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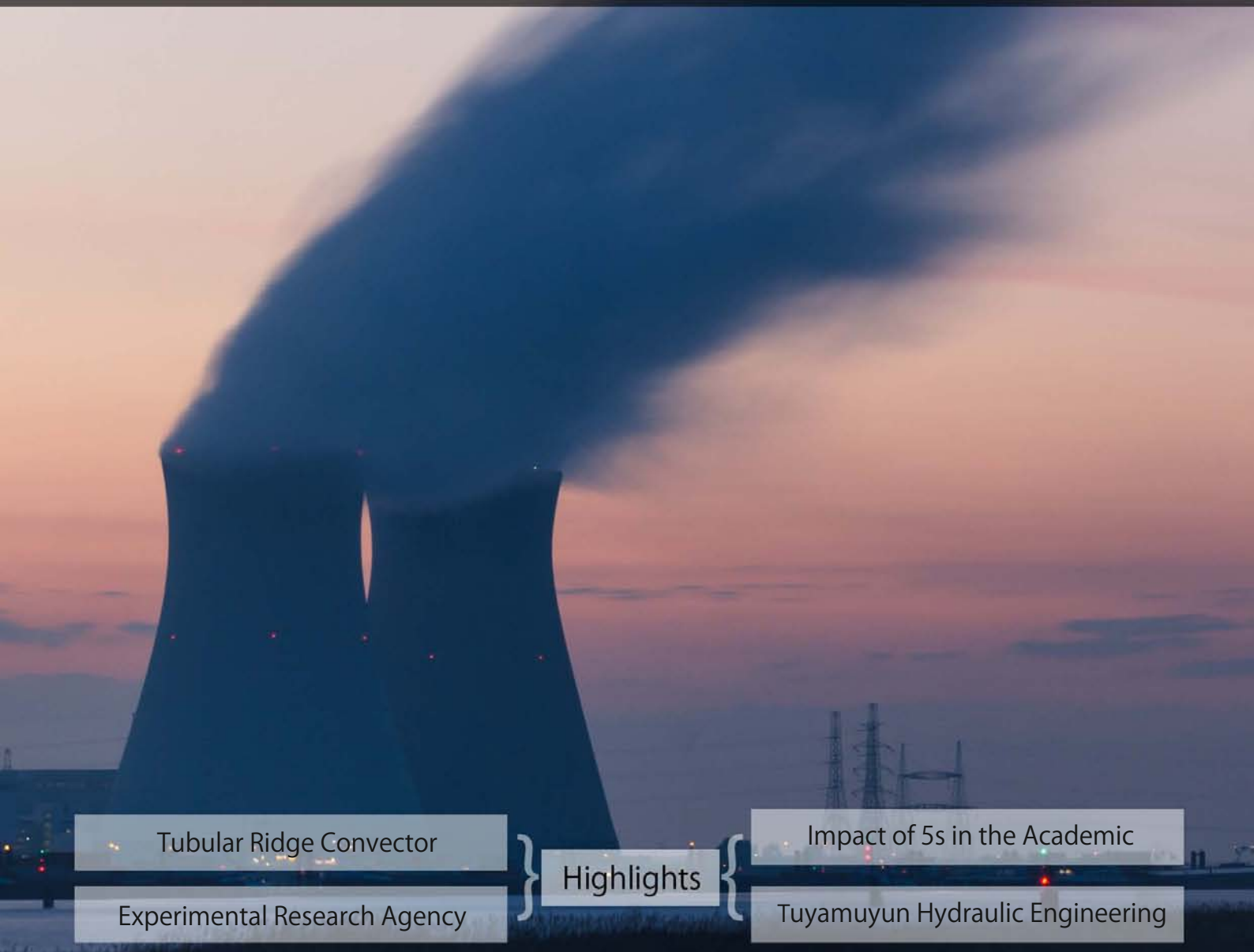

Highlights

- Tubular Ridge Convector
- Experimental Research Agency
- Impact of 5s in the Academic
- Tuyamuyun Hydraulic Engineering

Discovering Thoughts, Inventing Future

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Experimental Research Agency of Fouling on Heat Rating of the Tubular Ridge Convector

By Sukhotski Albert
Belarussian State Technological University

Abstract- The experimental research of intensity of a thermal stream and distribution of temperatures on ribbed pure and low-purity surface of the tubular ridge convector with spiral aluminium ribs is spent at air free convection. Researches were spent by a method of full thermal model testing at specially developed experimental stand, and ring uniform pollution ribbed tubes was created by dense winding between ribs of a linen cord or wrapping of tube by an aluminium foil.

It is revealed that at a free convection in tubes with a close arrangement of ribs of pollution of intercostal space at the basis **оребрения** does not lead to essential decrease in a heat rating (less than 10 %), and the decline to give heat properties of a tube occurs only at pollution of cops ribbed (on 20,5 %). The temperature on altitude of a lateral surface of a rib decreases slightly (less than 2 %), and on a rib cop in relation to the basis - for 6-9 %. Hence, at maintenance of ridge convectors of systems of heating their frequent and careful clearing of pollution is not obligatory.

Keywords: *bimetallic ribbed tube, convector, pollution, heat rating at air free convection.*

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Experimental Research Agency of Fouling on Heat Rating of the Tubular Ridge Convector

Экспериментальное исследование влияние внешнего загрязнения на тепловую мощность трубчатого ребристого конвектора

Sukhotski Albert

Abstract- The experimental research of intensity of a thermal stream and distribution of temperatures on ribbed pure and low-purity surface of the tubular ridge convector with spiral aluminium ribs is spent at air free convection. Researches were spent by a method of full thermal model testing at specially developed experimental stand, and ring uniform pollution ribbed tubes was created by dense winding between ribs of a linen cord or wrapping of tube by an aluminium foil.

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Keywords: bimetallic ribbed tube, convector, pollution, heat rating at air free convection.

Абстрактный- **Проведено экспериментальное исследование интенсивности теплового потока и распределение температур на оребренной чистой и загрязненной поверхности трубчатого ребристого конвектора со спиральными алюминиевыми ребрами при свободной конвекции воздуха. Исследования проводились методом полного теплового моделирования на специально разработанном экспериментальном стенде, а кольцевое равномерное загрязнение оребренной трубы создавалось путем плотной намотки между ребрами льняного шнура или обертыванием трубы алюминиевой фольгой.**

Обнаружено, что при естественной конвекции в трубах с тесным расположением ребер загрязнения межреберного пространства у основания оребрения не приводит к существенному снижению тепловой мощности (менее 10%), а ухудшение теплоотдающих свойств трубы происходит только при загрязнении верхушек оребрения (на 20,5%). Температура по высоте боковой поверхности ребра уменьшается незначительно (менее 2%), а на верхушке ребра по отношению к основанию – на 6–9%. Следовательно, при эксплуатации ребристых конвекторов систем отопления не обязательна их частая и тщательная очистка от загрязнения.

Ключевые слова: биметаллическая ребристая труба, конвектор, загрязнение, тепловая мощность при естественной конвекции воздуха.

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I. Введение

Во многих странах, в том числе и России, расширяется применение в системах отопления трубчато-ребристых нагревательных приборов – конвекторов, которые характеризуются малой инерционностью и металлоемкостью, простотой изготовления, возможностью механизировать и автоматизировать их производство [1, 2]. Одним из видов конструктивного исполнения конвектора является биметаллическая труба с круглыми алюминиевыми ребрами. Площадь внешней поверхности ребристой трубы во много раз больше, чем площадь поверхности гладкой трубы того же диаметра и длины, что придает отопительному прибору особую компактность. К недостаткам конвекторов относится трудоемкость очистки от пыли. При эксплуатации конвектора происходит снижение его тепловой мощности в результате загрязнения внутренней и наружной теплообменной поверхности.

