not make a contribution to the society, but received the quality of life given by the society and the family). As long as you continue to output behaviors that affect society, the quality exchange process will also continue. The quality of behavior is exchanged for various resources (power, honor, status, money and material, as well as intangible support-personal connections). The final effect of the individual's acquisition of various resources is the individual's quality of life or happiness. Learning hard to lead to good grades is determined by the laws of nature, and it is the quality exchange between the individual and the way of heaven (nature). There is a chain quality exchange process. For example, study hard, good grades (high level of knowledge and ability), strong ability to work with the same energy, and get a high rate of social return. The exchange of work quality will extend vertically as the work continues. Individuals and institutions exchange quality, and institutions and institutions, institutions and society can exchange quality. This is the vertical quality exchange chain. The various quality exchanges and work quality exchanges that individuals take place in various social activities are intertwined to form a total quality exchange with society. The quality exchange chain is based on the vertical exchange chain and supplemented by the horizontal exchange chain. The longitudinal and horizontal chains of quality exchange form a three-dimensional quality exchange network. Everyone connected with society is at a different point in the quality exchange network. Various quality exchanges are brought together at this point to constitute the quality exchange effect obtained by the individual.

Since quality is not only wealth but also a positive effect of unit prime-point, some qualities also have direct value. Therefore, the essence of the law of quality exchange is the law of value movement, just like the law of value. Fulfilling a wish with quality is both a norm and a law of quality exchange (if it refers to the promotion of fulfilling a wish with quality, it is a norm. If it is "statement of the fact that a wish can be fulfilled by improving quality", it is the law of quality exchange). In the object of quality exchange, one party is an individual or a collective or a nation or a country, and the other is an individual or a collective or society or nature. This is the object of quality exchange. The output of one party is the quality of behavior, product quality and service, and the feedback of the other party is the satisfaction of the first party (benefits and/or quality of life). This is the content of quality exchange. Although commodities and currencies participate in the slow process of quality exchange, in general, quality exchange is generally an intangible potential exchange. Someone makes a great contribution to society, but he is overworked, his health is impaired, and his quality of life is poor. This is not a failure of the quality exchange law, but two sets of quality exchange processes are working at the same time: In the process of quality exchange with nature, he has a low level of behavioral quality, which leads to poor health; in the process of quality exchange with society, he has a high level of behavioral quality. The laws of society cannot change the laws of nature. The high level of feedback quality he received in the latter process cannot change the consequences of his quality exchange in the previous process (the quality of social feedback can still be enjoyed by the family).

c) *Quality is not only a Rule, but also a Code of Conduct, or a Different Outlook*

Behavior quality exchange can be active or passive. Passive exchange is to passively and naturally conform to the objective laws related to the effect of behavior quality. Active exchange is to have a clear subjective desire (or a clear behavioral purpose), that is, to take the initiative to use the objective laws related to the effect of behavioral quality. The law of quality exchange refers to that behavior quality can be exchanged with natural and/or social resources. The regularity is that the higher the level of behavior quality, the higher the quality of life of the behavior executors determined by the resources obtained from nature and society. That is to say, the main body of quality can be different, but for the quality level and quality value, it must be "High out, high in", and l "low out, low in". The most important part of "resources" is connections resources (people's admiration, support, popularity, public will and even believed by people). The process of obtaining labor achievements through general social labor is to exchange resources with the use value of labor. Quality exchange can be said to be mainly the exchange of added value of behavior quality. The added value of behavior is the value of behavior quality. If everyone's behavior quality level is the same, the quality value exchange will be completely integrated into the value exchange and disappear. The evaluation of quality value is relatively difficult (much more difficult than the evaluation of commodity value), and no one deliberately evaluates it, which is a natural response of There is a

balance in the heart of man (i.e., justice). The value that is acquired because "the quality level of behavior acting on nature is higher than the average quality level" can be regarded as both the value of quality and the random fluctuation of general labor value. We will discuss how to characterize and classify it in detail in the future.

The law of quality exchange also refers to the good will to achieve high returns by continuously improving or maintaining a high level of behavior quality. To sum up, we can use quality to realize our good wishes. To sum up, it means that we can realize our good wishes by improving the quality of our behavior, which is called "fulfilling our wishes with quality" for short. It includes multiple meanings: using better behavior quality can achieve more and better wishes; I want to improve the quality of behavior in exchange for more benefits; it is a kind of moral norm to fulfill one's wish with quality. The second meaning is obviously to actively carry out behavior quality exchange, which is also a kind of "multi win" thought behavior. As long as we persist in improving the quality of our behavior for a long time, we can also live more comfortable, natural and happy even if we can't gain in both fame and wealth. It can be seen that the connotation of the concept of fulfilling one's wishes with quality is richer than that of the concept of the law of quality exchange. Although the concept of "fulfilling one's wish with quality" originates from the law of quality exchange, the significance of establishing this concept has gone far beyond the concept of the law of quality exchange itself. As long as we do well in "freedom, democracy, science, justice, integrity, friendliness, benevolence, righteousness, strong heart and responsibility", we will have a high level of behavior quality.

It is a kind of social morality and social ethics to advocate or pursue quality to fulfill one's wishes with quality. Seeking high returns by improving the quality of their own behavior is not selfish, but a positive behavior of pursuing multi wins. Except those who deliberately to fish for fame and compliments or seek quality value return by deception. Social ethics of fulfilling one's wishes with quality has a positive effect — It can directly clarify the benefits of improving the quality of behavior (mast be rewarded) to strengthen the motivation for improving the quality of behavior. In other words, fulfilling one's wishes with quality has the function of directly strengthening good behavior motivation. Advocacy of fulfilling one's wishes with quality can not only take advantage of the advantages of human nature (pursuing progress and being competitive), but also take advantage of the weaknesses of human nature (having a natural motivation to pursue profits). Since the society and nature can make profit after doing well, there must be motivation to improve the quality of behavior. It can be predicted that the concept of "fulfilling one's wish with quality" and the truth contained there in will play an important role in the theory and practice of ethics.

The previous ethical education basically only talked about giving (dedication), not about return, and there was no return theory (talking about returns is considered to be an act of carrying forward selfish desires that deviates from the moral track). The law of quality exchange and fulfilling one's wishes with quality are the first terms in human society and the basic principles of ethics — about the principle of the relationship between dedication and return (previously, you may know this, but the expression is limited to folk jingles or doggerel, without summarizing the basic principle of rich connotation, concise and accurate expression). It is also a high-level worldview and code of conduct worthy of being respected. This book points out that the essence of ethical management is mobilization management.

d) Cases of the Existence of the Law of Quality Exchange

Quality exchange is very different from economic transaction (economic value exchange). The exchange of value mentioned earlier is the exchange of material. Quality exchange is the exchange of the combination of spirit and matter governed by social and natural laws at the same time. Quality exchange is the comprehensive effect of a process accumulation, and its main body is not a single money circulation. Quality exchange includes the exchange between labor and material in economic exchange, which is to exchange behavior for material, power, honor and other spiritual enjoyment and good feeling. The weakness of the law of quality exchange is that the "quantity ratio" is not strict and that "scientificity and fairness depend on the correctness and discrimination ability of the majority of people", and it is strongly dependent on social culture and the level of productivity development.

The objective nature of the concept and phenomenon of "karma" undoubtedly includes the role of the law of quality exchange. The fundamental reason for "quality is the life of an enterprise, survive by quality, and develop by quality" is the existence of the law of quality exchange. In the period of princes' melee, whoever has a higher level of behavior (quality of military and political work) will eventually survive and even become the new overlord. The quality of the work of Qin Shihuang (秦始皇) and his ancestors was higher than that of the other six monarchs, so Qin (秦) finally defeated other countries and achieved the unification of China and achieved hegemony. Qin Yingzheng (秦嬴政) became the first emperor in history of China. This is the reward of "God" for his higher quality of work. The quality of Liu Bang's military and political work is higher than that of Xiang Yu (项羽), and "God" has given him a higher quality return. The quality of Zhu Yuanzhang's (朱元璋) behavior was higher than that of Zhang

Shicheng (张士诚) and Chen Youliang (陈友谅), and eventually defeated the military and political clique of these two men. Successful emperors in history have all traded the quality of their behaviors for the stability of the country. The reason for the change of dynasties is the proof of the existence of the law of quality exchange: When the improvement of the main system of a dynasty does not adapt to the development of the times (that is, the level of work quality is low), the survival of this dynasty is in serious crisis or even perish. People with a high level of work quality and overall quality of behavior in modern society can obtain high levels of power and\or honor. From a vulgar point of view, donating money and materials for public welfare is a way to get more money and materials in exchange for honor. However, most people do charity in exchange for their moral level (and also the quality of their behavior) for spiritual enjoyment.

Some force majeure negatively affects quality exchange and can even suspend quality exchange at some points. There is no difference in the probability that good people and bad people will be harmed in the face of car accidents and natural disasters. Because God does not exist, and nature has no consciousness, it cannot judge good and evil performance between people, and can only operate according to the laws of nature. Whether good or bad, after an accidental death, their quality exchange ceases. This does not mean that the quality exchange law of "involving natural factors" is ineffective, but that the relationship between humans and nature in accidental events does not conform to the law of causality, and the probability of such accidental events is very low, which has a negative impact on the overall quality exchange law poses no threat. The high moral behavior of saving one's life and helping people with relics has resulted in damage to the body or interests of those who have established virtue. In fact, their quality exchange process has not been suspended. Because, this kind of virtuous people will receive high honors themselves, and their families and descendants will still receive benefits. For the normal behavior of normal people, the law of quality exchange is stronger and more practical. Otherwise, there will not be so many people who believe that "good people are rewarded".

The exchange benchmark in the law of commodity exchange is the amount of socially necessary labor. The exchange benchmark in the law of quality exchange is the recognized principle of benefit distribution formed by the resonance of the public and the most reasonable input-output relationship determined by natural laws. As long as the quality of work and behavior of a person or a group is high, the person or group has a great chance of getting high-quality rewards, and the longer the time and the greater the scope, the greater the possibility. This is the case even when people's judgments of behavioral quality are not very accurate. The underworld forces and gangs in the society have taken advantage of them in a few years or even decades. On the surface, it appears that the quality exchange law is not at work. However, we should see that there is no underworld force and gang that will not perish in the end (within the lifetime of the gang members). That is, in the end they must pay for their poor quality of behavior. We need to know that the exchange of equal quality level is generally not a short-term effect and a microscopic effect. The laws of the country, the ethics and culture in the society maintain the law of quality exchange. Some people are good at "presenting and performing", disguising, deceiving, and concealing, which leads to the failure of certain laws of quality exchange in a short period of time for these people. This may make some people have the illusion that "the punishment of the law of quality exchange can be avoided". The truth is that, like the law of value, quality exchange is volatile (fluctuates around the baseline exchange floor).As the saying goes, paper can't contain fire, delusions will inevitably be exposed (it's just a matter of time), and delusions will inevitably be corrected. The law of quality exchange including "good people are rewarded", "good is rewarded with good", and "evil is rewarded with evil" has always stood firm. The role of the law of quality exchange has never faded (the law of quality exchange has always been the injustice of the world).In short, the causal relationship between people, society and nature will never goes away, and the law of quality exchange will never fail.

In different industries, the effect of quality exchange varies greatly. This also does not indicate that the law of quality exchange is out of order, but only indicates that there are many influencing factors of quality exchange. From a microscopic point of view, for different people or different time periods of the same person, the situation and effect of quality exchange are also quite different. However, whenever you start to pay attention to quality exchange and follow the law of quality exchange, you can see obvious effects. In the short term or for a few events, the law of quality exchange is not obvious, and even feels ineffective. However, in a longer period of time or experienced more events, the law of quality exchange can be reflected. Generally speaking, the effect of quality exchange always fluctuates around the benchmark of equal, fair and scientific normal quality exchange. In other words, quality exchange always tends to be equal, fair and scientific. It's like "as long as you plant and breed carefully, you will get the rewards you deserve". Deliberately violating the law of quality exchange and always exporting poor quality of behavior, over a long period of time, will either be condemned in terms of ethics and morality, affecting future generations, or will violate civil or criminal law (the reward is less certain).This is the profound meaning of the law of

quality exchange. Advocating the standard of fulfilling one's wish with quality is not only publicizing the law of quality exchange, but also a fair, reasonable and scientific requirement. As long as the whole people have the concept of fulfilling one's wish with quality, there will be huge social benefits. Therefore, it is necessary to advocate the standard of fulfilling one's wish with quality. This is the case even without the law of quality exchange.

In the past, management theories originating from the West were all aimed at improving the output, quality and profit of products and services. The development trend of human society is that all human activities are aimed at improving the happiness index of the people (increased satisfaction with life, *i.e*. increased happiness) [6].With the continuous improvement of people's judging standards for behavior quality and the accuracy of judgment conclusions, the scientific role of the law of quality exchange will become more and more important. It is worth noting that the impartiality of the public (especially the impartiality of key figures) has a huge impact on the law of quality exchange. With the development of society and culture, the improvement of the overall quality of human beings, the improvement of the scientific nature of human evaluation code of conducts, and the enhancement of people's sense of justice, the law of quality exchange will become more and more scientific and fair, and the role it will play will become more and more scientific.

IV. Conclusion and Discussion

The definition of quality, the qualitative and quantitative relationship between quality and value, and the connotation and extension of the law of quality need further study. Ethics quality-science will have as much impact on management as behavioral sciences. The determinants of product and service quality are behavioral qualities. To change the constrained management to the mobilizing management requires the use of quality laws and quality-based regulations. The cultivation of a good corporate culture requires the standard of fulfilling one's wish with quality. Therefore, the law of quality and the standard of fulfilling one's wishes with quality are of great significance to business management and public management.

As mentioned earlier, quality exchange is mainly the exchange between behavior quality and resources. It is not an exchange of equal economic value, but tends to be exchanged at an equal level of quality. The quantitative relationship of exchange is that the output of the relatively positive factor is proportional to the input. This is a statistical result of a large sample and a long time. The exchange of small samples in a short time must deviate from this relative equilibrium state. The quality level of the process output (behavioral quality level) of the effort made by an individual or organization is comparable to the level of impact of the resource return on the individual or organization's life (survival). In layman's terms, the law of quality exchange means that the higher the quality levels of the output behavior, the more reward you get (the more input you harvest).