Методики теплогидравлического расчета оребренных биметаллических труб для вынужденной и свободной конвекции приведены во многих источниках [3–9]. В справочной литературе [3, 4] имеется достаточно большое количество проверенных практикой данных по величине термического сопротивления движущихся внутри трубы различных охлаждаемых технологических энергоносителей. Подходы к учету внешнего загрязнения представлены только для вынужденной конвекции и принципиально противоположные. По мнению [4, 5] влияние загрязнения с воздушной стороны можно не учитывать, так как коэффициент теплоотдачи от оребрения к охлаждающему воздуху низок и поэтому термическое сопротивление теплоотдачи с внешней стороны является определяющим в общем термическом сопротивлении теплопередачи. Однако натурные экспериментальные исследования [10, 11] теплопередачи аппаратов воздушного охлаждения из биметаллических ребристых труб с накатанными алюминиевыми ребрами указывают на уменьшение от внешнего загрязнения оребрения коэффициента теплопередачи до 12% при вынужденной конвекции.

Разработаны также теоретические модели расчета коэффициента теплопередачи оребренной биметаллической трубы с кольцевым равномерным загрязнением [12–15] для разреженных круглых ребер, которые, однако, не подтверждены экспериментальными данными.

Цель работы – экспериментальное исследование интенсивности теплового потока и распределение температур на оребренной чистой и загрязненной поверхности круглоребристой трубы при свободной конвекции воздуха.

II. Основная Часть

Объектом исследования являлась биметаллическая ребристая труба со спиральными накатными ребрами. Материал ребристой оболочки – алюминиевый сплав АД1М, материал несущей трубы – углеродистая сталь Ст10. Диаметр несущей трубы $d_н$ = 25 мм, толщина стенки δ = 2 мм. Геометрические параметры оребрения, мм: наружный диаметр ребра d = 56 мм; высота ребра h = 14,6 мм; диаметр по основанию ребра $d_0 = d - 2h$ = 26,8 мм; шаг ребра s = 2,5 мм; средняя толщина ребра Δ = 0,5 мм; коэффициент оребрения трубы ф = 19,26. Полная длина биметаллической трубы с торцевыми участками 330 мм, теплоотдающая длина – l = 300 мм.

Исследования проводились методом полного теплового моделирования на специально разработанном в [16] экспериментальном стенде для исследования свободно-конвективного теплообмена. В центре стендовой камеры размером 0,8×0,8×1 м размещалась исследуемая оребренная труба, которая являлась калориметром с установленными средствами измерения.

Конструкция опытной трубы-калориметра представлена на рис. 1. Внутри биметаллической ребристой трубы *1*, указанной выше, установлен трубчатый электронагреватель (ТЭН) *2* со следующими параметрами: диаметр – 12,5 мм, длина 320 мм, мощность 320 Вт. Внутри оболочки ТЭНа, выполненного из углеродистой стал и, размещена спираль *3* из проволока с высоким омическим сопротивлением и наполнитель (электротехнический периклаз марки ППЭ). С помощью центровочного кольца *4* обеспечивалась центральное расположение ТЭНа в трубе. А с целью устранения внутренних конвективных токов воздуха и равномерного прогрева ребристой трубы между ТЭНом и стальной стенкой трубы, засыпался кварцевый песок *5* дисперсным составом 0,16–0,32 мм. Торцы трубок герметизировались высокотемпературной силиконовой замазкой *6*.

Для измерения средней температуры поверхности калориметра у основания ребер $t_{осн}$ зачеканивалось свинцом пять медь-константановых термопар *7* вдоль образующей трубы, сдвинутых относительно друг друга на угловое расстояние 45°. Термопары были заложены у основания ребер вдоль образующей трубы по винтовой линии на половине окружности трубы, считая, что вторая половина имеет симметричное поле температур. Также на поверхности ребра, размещенного в центре трубы, припаивались четыре медь-константановые термопары *8* (диаметр провода 0,2 мм) с шагом 3,65 мм от основания по высоте 3,65 мм и последней термопарой размещенной на верхушке ребра (рис. 1, сечение *I*). Предварительно термопары были протарированы с точностью 0,1°С. Торцевые участки оребренной трубы защищены фторопластовыми втулками *9* наружным диаметром $d_{вт}$ = 45 мм, длиной $l_{вт}$ = 35 мм, глубиной $b_{вт}$ = 25 мм. С целью измерения торцевых потоков тепла на поверхности обеих втулок с противоположных сторон закреплялось по два спая общей 4-спайной медь-константановой дифференциальной термобатареи.

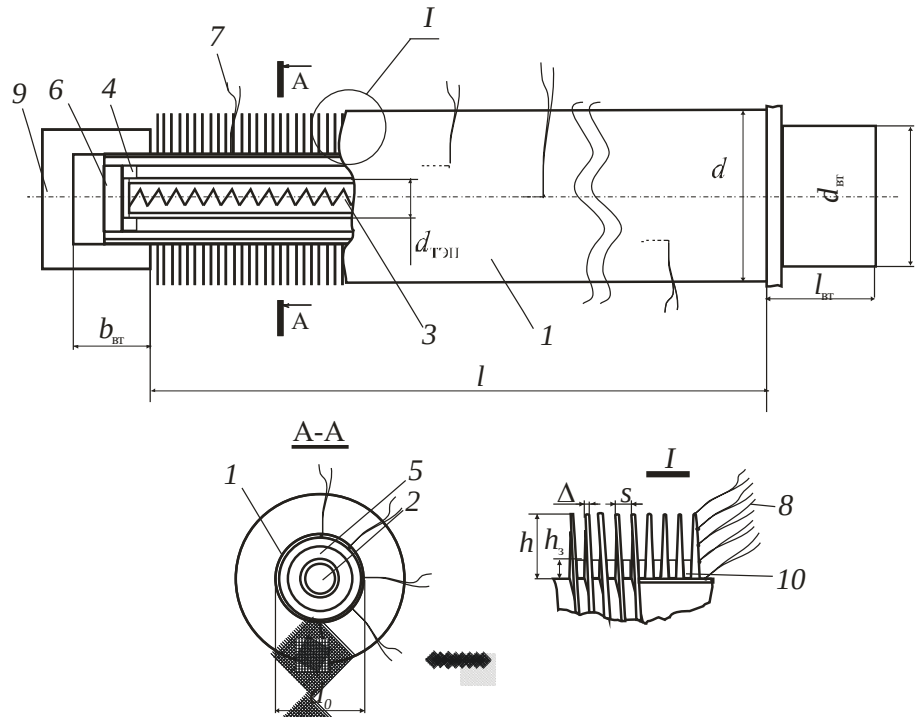

Рис. 1: Общий вид калориметрической трубы: *1* – биметаллическая ребристая труба; *2* – трубчатый электронагреватель (ТЭН); *3* – – спираль ТЭНа; *4* – центровочное кольцо; *5* – кварцевый песок; *6* – высокотемпературная силиконовая замазка; *7* – медь-константановые термопары у основания ребер; *8* – медь-константановые термопары по высоте ребра; *9* – фторопластовая втулка; 10 – льняной шнур

Показания медь-константановых термопар *7* и *8* фиксировались с помощью вольтметра (модель GDM-78341 класса точности 0,25), подключенного через переключатель. Холодный спай всех термопар помещался в сосуд Дьюара.