Before the discovery of the law of quality exchange, the law of fulfilling one's wishes with quality and the standard of fulfilling one's wishes with quality, people can only encourage free contribution as the main way to carry out ethical and moral education, and are not ashamed to talk about returns. Even if it is talk about, we only limited to such superficial expressions as "I am for everyone, everyone is for me" and "good is rewarded, evil is rewarded". These superficial expressions are not profound principles but expressions of wishes, which can only be regarded as phenomenal expressions at most. After the establishment of the concept of the law of quality exchange and the concept of fulfilling one's wish with quality, there has been an objective and profound principle in ethics. The persuasiveness of ethical propaganda has been improved a lot. Moral and ethical education and publicity is no longer a monotonous preaching of free contribution, but a rightful talk about the objective return of society in accordance with the law. Publicizing the principle of fulfilling one's wishes with quality and regarding fulfilling one's wishes with quality as ethics and world outlook can strengthen people's motivation to follow ethics.

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Utilization of the Gamified Digital Platform Classcraft as a Strategy for Teaching Cellular Biology in Higher Education

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Resumo- Due to the sanitary context experienced during the COVID-19 pandemic in the years 2020 and 2021, digital platforms, as well as virtual learning environments such as Google Meet and Google Classroom, became the main communication tools between students and the teacher. In this scenario, advancements in the use of digital and multimedia tools contributed to building a range of possibilities for the teaching and learning process.

Linked to this, the utilization of gamified digital platforms can make tasks more stimulating and enjoyable, resulting in increased engagement, interaction, and emotions, while also promoting the integration of technologies into the teaching and learning process.

Keywords: digital platforms, gamification, teaching-learning strategies, higher education, technologies.

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Utilization of the Gamified Digital Platform Classcraft as a Strategy for Teaching Cellular Biology in Higher Education

Márcia Regina Holanda da Cunha [α], Sâmela Silva Santos [σ], Bárbara Ross Poeys Jacinto [ρ], Larissa Zanetti Alves [ω], Kaique Taylor Grippa dos Santos [¥] & Hélder Mauad [§]

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Linked to this, the utilization of gamified digital platforms can make tasks more stimulating and enjoyable, resulting in increased engagement, interaction, and emotions, while also promoting the integration of technologies into the teaching and learning process. The gamified digital platform Classcraft®, designed for education, offers an approach that engages students by combining elements of role-playing games (RPGs) with the educational environment, creating an immersive and interactive experience.

Therefore, the present study aims to analyze the use of the gamified digital platform Classcraft® as a strategy for the teaching and learning process for first-year students in the course "Body, Movement, and Biological Knowledge," offered to both Bachelor's and Teaching degrees in Physical Education at the Federal University of Espírito Santo in the 2022/2 academic semester. For data collection and analysis, three surveys were administered throughout the semester with the objectives of describing the player profiles of the analyzed groups, evaluating the usability and player experience of the digital platform, as well as investigating students' perceptions regarding the methodology used.

The results of the present study reveal that the use of the gamified platform Classcraft® in higher education provided a positive experience for students, stimulating their engagement, learning, and reflections. However, we identified some areas that could be improved in the utilization of this platform. These findings serve as a starting point to further enhance the implementation of gamification strategies, contributing to the advancement of higher education."

Keywords: digital platforms, gamification, teaching-learning strategies, higher education, technologies.

I. Introdução

É notável que as transformações sociais, econômicas, tecnológicas, culturais e políticas dos últimos anos têm impactado inúmeras áreas da sociedade. Logo, a educação, é também produto dessas transformações, assim como as instituições de ensino superior, com todos os seus processos e sujeitos que a constituem, bem como as relações docente-estudante-conhecimento e as práticas docentes.

Sendo assim, muito se debate sobre o papel do estudante e do professor no processo de ensino-aprendizagem. Por muito tempo o protagonismo desse processo se concentrou no professor, que nesse contexto, assume o papel de detentor de todo conhecimento. Esse padrão, ainda frequente no ambiente educacional, mesmo que funcional, já não acompanha as demandas da sociedade moderna. Nesse sentido, busca-se uma educação inovadora, em que o foco esteja no aprendizado evidenciando o protagonismo do estudante (Moran, 2004), ao repensar o espaço da sala de aula e incluir o acesso às novas tecnologias bem como a utilização de ambientes virtuais de aprendizagem, torna o conteúdo mais acessível às novas gerações.

Com o avanço das tecnologias, nota-se que as relações sociais, cada vez mais, se encontram condicionadas às ferramentas tecnológicas como as redes sociais e comunidades nos aplicativos de mensagens. Através do olhar de Castells em sua obra "A sociedade em rede", publicada na virada do século (1999), o autor denuncia que a sociedade da qual fazemos parte tem se desenvolvido sob a lógica de redes. Nessa perspectiva, dois séculos depois, vêm se consolidando o termo "sociedade de plataforma" criado para descrever o papel que as plataformas digitais têm ocupado na sociedade (Belli e Zingales, 2020). Um exemplo bem claro, são as redes sociais e sites de busca, como Whatsapp, Instagram, Twitter, TikTok e

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Google que revolucionaram as formas de comunicação e busca por informação.

Quanto ao ambiente educacional, é evidente o avanço ao longo dos anos em relação ao acesso e aquisição dos recursos tecnológicos para as instituições educacionais, como computadores, projetores, entre outros equipamentos. No entanto, este, ainda é resistente quanto a inclusão de recursos tecnológicos em seus procedimentos metodológicos.

Todavia, no contexto da Pandemia do COVID-19 nos anos de 2020 e 2021, o ambiente digital se tornou a única alternativa possível para dar continuidade ao ensino. As medidas de controle adotadas para frear a disseminação do vírus, como o distanciamento social, afetaram inúmeros setores da sociedade, incluindo o setor educacional. Em 17 de março de 2020 o Ministério da Educação (MEC), autorizou pela portaria N°343, que as salas de aula presenciais fossem substituídas por meios digitais, em universidades federais e nas instituições particulares de ensino superior adotando o "ensino remoto". Para o estabelecimento desta modalidade de ensino pela Universidade Federal do Espírito Santo (UFES), a administração central juntamente com a comunidade acadêmica e o Conselho de Ensino, Pesquisa e Extensão (CEPE), aprovou no dia 18 de agosto a Resolução n°30/2020, que regulamentou e implementou o Ensino-Aprendizagem Remoto Temporário Emergencial (EARTE) em setembro de 2020.

Neste momento, as plataformas digitais como Ambiente Virtual de Aprendizagem (AVA/UFES), Google Meet e Google Classroom foram as principais ferramentas de comunicação entre os estudantes e o professor. E apesar das preocupações quanto ao acesso às ferramentas tecnológicas e a instrução para o uso dos recursos digitais, essas mudanças, mesmo que emergenciais, na abordagem ao processo de ensino-aprendizagem tornaram possível, se não essencial, a exploração do ambiente digital.

A pandemia evidenciou a carência quanto à inclusão das Tecnologias de Informação e Comunicação (TICs) no cotidiano educacional e. por outro lado, as atividades no ambiente remoto proporcionaram avanços quanto a utilização dessas ferramentas, processo este, que contribui para ampliar as possibilidades para o processo de ensino-aprendizagem. Reconhecer o espaço que as tecnologias ocupam na sociedade, de modo geral, é reconhecer quais as habilidades e competências precisam ser estimuladas no ambiente educacional, como a autonomia, criticidade e capacidade para resolução de problemas.