При исследовании кольцевое равномерное загрязнение оребренной трубы создавалось путем плотной намотки между ребрами льняного шнура *10* диаметром 1,7−2,3 мм, средней теплопроводностью $\lambda_з$ = 0,05 Вт / (м К). Таким образом, в межреберном пространстве создавался слой высотой $h_з$ = 3,3; 6,3; 8,7; 11,4; 16,1 мм с неравномерностью ±0,4 мм ((рис 2, *а*)).

а *б*

Рис. 2: Исследование кольцевого равномерного загрязнения оребренной трубы путем намотки льняного шнура *а* и обматыванием фольги *б*

Также, для обеспечения максимального термического сопротивления межреберного пространства, чистая оребренная труба герметично обматывалась алюминиевой фольгой толщиной 0,3 мм (рис 2, *б*). Таким образом, достигалось заполнение межреберного пространства неподвижным воздухом и обеспечивалось максимальное снижение тепловой эффективности ребристой трубы.

Подвод теплового потока к оребренным поверхностям обеспечивался ТЭНом, который подключался к регулируемому масляному трансформатору (модель АОМН-40-220-75). Мощность, подводимая к оребренной трубе, измерялась ваттметром (модель К 505 класса точности 0,5). Температура воздуха t_0 внутри камеры измерялась двумя ртутными лабораторными термометрами со шкалой 0−50°С и

ценой деления 0, 1°C, расположенными в диагонально противоположных ее углах. Ртутные шарики термометров защищались от излучения пучка экранами из алюминиевой фольги.

Теплота от оребренной поверхности конвекцией и излучением передавалась атмосферному воздуху, который за счет разности плотностей нагретого и холодного воздуха поднимался вверх в окружающую среду. Во время экспериментального исследования оребренной трубы электрическая мощность, подводимая к трубе, поддерживалась постоянной для льняного шнура $W = 40\pm2$ Вт и изменялась для воздуха $W = 10{,}3-77{,}5$ Вт , температура стенки у основания ребер составляла $t_{осн} = 80-94$°C, а температура окружающего воздуха в камере $t_0 = 18{,}4 - 20{,}1$°C.

Удельный тепловой поток q, Вт/м, на 1 м погонной длины конвектора отведенный от трубы к воздуху конвекцией и излучением, рассчитывался из уравнения

$$q = \left(W - Q_{\text{п}}\right) / l,$$

где $Q_{\text{п}}$ – тепловые потери через торцы труб и токоподводы (рассчитывались через ранее полученную экспериментальную зависимость по средней температуре на поверхности втулок), Вт.

Результаты экспериментов представлены на рис. 3, 4. На рис. 3 показана зависимость относительной тепловой мощности трубы q / $\Delta t_{осн}$ от термического сопротивления загрязнения $R_{з} = h_{з} / \lambda_{з}$, где $\Delta t_{осн} = t_{осн} - t_0$ – среднее увеличение температуры у основания оребрения над температурой окружающей среды. При размещении в межреберном пространстве неподвижного воздуха $h_{з} = h =$ 14,6 мм, а коэффициент теплопроводности воздуха $\lambda_{з}$ определялся в зависимости от средней температуре по поверхности ребра.

Как видно, при высоте загрязнения меньше высоты ребра ($h_{з} < h =$ 14,6 мм), тепловая мощность трубы уменьшается незначительно (менее 10%). При полном закрытии оребрения слоем загрязнения из льняного шнура ($h_{з} =$ 16,1 мм) тепловая мощность уменьшается на 20,5%. По-видимому, это обусловлено тем, что при естественной конвекции в трубах с тесным расположением ребер в межреберном пространстве у основания ребер воздух остается практически неподвижным и является естественным изолятором, а основной отвод теплового потока осуществляется с верхушек оребрения. Поэтому загрязнения межреберного пространства у основания оребрения не приводит к существенному снижению тепловой мощности, а ухудшение теплоотдающих свойств трубы происходит только при загрязнении верхней части оребрения. При изоляции межреберного пространства неподвижным воздухом тепловая мощность снижается до 55%.

Это предположение косвенно подтверждается путем сравнения относительной тепловой мощности оребренной трубы с тепловой мощностью гладкой трубы диаметром равной диаметру оребрения $d =$ 56 мм (на рис. 3 представлена в виде пунктирной линии), рассчитанной по [17]. Как видно, тепловые мощности чистой оребренной трубы и гладкой трубы сопоставимы, что подтверждает представление об интенсивном отводе тепла с верхушек ребер.

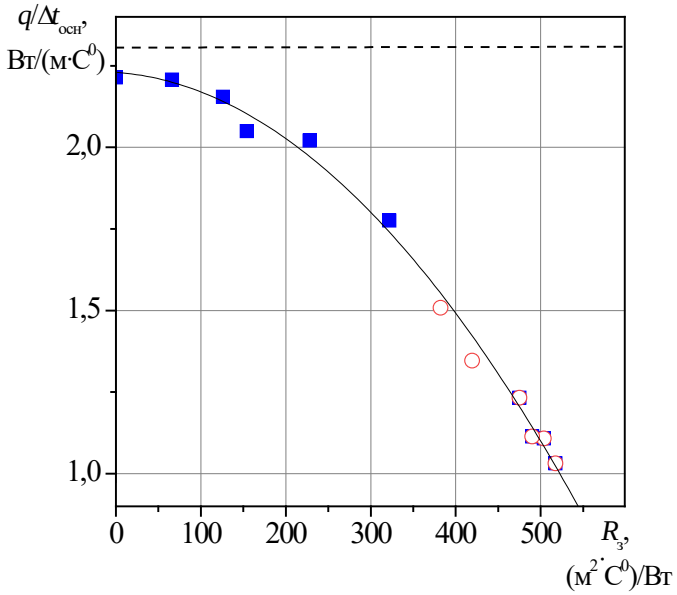

Рис. 3: Зависимость относительной тепловой мощности трубы $q / \Delta t_{осн}$ от термического сопротивления загрязнения $R_з = h_з / \lambda_з$: ! – льняной шнур, – – воздух

На рис. 4 представлены зависимости относительного перепада температуры $(t_р - t_0) / q$ по высоте ребра h для чистой и загрязненной оребренной трубы, где $t_р$ температура на поверхности ребра определенная термопарами 8 (рис. 1, сечение *I*). Пунктирной линией на рисунке показана граница раздела чистой и загрязненных областей оребренной поверхности (выше пунктирной области температуры $t_р$ определялись термопарами закрытыми загрязнением).

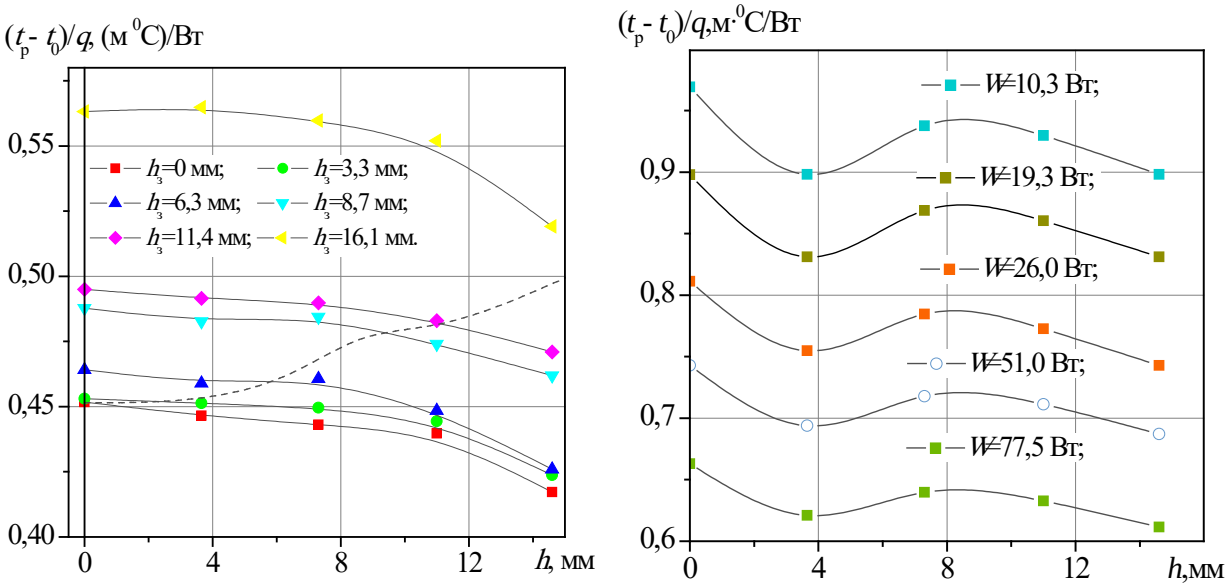

Рис. 4: Зависимости относительного перепада температуры $(t_р - t_0) / q$ по высоте ребра h для чистой ($h_з = 0$), загрязненной льняным шнуром *а* и неподвижным воздухом *б* оребренной трубы с высотой загрязнения $h_з$ и тепловой мощностью W: ! – $h_з$ = 0 мм, , – $h_з$ = 3,3 мм, 7 – $h_з$ = 6,3 мм, В – $h_з$ = 8,7 мм, Λ – $h_з$ = 11,4 мм, Ω – $h_з$ = 16,1 мм; ! – W = 10,3 Вт, ! – W = 19,3 Вт, ! – W = 26,0 Вт, – – W = 51,0 Вт, ! – W = 77,5 Вт

Как видно, температура по высоте боковой поверхности ребра уменьшается незначительно (менее 2%), а на верхушке ребра по отношению к основанию – на 6–9%.

III. Заключение

Проведено экспериментальное исследование интенсивности теплового потока и распределение температур на оребренной чистой и загрязненной поверхности круглой трубы при свободной конвекции воздуха.

При загрязнении оребренной поверхности только у основания ребер тепловая мощность теплообменной трубы уменьшается менее чем на 10%. Предельное загрязнение межреберного пространства неподвижным воздухом уменьшило тепловую мощность более чем в два раза. Следовательно, при эксплуатации трубчатых ребристых конвекторов не обязательна их частая и тщательная очистка от глубоких межреберных плотных загрязнений.

Литература

1. Сканави А. Н., Махов Л. М. Отопление. М.: АСВ, 2008.
2. Тиатор И. Отопительные системы: перевод с немецкого. М.: Техносфера евроклимат, 2006.
3. Кунтыш, В. Б. Тепловой и аэродинамический расчеты оребренных теплообменников воздушного охлаждения / В. Б. Кунтыш, Н. М. Кузнецов. СПб.: Энергоатомиздат, 1992.
4. Машины и аппараты химических производств: примеры и задачи / И. В. Доманский [и др.]. Л.: Машиностроение, 1982.
5. Bott, T. R. Fouling of Heat Exchangers / T. R. Bott. Amsterdam: Elsevier, 1995.
6. Müller-Steinhagen, H. Heat Exchanger Fouling. Mitigation and Cleaning Technologies / H. Müller-Steinhagen. Essen: PUBLICO Publications, 2000.
7. Анализ методик расчета теплопередачи аппаратов воздушного охлаждения/ В. Б. Кунтыш [и др.] // Химическая техника. 2015. No 4. С. 7-13.
8. Основы расчета и проектирования теплообменников воздушного охлаждения: Справочник / Под общ. ред. В.Б.Кунтыша, А.Н.Бессонного. СПб.: Недра, 1996.
9. Керн, Д. Развитые поверхности теплообмена / Д. Керн, А. Краус. М.: Энергия, 1977.
10. Камалетдинов И. М. Энергосбережение при эксплуатации аппаратов воздушного охлаждения на магистральных газопроводах. Автореферат канд. диссертации. Уфа, 2002.
11. Беркутов Р. А. Повышение энергоэффективности систем охлаждения газа на компрессорных станциях. Автореферат канд. диссертации. Уфа, 2010.
12. Володин В.И., Кунтыш В.Б., Петреева Н.Г., Бессонный А.Н., Бессонный Е.А. Влияние внешнего загрязнения на эффективность теплообменных аппаратов воздушного охлаждения / Володин В. И. [и др.] // XIV Минский международный форум по тепло- и массообмену: тез. докл. и сообщ., Минск, 10–13 сентября 2012. Минск: ИТМО имени А. В. Лыкова НАН Беларуси, 2012. Т. 3. С. 315–317.
13. Дифференцированный учет термического сопротивления внешнего загрязнения оребрения труб шахматных пучков в тепловом расчете воздухоохлаждаемых теплообменников / А. Б. Сухоцкий [и др.] // XV Минский междунар. форум по тепло- и массообмену: тез. докл. и сообщ., Минск, 23–26 мая 2016 г. Минск: ИТМО имени А. В. Лыкова НАН Беларуси, 2016. Т. 3. С. 424–426.
14. Карлович Т.Б. Теплопередача круглых ребристых труб при неравномерном эксплуатационном загрязнении межреберного пространства // Инженерно-физический журнал. 2018. Т. 91. № 5. С. 1278-1286.
15. Дударев В.В., Филатов С.О., Карлович Т.Б. Методика расчета и анализ коэффициента теплопередачи биметаллических ребристых труб аппаратов воздушного охлаждения с неравномерным внешним загрязнением // Энергетика. Известия высших учебных заведений и энергетических объединений СНГ. 2017. Т. 60. № 3. С. 237-255.
16. Сидорик Г. С. Экспериментальный стенд для исследования тепловых и аэродинамических процессов смешанно-конвективного теплообмена круглоребристых труб и пучков / Г. С. Сидорик // Труды БГТУ. Сер. 1, Лесное хозяйство, природопользование и переработка возобновляемых ресурсов. Минск: БГТУ, 2018. № 1. С. 85–93.
17. Михеев М. А., Михеева И. М. Основы теплопередачи. М.: Энергия, 1973.

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Impact of 5s in the Academic Life of Undergraduate Students: A Case Study

By Maliha Rajwana Haque & Sadia Tabassum
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Abstract- The aim of this paper is to determine the impact of the 5S tool on a student's academic career. Some factors were considered from the 5S tool and the result of the students were considered to be dependent on these factors-Time maintenance, Competitiveness, Confidence, Other skills, Punctuality, Organizing skill, Comprehensiveness, Proactivity, Readiness. Based on this, some hypotheses were generated. Kruskal Wallis H test was done on the dataset along with Mann Whitney U test. As a result, the null hypotheses were rejected. The result showed that 5S had a significant impact on a student. The P-value was significantly less which assures that the result was as intended. The 'satisfactory' result group showed a difference with the 'not satisfactory' result group. Which confirms our objective. This research gives an idea of how a lean manufacturing tool can be used on subjects other than manufacturing organizations. However, the study was only done on students of Bangladesh. For more elaborate use of 5S, the worldwide population can be considered as the respondents of this study.