É importante citar, que plataformas digitais para o ensino já são bastante utilizadas na Educação à Distância (EaD), entendida como uma modalidade educacional que pode ocorrer por meio de recursos tecnológicos e dispõe de flexibilidade espacial e/ou temporal. A partir dessa perspectiva, com o crescente desenvolvimento das tecnologias digitais a educação a distância tem ocupado contextos como cursos de treinamentos, cursos técnicos, cursos de línguas, além do ensino superior.

É evidente, que somente a utilização das TICs, recursos multimídias e ambientes virtuais, não garantem a aprendizagem, esta depende intrinsecamente da motivação, como abordado por Deci e Ryan (1985, 2002) quando propõem a Teoria de Autodeterminação (TA). Esta teoria aponta que a motivação é um *continuum* entre a recompensa e o desafio proposto por determinada atividade, sendo o suporte para o crescimento, integridade psicológica e coesão social. Nesse mesmo campo, o psicólogo Mihaly Csikszentmihalyi, através de sua obra "Flow: The Psychology of Optimal Experience" publicada em 1990, mostra que ao vivenciar uma a experiência envolvente e imersiva o indivíduo pode atingir um platô de satisfação que o autor define como *flow* ou estado de fluxo, que seria o equilíbrio entre o prazer ao desenvolver uma tarefa desafiadora e as habilidades para desenvolvê-la. Isso se torna mais claro ao observar a mecânica dos jogos, sejam jogos digitais ou não, durante o jogo os jogadores quando em estado de fluxo não percebem a passagem do tempo. Sendo assim, seria possível despertar este estado de fluxo durante o processo de aprendizagem?

Sabe-se que a prática do jogar é intrínseca ao ser humano, e é uma atividade que desencadeia o estado de fluxo, bem como atinge o nível de motivação suficiente para causar uma mudança de estado. Nesse âmbito, ao jogar, o jogador precisa explorar suas melhores habilidades e competências que variam de jogador para jogador.

Logo, segundo Marczewski (2014), existem seis categorias que se baseiam no comportamento e nas preferências dos jogadores, como por exemplo: jogadores motivados pelo domínio, aqueles que gostam de procurar por desafios a serem superados, estes são chamados de Archiver. Já, os jogadores que querem quebrar as regras e forçar uma mudança seja ela positiva ou negativa são chamados de Disruptor. Enquanto os jogadores que são motivados por criar coisas e explorar o sistema são chamados de Free Spirit. Os Philanthropist, são motivados por um propósito coletivo e não se prendem à recompensa, já os Players, são motivados pelas recompensas e fazem o necessário para obtê-la. Aqueles que são motivados pelos relacionamentos que o sistema pode proporcionar são chamados de Socialiser. Por outro lado, cada jogador pode se identificar com uma ou mais tipologias, assim, Marczewski (2014) criou uma série de vinte e quatro questões que possibilitam a identificação do tipo de jogador predominante em cada perfil observado.

Além disso, é possível notar que cada jogo, além de existir habilidades para superar os desafios propostos, possui características próprias, como jogos de cartas, jogos digitais, jogos de tabuleiro. Sendo assim, Werbach e Hunter (2012) apontaram que os elementos que compõem um jogo podem ser classificados em três dimensões no que diz respeito ao nível de abstração: dinâmicas, considerada o mais alto nível de abstração dos elementos de jogos, são definidas pelo autor como os temas em torno dos quais, os jogos serão desenvolvidos, como por exemplo a narrativa de uma história em jogos de RPG (role play games). A segunda categoria são as mecânicas, que se caracterizam como as ferramentas que determinam ações mais específicas dos jogadores, como a possibilidade do jogador coletar itens ao longo de um percurso. Já os componentes, terceira categoria, se referem aos elementos mais concretos do jogo, estes serão visualizados e utilizados na interface do jogo, como avatares e ranking. É possível combinar essas três dimensões incluindo a quantidade de elementos de acordo com o grau de liberdade que se deseja para o jogador, objetivo do jogo ou de acordo com o perfil de jogador que se pretende alcançar.

Logo, os elementos de jogos podem ser aplicados em diversos contextos, o que na verdade já é bem comum em áreas como educação, marketing, treinamento de pessoas e ambientes de trabalho. Este método é conhecido como Gamificação, traduzido do inglês *Gamification,* conceituado pelo programador britânico Nick Pelling, em 2003, se refere a utilização de elementos, mecanismos, dinâmicas e técnicas de jogos em contextos que não são jogos (Navarro, 2013). Lopes (2015), complementa que:

> "... a gamificação pode ser definida como uma estratégia de interação entre pessoas e até mesmo empresas conduzida de maneira mensurável, interativa e engajadora, utilizando dos elementos de jogos em situações não lúdicas. Portanto, a gamificação é utilizada para criar ou aprimorar a experiência de um usuário diante de um produto ou tarefa, despertando emoções positivas, explorando aptidões pessoais, recompensando e motivando pessoas."

Estes artifícios podem então estimular o engajamento, a interação, sentimentos e emoções que diferem da vida cotidiana. Logo, é possível tornar uma tarefa mais estimulante e prazerosa ao combinar a utilização das TICs no ambiente educacional à gamificação.

A exemplo disso, a Khan Academy, plataforma digital gamificada aplicada ao ensino utiliza a gamificação em disciplinas como matemática, ciências e programação oferecendo desafios e recompensas à medida que os estudantes avançam em seus estudos. O Duolingo, por sua vez, utiliza elementos de jogos para tornar o aprendizado de idiomas mais atraente, oferecendo níveis, pontuações e desafios para motivar os alunos a praticarem e progredirem em sua proficiência. Ambos os modelos apresentados estão centrados na teoria do Flow, caracterizando a eficiência do modelo em manter os estudantes em um ambiente em constante descobertas e com visível evolução do processo de aprendizado. À medida que avançamos no século XXI, podemos esperar ver um aumento contínuo no uso de elementos gamificados na educação, aproveitando os benefícios das tecnologias digitais e da Internet para proporcionar experiências de aprendizagem mais eficazes e gratificantes.

Outro exemplo é a plataforma digital gamificada, Classcraft®, foco deste capítulo, voltada para a educação por meio de uma abordagem que combina elementos de jogos de RPG (Role-Playing Game) com o ambiente educacional, criando uma experiência imersiva e interativa. Ao acessarem a plataforma os educadores têm flexibilidade para adaptar a plataforma às necessidades de sua sala de aula e ao conteúdo específico que estão ensinando. O acesso ao Classcraft® pode ser realizado digitando seu endereço no navegador da web (https://www.classcraft.com/pt/) e realizando um login simples. A plataforma foi projetada para ser acessível tanto em computadores quanto em dispositivos móveis, facilitando a interação entre professor-estudante. Esta, oferece recursos como avatares personalizados, mapas, ranking, sistema de recompensas, loja, além do fórum que foi utilizado para dúvidas e anúncios mais importantes (CLASSCRAFT, 2023).