Keywords: 5S tool, undergrad students, academic career, kruskal wallis H test, mann whitney U test, significance level.

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Maliha Rajwana Haque[α] & Sadia Tabassum[σ]

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I. Introduction

5S known as a lean tool that is used in a manufacturing environment system of an organization is used normally used to organize a workspace. It is a well-practiced systematic tool based on 5 pillars: Sort, Set in Order, Shine, Standardize, Sustain. These steps include going through everything in a space, rejecting the unnecessary and keeping the necessary things, arranging everything in order, cleaning, and setting up procedures for performing these tasks on a regular basis. From these components, we have considered some factors- Time maintenance, Competitiveness, Confidence, Other skills, Punctuality, Organizing skill, Comprehensiveness, Proactivity, Readiness. We have examined if these factors can impact a student's academic career. This decision was made based on their result which we found through the survey. The survey was done through a five-point Likert chart questionnaire. We had generated some hypotheses after which we conducted statistical analysis on the data set. Based on the nature of the data, a non-parametric KruskalWallis H test was performed. The null hypothesis was rejected, and the alternative hypothesis was accepted through the process.

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a) Problem Statement

5S is a method that has 5 steps that work for organizing a workplace for more efficiency and ensures proper management of time and energy to make sure optimization is done. Undergraduate students try hard to cope with the overall environment of their institutions and face problems with time maintenance. It is seen in general that some students face a downfall of their result, miss classes, they have lack of ambition, etc. These as a result can impact their mental state creating anxiety and suicidality.

5S can contribute to arranging tasks of school and home in a proper manner. The main motive of using 5S is to make their visions clear and strategic. It helps students to gain perspective and reach for their goals.

b) Objectives

1. To practice the five main segments of 5S in the aspect of a student's academic life.
2. To ensure improvement of the result of a student.
3. To discuss the effects of 5S steps in a student's academic life.

c) Organization of the Case Study

This paper follows a sequence of our work. Chapter 2 has covered the literature review. We have elaborated on the paper we reviewed and the research gaps of those papers. Chapter 3 covers the theoretical background of this paper. Chapter 4 has the methodology of our research. And then the data collection process and result analysis were covered in chapter 5. Chapter 6 ends with the conclusion of this paper. We have mentioned some of the future work suggestions we have from our work.

II. Literature Review

This chapter contains the significance of our study through the literature review of papers that we have followed. Findings, suggestions for future work and the limitations of the papers are mentioned in this chapter.

a) Review of Literature

Students of undergrad level struggle from the beginning of their university journey to pull off a good result. But many factors prevent them from achieving that. For example, a journal of college students development suggested that Personal or career-related motivation to attend college in the fall was a positive

predictor for a good result and lack of peer support was a negative predictor for lower GPA (Dennis, Jessica M., Jean S. Phinney, and Lizette Ivy Chuateco,2006). Bad results outcome impacts a student's life in a way that sometimes they can become stressed and have mental instability. They are also seen having chronic anxiety disorders and a tendency of being suicidal. According to (Eisenberg, Daniel, et al, 2007) students with lower socioeconomic status are at higher risk of facing these problems. About 15.6% of undergraduate students were found to have depressive and anxiety disorders in the U.S.A. Then another study by (Zajacova, Anna, Scott M. Lynch, and Thomas J. Espenshade, 2005) estimated structural equation models to assess the relative importance of stress and self-efficacy in predicting three academic performance outcomes: first-year college GPA, the number of accumulated credits, and college retention after the first year. The results held academic self-efficacy to be a more robust and consistent predictor than stress in academic success. Academic goals, academic self-efficacy, and academic-related skills were shown to be the strongest factors that could give a student a tight grip on the maintenance of daily college activities and achieve a good result (Dennis, Jessica M., Jean S. Phinney, and Lizette +Ivy Chuateco,2005).

Application of the 5S tool can bring about good changes in an educational institution as well as in students. A study by (Abu Bakar, N., Uzaki, K., Mohamed Naim, A., and Abd Manaf, N. A,2020) showed that implementing the 5S tool can improve quality management and it helps policymakers in university to develop a conducive environment for students. 5S application the higher education institute showed a method to rearrange the layout and improve the discipline and can also improve the productivity and quality (Chourasia, Ravi, and Archana Nema, 2019). Not only the performance of a system but 5S can also develop the relation among peers in an institution. (El-Sherbiny, Naglaa A., Eman H. Ibrahim, and Asmaa Younis, 2019) took an initiative on engaging the undergraduate medical students in implementing the 5S-KAIZEN at the Faculty of Medicine, Fayoum University and as a result, they found that 5S immensely improved the communication between medical students and the healthcare providers. This tool can also be used in the classroom where everyday cleaning and organizing the study area is hard. Implementing 5S in a classroom can improve and optimize the classroom environment (. Moreno López, Stephanie L, 2020).

Not only in a student's life or educational institution but many organizations can benefit from the use of the 5S tool. This tool is a must in institutions where a safety issue is necessary. The 5S tool helps to improve the ergonomics of the surveying laboratory (Ebuetse, Mercy Akunna, 2018), helps make better use of the laboratory area (Sari, Amarria Dila, Fety Ilma Rahmillah, and Bagus Prabowo Aji, 2017), saves time when looking for tools and materials due to its location and gives good visual control. It also optimizes the work and safety of the university engineering laboratories (Mariano Jiménez Calzado, Luis Romero Manuel Domínguez, M.M Espinosa, 2015).

If proper steps of 5S are undertaken and can be executed properly it will emphasize the overall benefit of an organization (Kumar, Kaushik, and Sanjeev Kumar, 2012). According to (Gapp, Rod, Ron Fisher, and Kaoru Kobayashi) the 5S tool can be identified as the strategic platform for the managerial decisions required for the development of an integrated management system. It is necessary for the spontaneous and continuous improvement of the working environment and working conditions in an organization (Mahalik, Pradeep, 2016). 5S can organize a workplace for efficiency, it helps to decrease waste and optimize quality, productivity via monitoring (Shaikh, Saad, 2015). It has an important role in the manufacturing industries. A study by (Veres, Cristina, et al, 2018) points out that 5S implementation increases the productivity of the automotive industry. (Kumar, Pavan, 2017) & (Roy Balinado, Justine Roy O., and Yogi Tri Prasetyo, 2020) both implemented 5S in the manufacturing industry and found it to have a significant impact on the company's performance quality of employees, department operations' productivity, and workplace safety. The 5S application makes a company more competitive and productive; furthermore, it does provide a solid foundation for achieving operational excellence.

All of these papers have mentioned the effective use of the 5S tool in educational institutions, manufacturing industries, and laboratories. However, the 5S tool can contribute to a student's day-to-day life. We can see above that some papers have mentioned the bad effects a student faces due to the downfall of their academic result. After investigating the effects of the 5S tool we are hopeful that it will have a positive impact on improving a student's academic career.

III. Methodology

This chapter contains the research methodology of our case study. It also mentions the significance of our research method and the solutions.

a) Research Methodology

Throughout this study, our prime focus was to observe the impact that 5S method has upon the academic life of undergraduate students. The data were analyzed by manipulating the variables. The whole study was carried out as quantitative research. Descriptive statistics were used to show students' demographic characteristics. Five-point Likert chart was used to analyze the impact 5S tool has in the academic lives of undergraduate students.

b) Alternatives

The survey of our study was done with 5 point Likert chart questionnaire. After doing a normality test on our data set it showed that the data set was not normally distributed. But as we could not identify the exact distribution, it followed, the dataset was considered to be non-parametric. Then One-way ANOVA test was carried out on the dataset. In ANOVAtest-

1. The dependent variable must be continuous.
2. There should be homogeneity of variance.
3. Independent variables have two or more categorical or independent groups.
4. The dependent variable must be approximately normally distributed for each level of the independent variable.