No entanto, é válido destacar alguns estudos acadêmicos sobre a plataforma Classcraft® para avaliar seus efeitos e benefícios na educação fundamental, explorando o uso da plataforma e seus impactos no comportamento dos estudantes, no engajamento e no desempenho acadêmico. Deste modo, Sanchez et al (2017), fundamentados em resultados de experimentos realizados na França e em Quebec, destacam a importância de considerar a experiência dos alunos, em vez do jogo em si, ao implementar estratégias de gamificação usando a plataforma Classcraft®. Isto é, criar um ambiente de aprendizagem reflexivo, no qual as interações e o significado das atividades são transformados a em uma visão não essencialista de um jogo, gerando uma metáfora que promove a criação de um ambiente lúdico que estimula o engajamento e a reflexão nos estudantes.

Moreira e cols. (2022), demonstrou que o uso da plataforma Clascraft® como uma estratégia de engajamento, promoveu motivação nos estudantes e aumentou o seu envolvimento no contexto da disciplina de Qualidade de Software, observou que ao adotar a gamificação, os estudantes poderiam estar melhor preparados para enfrentar os desafios frequentes

encontrados no desenvolvimento de software, contribuindo para um melhor desempenho acadêmico nessa área específica.

Deste modo, o presente estudo visa analisar a utilização da plataforma digital gamificada, Classcraft®, como estratégia motivacional para o processo de ensino-aprendizagem dos conteúdos de biologia celular e histologia nos cursos de Educação Física da UFES.

II. Metodologia

Trata-se de um estudo quali-quantitativo de caráter descritivo elaborado por meio de um projeto de ensino associado à disciplina Corpo Movimento e Conhecimentos Biológicos, ministrada para os estudantes do primeiro período do curso de Graduação em Educação Física nas modalidades Bacharelado e Licenciatura da Universidade Federal do Espírito Santo (UFES). O objetivo principal da disciplina é discutir os aspectos estruturais e moleculares da célula além das estruturas e funcionalidade dos tecidos humanos. Este trabalho foi desenvolvido a partir da aprovação do projeto de ensino pela Pró-Reitoria de Graduação (PROGRAD/UFES), os dados coletados no presente estudo referem-se ao semestre de 2022/2 com a participação de 77 estudantes matriculados na disciplina, dentre os cursos de licenciatura e bacharelado.

a) Estruturação da Disciplina: CORPO, MOVIMENTO E CONHECIMENTOS BIOLÓGICOS

A disciplina, obrigatória a todos os estudantes dos cursos de Educação Física na UFES, possui 60 horas de carga horária semestral. Para o processo de avaliação de aprendizagem, segundo o regimento da UFES, o estudante é considerado aprovado na disciplina com setenta por cento (70%) de aproveitamento do conteúdo das avaliações programadas ao final da apresentação dos blocos Citologia e Histologia. O conteúdo ministrado nas aulas, as atividades assíncronas, o material complementar e as referências bibliográficas utilizadas na disciplina foram descritas nos planos de ensino e todo o material foi disponibilizado por meio da plataforma digital Classcraft ®. Esta, é de uso gratuito e oferece aos usuários jogabilidade por meio de RPG (role play games), fomentando o comprometimento e a colaboração da equipe. A apresentação da disciplina na plataforma Classcraft®, foi iniciada por meio de uma narrativa que permitia aos estudantes o entendimento distribuição dos conteúdos a serem estudados, as células, componentes celulares e tecidos em associação às suas características e funcionalidades no corpo humano, O título da história: Uma Viagem às Células do Movimento Humano.

b) Planejamento das atividades

As atividades da disciplina, aulas práticas e teóricas, foram desenvolvidas de forma integrada ao uso da plataforma digital. O plano de ensino da disciplina foi a ferramenta utilizada para nortear o processo de ensino-aprendizagem que foi apresentado e distribuído da seguinte forma:

a) O conteúdo disponibilizado na plataforma digital, estava associado ao layout da disciplina e foi apresentado para criar uma experiência imersiva e envolvente, utilizando ilhas temáticas que remetem a um mundo fictício. Essas ilhas representam os diferentes locais onde os conteúdos das disciplinas são alocados, proporcionando aos estudantes uma sensação de exploração e progressão no ambiente de aprendizagem. As ilhas geralmente são divididas em diferentes áreas ou seções, correspondendo aos diferentes tópicos ou unidades de conteúdo da disciplina. Os estudantes podem navegar entre as ilhas e explorar as áreas correspondentes aos conteúdos específicos, estes foram divididos em cinco ilhas sequenciais e estavam em consonância com os temas abordados em sala de aula (Figura 1).

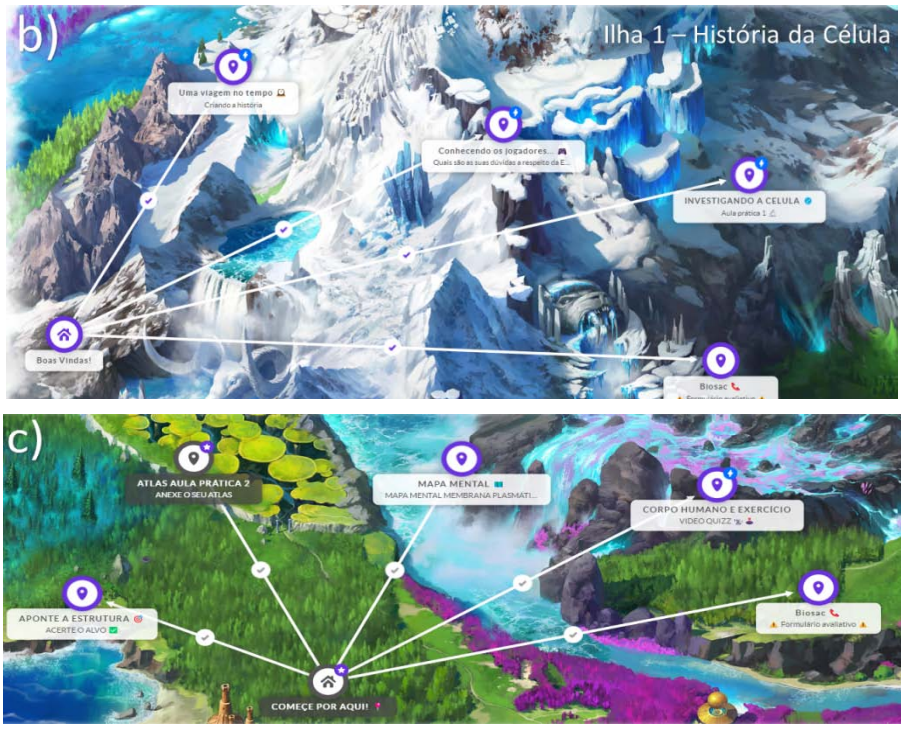

Figura 1: Disposição dos Conteúdos na Plataforma Classcraft®. a) Mapa Geral; B) Atividades Ilha 1; C) Atividades Ilha 2

b) Foram elaboradas e inseridas na plataforma Classcraft® diferentes atividades on-line baseadas no critério de domínio gratuito, dentre eles o aplicativo Quizz e programas/sites utilizados para criação/edição/exibição de apresentações gráficas (Educaplay, PowerPoint e Canva). As atividades foram utilizadas como ferramenta de revisão, aprofundamento do conteúdo e/ou avaliação, com a participação voluntária, com pontuação extra aos estudantes.

c) Coleta e Análise de Dados

Mattar e Ramos (2019), Cislaghi (2008) e Feitosa *et al* (2014) concordam que a utilização das tecnologias digitais no processo de ensino-aprendizagem pode levar a uma maior motivação e envolvimento dos estudantes em suas atividades, por outro lado é necessário o monitoramento de indicadores que possibilitem uma coleta sistemática de dados a avaliação e correlação desses fenômenos. Nesse sentido, foram desenvolvidos e aplicados três formulários ao longo do semestre a fim de descrever o perfil da turma, avaliar a utilização da plataforma digital gamificada Classcraft® e mensurar a percepção dos estudantes mediante a metodologia proposta.

i. *Tipos de Jogadores*

Com o objetivo de identificar o perfil de jogador predominante nas turmas e realizar o levantamento de dados demográficos (sexo e faixa etária), foi aplicado um questionário on-line com participação voluntária no início do semestre letivo intitulado: "Que tipo de jogador você é?" este, foi elaborado por meio do formulário do Google.

Baseado na metodologia proposta por Marczweski (2014), o formulário foi descrito por vinte e quatro perguntas com cinco alternativas de respostas que variam entre o nível de concordância (Discordo totalmente, Discordo, Não concordo nem discordo, Concordo e Concordo totalmente) conforme uma escala de Likert (5 pontos). Para cada estudante é possível identificar um tipo de jogador predominante e os secundários, portanto, para determinar o perfil de jogador predominante nas turmas considerou-se somente as respostas "concordo totalmente" para cada pergunta e optou-se em considerar os valores de frequência relativa, para apresentação dos resultados.

ii. *Formulários avaliativos: BioSac*

Na metade do semestre letivo 2022/2, os estudantes foram convidados a participar de uma avaliação da usabilidade e experiência de jogo na plataforma Classcraft® (PINELLE, 2009 e NECKE, 2010). Essa avaliação foi realizada de forma presencial e voluntária, utilizando um formulário intitulado BioSac contendo questões abertas e fechadas para descrever a experiência com o uso da plataforma. As perguntas fechadas foram formuladas com base em uma escala de dupla alternativa (concordo ou discordo) de resposta.

Os dados qualitativos foram solicitados aos estudantes por meio da descrição de três palavras-

chaves que estivessem relacionadas com a experiência de uso da plataforma pelos estudantes.

iii. *Avaliação Metodológica da Disciplina*

Ao final do semestre letivo 2022/02, os estudantes foram convidados a responderem o formulário, de maneira voluntária, referente a avaliação metodológica por meio de dados qualitativos através de perguntas abertas, onde poderiam expressar suas opiniões, descrever suas experiências além de dar sugestões, críticas e fazer comentários para o aprimoramento da metodologia de gamificação.

Essa combinação de análise descritiva dos dados quantitativos e análise interpretativa dos dados qualitativos permite obter uma compreensão mais abrangente da utilização da gamificação como ferramenta do processo de ensino-aprendizagem de biologia celular e histologia no ensino superior.

A apresentação dos resultados expressos em porcentagem e frequência relativa, permite a visão geral dos padrões e tendências presentes nos dados quantitativos coletados. Enquanto os dados qualitativos, apresentam análise de conteúdo com o objetivo de identificar temas, padrões e categorias emergentes nas respostas abertas dos participantes.

III. Resultados

a) Amostra

Os resultados apresentados se referem às turmas de licenciatura e bacharelado do curso de Educação Física da Universidade Federal do Espírito Santo matriculados na disciplina Corpo, Movimento e Conhecimentos Biológicos no semestre letivo de 2022/2. No total, foram matriculados na disciplina 77 estudantes entre os dois cursos, bacharelado (n=37) e licenciatura (n=40), respectivamente. No entanto, é importante observar que o número de participantes que responderam ao questionário foi diferente entre os cursos de bacharelado (n=34) e licenciatura (n=27).

Em relação ao perfil dos estudantes dos cursos de bacharelado e licenciatura, quanto ao sexo, observamos que 58,8% e 48% são do sexo masculino e 41,2% e 51,9% do sexo feminino, respectivamente. E em relação à faixa etária obtivemos a seguinte distribuição no curso de bacharelado, 52,9% entre 16-20 anos e 29,4% entre 20-25 anos, enquanto 17,7% possuem faixa etária igual ou maior a 26 anos. No curso de licenciatura, 51,9% entre 16-20 anos, 33,3% entre 20-25 anos, enquanto 14,8% faixa etária igual ou maior a 26 anos.

b) Tipos de jogadores

Os resultados referentes a análise do perfil dos jogadores está apresentada como valores de frequência relativa (fr), permitindo assim a distribuição e classificação dos perfis entre os estudantes dos cursos de bacharelado e licenciatura, respectivamente, Archiver (0,25 e 0,26), Free Spirit (0,19 e 0,20), Philanthropist (0,19 e 0,22), Socializer (0,17 e 0,19), Player (0,14 e 0,11) e Disruptor (0,06 e 0,02) (Gráfico 1), não observamos na estatística, diferença significativa entre os perfis dos jogadores dos estudantes dos cursos de bacharelado e licenciatura.

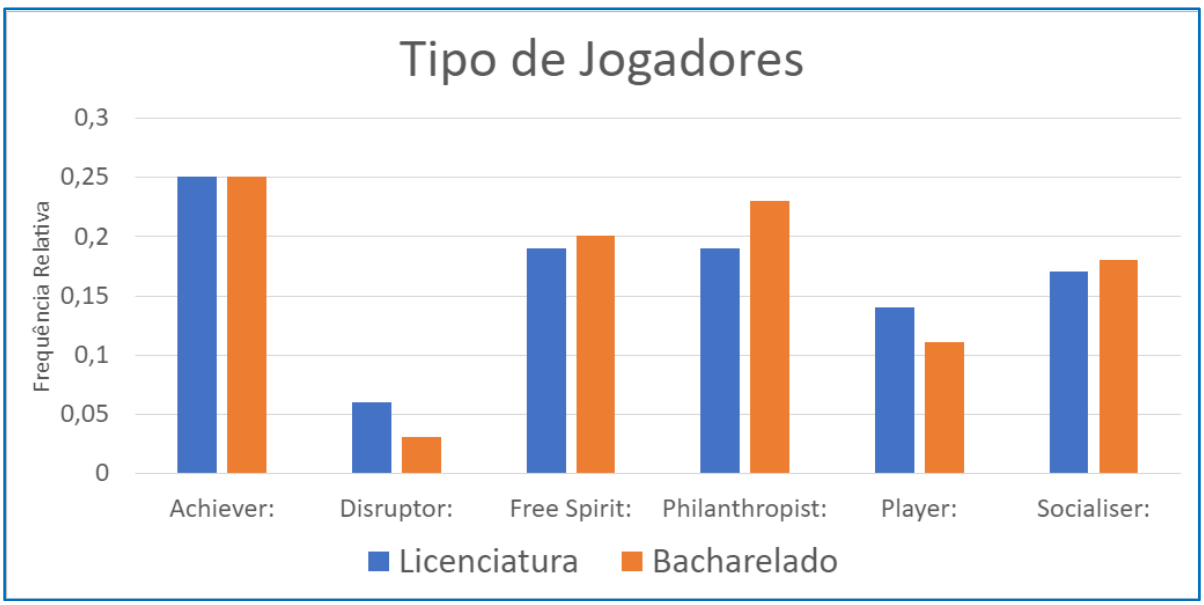

Gráfico 1: Perfil dos jogadores encontrados nas turmas de Licenciatura e Bacharelado