Our dataset accepted all of the above conditions except for the continuity of the dependent variable. So the one-way ANOVA could not be accepted. Instead, we selected the KruskalWallis H test, the non-parametric equivalent of ANOVA. KruskalWallis H test does not follow a distribution. So this method was well suited for our study.

c) Proposed Solution

Method of Analysis

Throughout the case study, a pre-test of the questionnaire, a survey, processing the data, analysis of the data, and lastly an interpretation of the data was carried out. The data were collected through the survey and then converted to an excel file. Then the excelfile was imported into SPSS for further analysis.

Firstly, a normality test named the Shapiro-Wilk test was done on the data set. The collected data was found to be not normally distributed. Later on, a non-parametric test Kruskal-Wallis test was carried out. The Kruskal-Wallis H test was done on some independent and dependent factors that we had considered earlier for the convenience of our study. Here the dependent variable was nominal, and the independent variables were ranked. The level of significance was considered 95%. To identify the difference between the sub-groups of each independent variable, a Mann–Whitney U test was done on each of them.

Hypothesis Generation

5S tool has five components- Sort, Set in order, Shine, Standardize, and Sustain. Based on these components we have hypothetically considered some factors that might have an impact on a student's academic life. After reviewing currently available papers, we generated the hypotheses and experimented on them for useful interpretations.

1. H1o: Time Management
2. H2o: Competitiveness
3. H3o: Confidence
4. H4o: Other Skills
5. H5o: Punctuality
6. H6o: Organizing Skill
7. H7o: Comprehensiveness
8. H8o: Proactivity
9. H9o: Readiness

These are the null hypotheses we have developed indicating that each of the factors does not help in developing a student's academic life. On the other hand, the alternative hypotheses suggest that they do.

Data Analysis

Demographic Information

Demographics is the information of a population-based on factors such as age, gender, and race. Respondents for this study were mostly students from different universities of Bangladesh. Gender, the educational background was collected from the students to justify the conclusions of this study.

Gender of the Sample

Table 3.1 shows the gender distribution of the sample. From the table, it can be seen that the majority of respondents are male. Fig.3.1 is the Pie chart of the gender of the population.

Table 3.1: Frequency table of gender of the population

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	7	4.7	4.7	4.7
	Female	41	27.3	27.3	32.0
	male	12	8.0	8.0	40.0
	Male	89	59.3	59.3	99.3
	other	1	.7	.7	100.0
	Total	150	100.0	100.0	

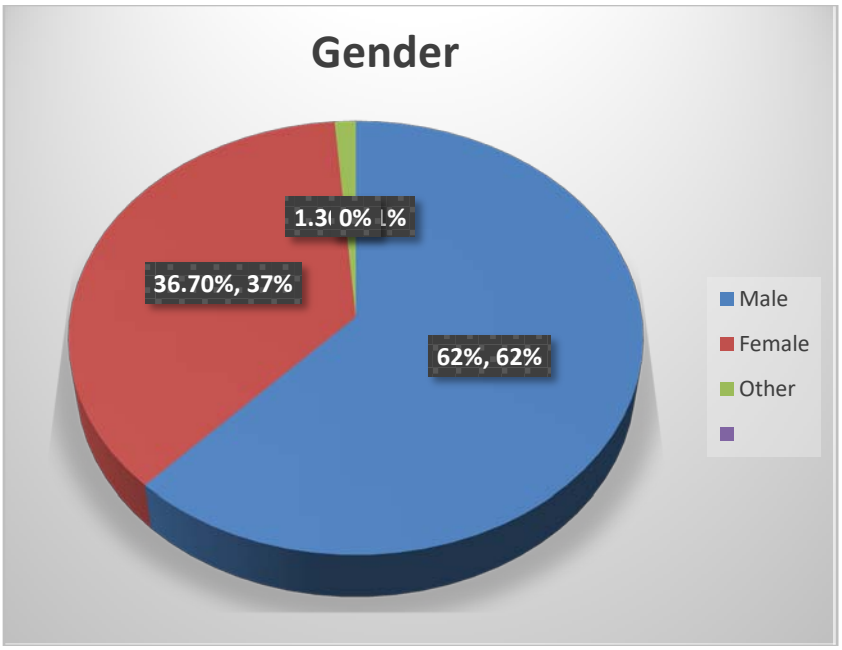


Fig. 3.1: Pie chart of gender of population

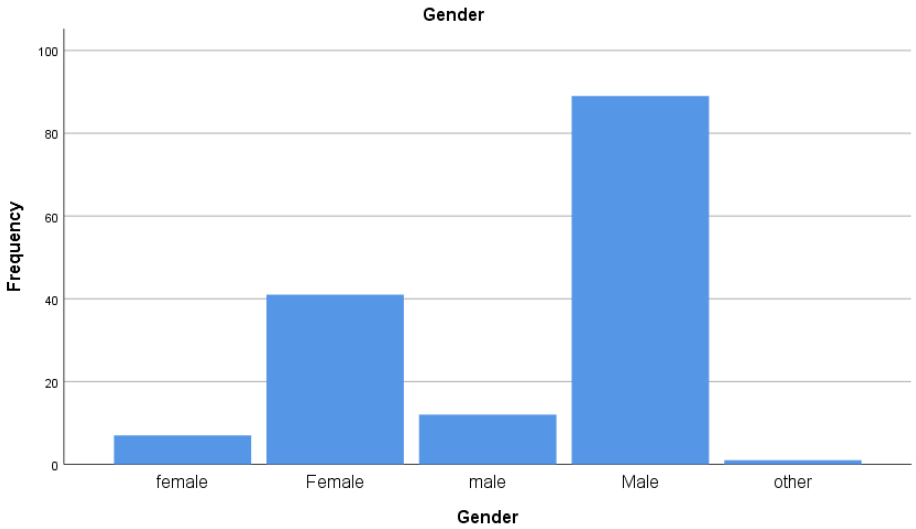


Fig. 3.2: Frequency chart of gender of population.

Education of the Sample

Table 3.2 shows the percentage of the field of study of the sample. From the table we can see that highest number of population are from B.Sc background.Fig.3.3 is the Pie chart of the Field of Study of the population.

Table 3.2: Frequency table of the Field of Study of the population

Field of Study					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B.S.S	2	1.3	1.3	1.3
	B.Sc	145	96.7	96.7	98.0
	LL.B	2	1.3	1.3	99.3
	Other	1	.7	.7	100.0
	Total	150	100.0	100.0	

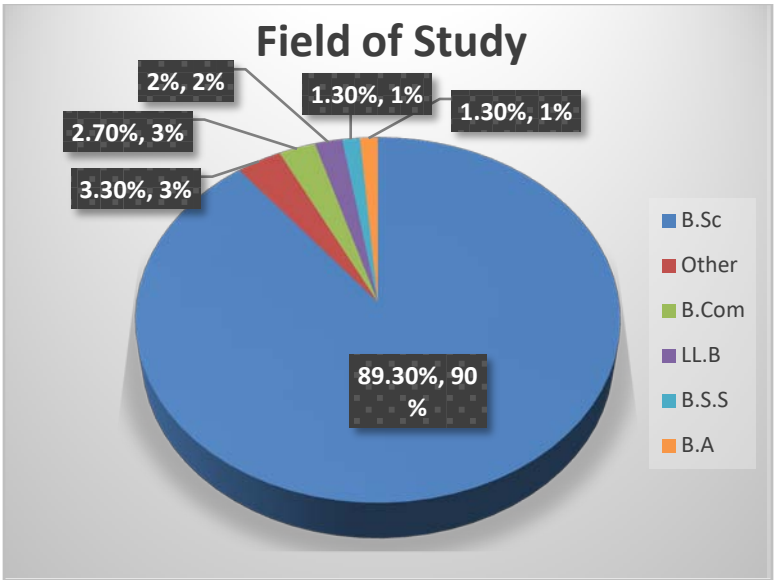


Fig. 3.3: Pie chart of the Field of Study of the population.

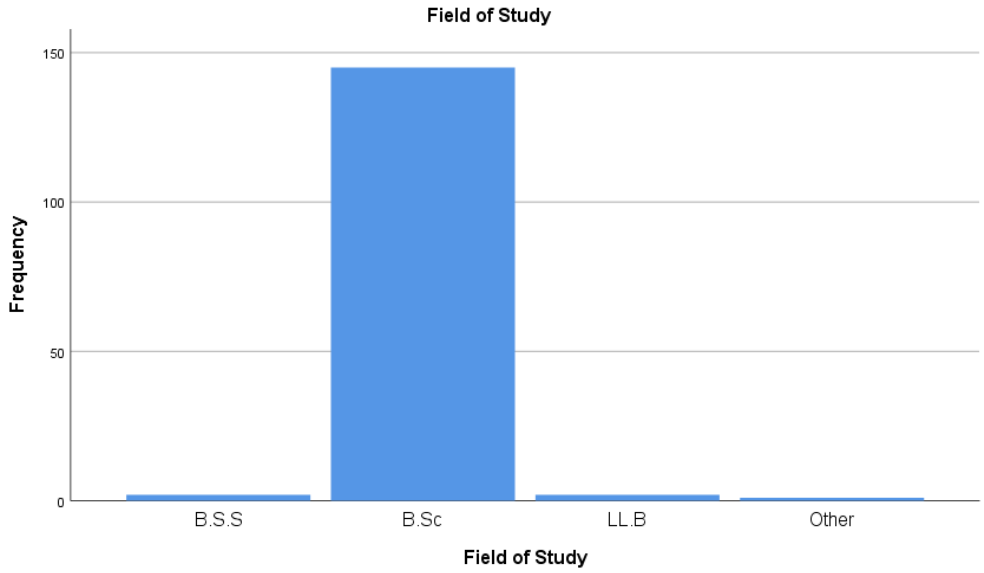
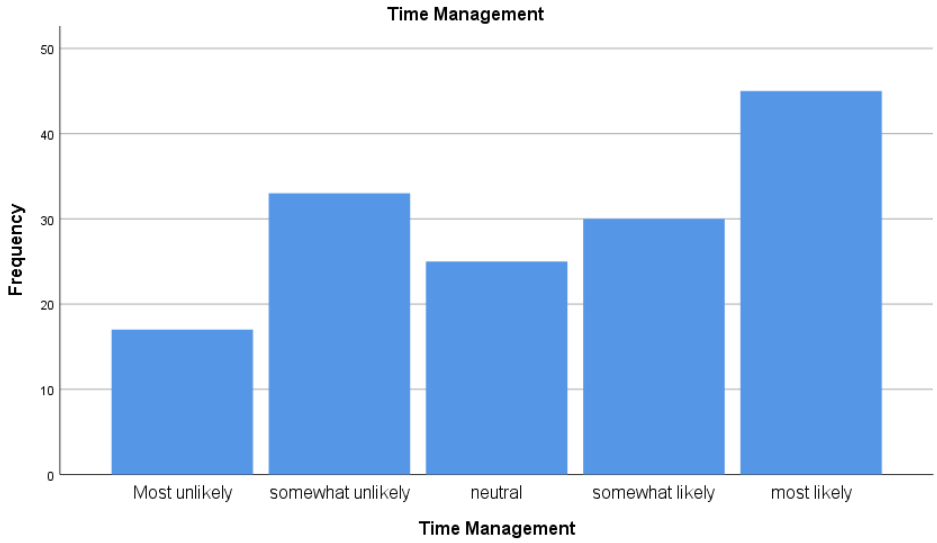


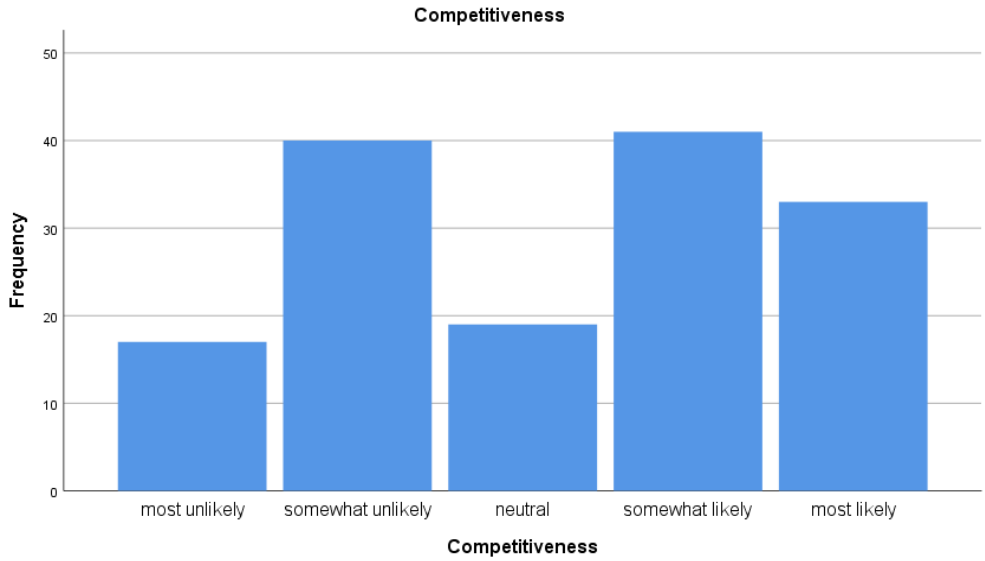
Fig. 3.4: Frequency chart for field of study of population.

Table 3.3: Frequency tables for the Factors

Time Management					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Most unlikely	17	11.3	11.3	11.3
	somewhat unlikely	33	22.0	22.0	33.3
	neutral	25	16.7	16.7	50.0
	somewhat likely	30	20.0	20.0	70.0
	most likely	45	30.0	30.0	100.0
	Total	150	100.0	100.0	