c) BioSac

Na tabela 1, podemos observar a distribuição dos percentuais que caracterizam os critérios de usabilidade e experiência do jogador na plataforma Classcraft®, com base nas respostas dos estudantes dos cursos de bacharelado e licenciatura. Em relação à usabilidade, cerca de 75% dos estudantes de ambos os cursos, reconheceram que os prazos para entrega das

atividades propostas foram suficientes, e eles consideraram a plataforma fácil de usar devido ao seu layout intuitivo. Porém, chama atenção que apenas 21,7% dos estudantes do curso de bacharelado e 28,6% dos estudantes do curso de licenciatura utilizaram recursos importantes da plataforma, que consolidam sua proposta de gamificação, esses recursos incluem elementos de jogo, como avatares, diamantes e o fórum da plataforma.

Em relação a experiência dos estudantes no uso da plataforma Classcraft®, observa-se aproximadamente 50% dos estudantes de ambos os cursos, bacharelado e licenciatura, destacaram que os problemas encontrados na plataforma não foram solucionados por meio do fórum, corroborando assim com os resultados apresentado no critério da usabilidade. Vale ressaltar ainda que aproximadamente, 60 a 80% dos estudantes de ambos os cursos, percebem o próprio progresso durante o uso da plataforma.

Tabela 1: Respostas ao formulário Biosac quanto a usabilidade e experiência do jogador durante a utilização da plataforma. *fórum=chat de conversa usado para tirar dúvidas e anunciar avisos importantes

Distribuição dos percentuais			
		Biosac	
Critérios	Perguntas	Licenciatura	Bacharelado
Usabilidade	Os prazos para cumprir as atividades propostas é suficiente para realizá-las	71,4	82,6
	Você já utilizou o fórum da platarfoma?	52,4	47,8
	As funções e o layuot da plataforma são intuitivas e fáceis de usar?	73,1	75,0
	Você já utilizou os diamantes do seu avatar?	28,6	21,7
Experiência do jogador	Caso você tenha utilizado o fórum, seu problema foi resolvido?	57,1	52,2
	A linguagem utilizada na plataforma é clara?	95,2	82,6
	Você está satisfeito com o feedback dos monitores?	85,7	73,9
	Você identifica o seu progresso na platarfoma?	66,7	69,6
	Na sua opinião, a plataforma é um caminho promissor para a disciplina?	76,2	87,0
	Você se sente mais motivado ao realizar as atividades?	61,9	73,9

Em relação a análise qualitativa, foi solicitado aos estudantes que ao avaliarem a experiência com a plataforma, informassem por meio de três palavras-chaves a visão geral da sua experiência com a plataforma Classcraft®. As palavras mais citadas entre os estudantes de ambos os cursos, bacharelado e licenciatura, foram: Aprendizado (10), Interessante (9), Legal (5), Conhecimento (5), Desafiador (3), Curiosidade (3) e Aprendizagem (3).

d) Avaliação da Disciplina

Em relação à avaliação da disciplina foram recebidas o total de 40 respostas que representam a variedade de opiniões dos estudantes sobre a metodologia adotada na disciplina de Corpo, Movimento e Conhecimentos Biológicos. Elas destacam os aspectos positivos da abordagem prática, a integração entre teoria e prática, a motivação proporcionada pela gamificação, as sugestões de melhorias em recursos e suporte, bem como comentários adicionais sobre a ampliação de conhecimentos e reflexões promovidas pela disciplina. As respostas foram categorizadas e para ilustrar a metodologia adotada, foram selecionadas respostas aleatórias de cada categoria.

A) Pontos Positivos

Aluno 1: "...gostei demais e aprendi muito com a dinâmica..."

Abulo 2: "...gostei da metodologia da disciplina, a gamificação ajuda no aprendizado, estimulando e instigando o aluno na matéria...",

Aluno 3: "...as atividades durante o semestre foram o grande ponto positivo da disciplina, fizeram com que

nós, os alunos, nos esforçarmos um pouco mais para estudar e aprender os conteúdos apresentados nas aulas...".

B) Sugestões de Melhorias

Aluno 1: "...o Classcraft foi um pouco complicado, achei difícil usá-lo..."

Aluno 2: "...achei a plataforma Classcraft confusa e precisa de melhorias..."

Aluno 3: "...a plataforma Classcraft foi inovadora, mas bem confusa..."

C) Comentários Adicionais

Aluno 1: "...experiência diferente de todas as outras disciplinas..."

Aluno 2: "...experiência satisfatória com os conteúdos e forma de ensino..."

Aluno 3: "...experiência boa, aprendi muito com os conteúdos e a forma como a professora explicou..."

IV. Discussão

As metodologias ativas são estratégias de ensino que colocam os estudantes no centro do processo de aprendizagem, permitindo que eles participem ativamente da construção do conhecimento. Essas abordagens são flexíveis, interligadas e híbridas, adaptando-se às necessidades e características dos alunos. Em um mundo conectado e digital, as metodologias ativas se manifestam por meio de modelos de ensino híbridos, combinando diferentes abordagens. Essa combinação de metodologias ativas com modelos flexíveis e híbridos traz contribuições significativas para o design de soluções educacionais contemporâneas para os estudantes de hoje. (Yaegashi, 2017). Para Haguenauer (2005), os métodos de ensino podem estar associados ao aumento na criatividade e a inteligência dos estudantes e, portanto, é preciso modernizar a educação para acompanhar as transformações que contribuam e inovem o processo de ensino-aprendizagem no âmbito acadêmico.

Diante da necessidade de promover uma discussão com ênfase nessas ferramentas e no seu impacto para a educação, justifica-se a realização de estudos que possam quantificar os valores desta mudança e a aplicabilidade de novas metodologias. Segundo Pedrosa (2011), a aplicação de metodologias ativas leva o discente a refletir sobre o seu processo de trabalho e a transformar a sua realidade, beneficiando-a, tendo em vista que desperta nele o senso crítico e a busca de mudanças em sua relação consigo mesmo, com o usuário e com a comunidade geral permitindo que ele perceba que a nova aprendizagem é um instrumento necessário e significativo para ampliar suas possibilidades e caminhos.

Nesse âmbito, os resultados obtidos no presente estudo corroboram com Landers e Callan (2014), que a metodologia de gamificação pode ser uma das formas de promover esse papel com maior entusiasmo e motivação para participação ativa no processo de construção e colaboração no seu processo de aprendizagem. Assim como outros autores, encontraram resultados positivos em termos de motivação dos estudantes e satisfação com a experiência de aprendizagem e destacaram que no uso da gamificação pode promover ocorrência de um impacto positivo em diferentes áreas do ensino superior, incluindo a melhoria da motivação, engajamento e desempenho dos estudantes.

Todavia, é necessário que esta abordagem seja planejada de maneira atrativa, mas que também contemple as necessidades do contexto educacional a que se refere (Silva, (2019). Nesse sentido, vários aspectos podem ser examinados mediante a aplicação dos elementos de jogos, tais como: usabilidade (Pinelle, 2009), jogabilidade (Mohamed e Jaafar, 2010) e a própria experiência do jogador (Necke, 2010). Ainda, segundo Necke, 2010, a experiência do jogador pode ser avaliada por meio de diversas ferramentas, incluindo entrevistas, questionários qualitativos e por método de heurística de jogabilidade. Segundo Mohamed e Jaafar, 2010, é visto que a avaliação heurística é comumente utilizada, onde o produto ou sistema ainda está em processo de desenvolvimento. Logo, essa ferramenta possibilita mapear a usabilidade e a experiência com o produto com relação a utilização de software sendo jogos ou não, com intuito de melhorar a eficiência do mesmo.

Para contribuir com a discussão acerca do uso da gamificação como fator motivacional associada aos recursos tecnológicos digitais na educação, os resultados referentes à utilização da plataforma foram categorizados em usabilidade e experiência do jogador. A gamificação e o uso dos recursos digitais são consideradas duas abordagens com ascendente destaque na educação do século XXI, proporcionando novas conexões na forma do processo de ensino e aprendizagem. De acordo com os resultados obtidos, cerca de 65% dos estudantes afirmaram que se sentem mais motivados durante o processo de ensino-aprendizagem, além de enxergar o próprio progresso ao utilizar a plataforma digital gamificada Classcraft®. Portanto, aplicar elementos e dinâmicas de jogos em contextos educacionais, torna o processo de aprendizagem mais engajador e motivador e ao associar recursos tecnológicos digitais como as plataformas e/ou aplicativos utilizados no ensino, pode mostrar um impacto significativo na forma como os estudantes se comunicam e acessam informações.

O ensino remoto acelerou o uso constante das novas tecnologias, acentuou as interações entre professores e estudantes por meio de videoconferências, plataformas digitais e grupos de comunicação online. Esse processo foi vivenciado no EARTE/UFES, com a transição para o ensino remoto e o

aumento do uso de tecnologias digitais, assim como a inserção de novas abordagens que têm sido exploradas no ensino superior. Pereira *et al*. (2021), investigou a implementação do ensino remoto no contexto universitário durante a pandemia de COVID-19, destacaram que para além da adaptação dos docentes às novas tecnologias, os recursos digitais promovem a participação ativa dos estudantes, como fóruns de discussão e atividades colaborativas, buscando manter a qualidade e a interatividade nas práticas educacionais.

Johnson *et al*. (2016), ressalta outro papel importante que os recursos tecnológicos digitais oferecem, a personalização do ensino, possibilitando um aprendizado mais individualizado para cada estudante, de acordo com seu ritmo e estilo de aprendizagem e permite ao docente, aprimorar as suas técnicas e intervenções no processo sem deixar de lado o alinhamento aos objetivos pedagógicos e considerando as características e necessidades dos estudantes.

Quanto a utilização da plataforma, os resultados deste trabalho apontam que aproximadamente 55% dos estudantes utilizaram ferramentas como o fórum da plataforma e cerca de 75% dos estudantes concordam que o prazo das atividades foi suficiente para sua realização, bem como 55% dos estudantes que recorreram ao fórum para dúvidas, estas foram resolvidas. Outro ponto importante dos resultados deste estudo, diz respeito às características como o perfil do jogador que também influenciam na adesão e engajamento desta metodologia proposta. Os resultados apontam uniformidade quanto aos perfis de jogadores encontrados nas turmas estudadas. Hassan *et al*.; 2019 e Klock *et al*., 2020 mostraram que é relevante personalizar a experiência de aprendizagem, e explorou a relação entre o perfil de jogador dos estudantes e seu desempenho em um ambiente gamificado. Os resultados revelaram que diferentes tipos de jogadores apresentaram preferências e comportamentos distintos durante o processo de aprendizagem. Entretanto, não há consenso na literatura sobre esta relação direta e de eficácia no processo de engajamento. De acordo com, Andrade (2018), não é possível afirmar que a gamificação personalizada proporciona maior engajamento do que a gamificação não-personalizada, mas os resultados sugerem que usuários que permanecem mais tempo no sistema têm maior engajamento em um ambiente personalizado. Sendo assim, compreender o perfil do jogador pode auxiliar os educadores na adaptação das estratégias de gamificação, oferecendo desafios adequados e estímulos personalizados para cada aluno.

Segundo Brusilovsky (1996), em um modelo individualizado que considera os objetivos, preferências e conhecimentos de cada jogador, facilita-se a adaptação e interação de acordo com suas necessidades específicas. É fundamental reconhecer que cada jogador possui um perfil único, que influencia sua forma de apresentação e utilização dos recursos, permitindo identificar as informações mais relevantes para cada perfil.

O uso das tecnologias digitais pelas gerações atuais tem sido amplamente documentado (Habowski, 2019; Habowsky, 2020; Grinspun, 2016) e apontam que os jovens estão cada vez mais imersos em ambientes digitais, utilizando dispositivos móveis e participando de comunidades online. Nesse contexto, os jogos eletrônicos têm desempenhado um papel significativo, pois oferecem uma linguagem atrativa e familiar para os jovens, despertando seu interesse e envolvimento. Essa preferência pela linguagem dos jogos no processo de aprendizagem também tem sido objeto de estudos recentes. Kebritchi et al. (2017), têm evidenciado que a gamificação na educação pode aumentar a motivação dos estudantes, melhorar o engajamento e promover um ambiente de aprendizagem mais dinâmico e interativo. Através de elementos como desafios, recompensas e progressão, os jogos educacionais oferecem uma abordagem lúdica e efetiva para o ensino e a aprendizagem. Por outro lado, uma das limitações encontradas na aplicação da metodologia proposta foi a utilização de recursos de recompensa fornecido pela plataforma, somente 25% dos estudantes utilizaram os diamantes. Por fim, é importante mencionar que as respostas abertas contribuem para avaliar a aplicação da metodologia proposta e elucidar um caminho mais efetivo quanto a utilização posteriormente desta plataforma, fornecendo o feedback necessário para melhorar a eficácia da metodologia proposta.

V. Considerações Finais

Com base nos resultados apresentados, pode-se concluir que a utilização da plataforma digital gamificada, Classcraft®, teve impactos positivos na experiência dos estudantes de primeiro período dos cursos de bacharelado e licenciatura em Educação Física da Universidade Federal do Espírito Santo estimulando o engajamento, motivação, aprendizado e reflexões. No entanto, o trabalho também aponta que são necessárias melhorias na exploração dos recursos disponíveis na plataforma e na resolução de problemas identificados. Esses resultados podem fornecer subsídios para futuras investigações e aprimoramentos na implementação de estratégias de gamificação no ensino superior.

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We accept the manuscript submissions in any standard (generic) format.

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Alternatively, you can download our basic template from https://globaljournals.org/Template.zip

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3. Ensure corresponding author's email address and postal address are accurate and reachable.
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Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

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Tips for Writing a Good Quality Science Frontier Research Paper

Techniques for writing a good quality Science Frontier Research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of science frontier then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

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References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

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