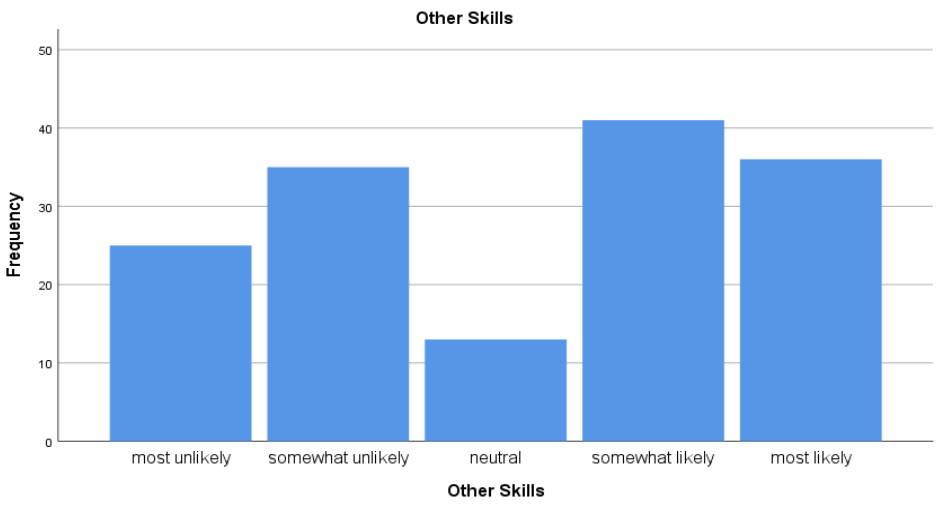


Competitiveness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	most unlikely	17	11.3	11.3	11.3
	somewhat unlikely	40	26.7	26.7	38.0
	neutral	19	12.7	12.7	50.7
	somewhat likely	41	27.3	27.3	78.0
	most likely	33	22.0	22.0	100.0
	Total	150	100.0	100.0	

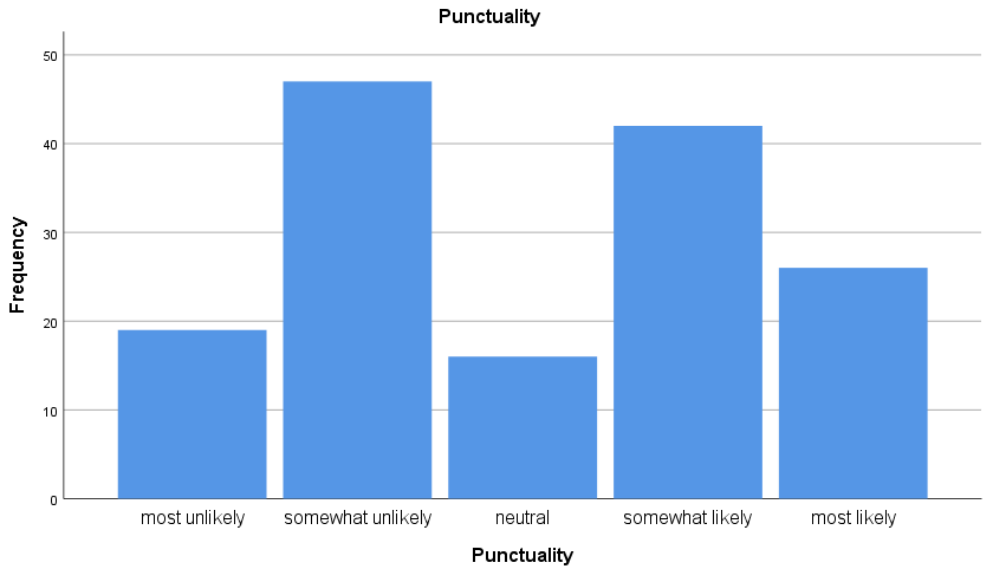


Confidence					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	most unlikely	25	16.7	16.7	16.7
	somewhat unlikely	38	25.3	25.3	42.0
	neutral	19	12.7	12.7	54.7
	somewhat likely	32	21.3	21.3	76.0
	most likely	36	24.0	24.0	100.0
	Total	150	100.0	100.0	

Other Skills					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	most unlikely	25	16.7	16.7	16.7
	somewhat unlikely	35	23.3	23.3	40.0
	neutral	13	8.7	8.7	48.7
	somewhat likely	41	27.3	27.3	76.0
	most likely	36	24.0	24.0	100.0
	Total	150	100.0	100.0	

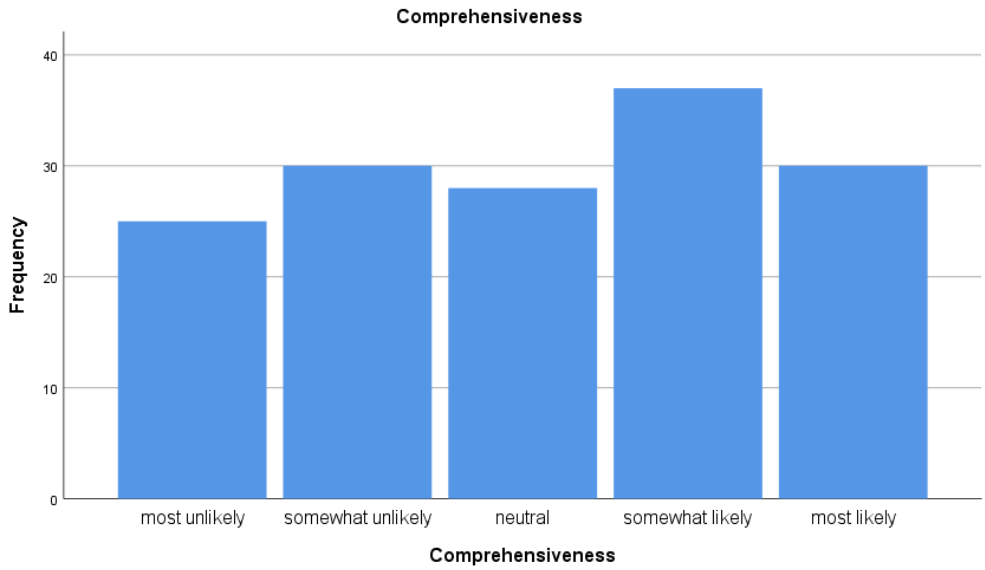


Punctuality					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	most unlikely	19	12.7	12.7	12.7
	somewhat unlikely	47	31.3	31.3	44.0
	neutral	16	10.7	10.7	54.7
	somewhat likely	42	28.0	28.0	82.7
	most likely	26	17.3	17.3	100.0
	Total	150	100.0	100.0	

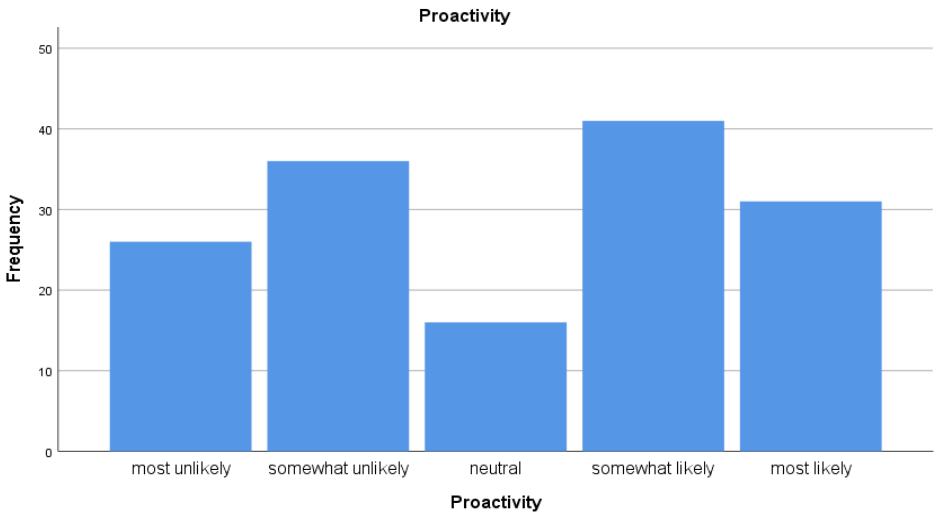


Organizing Skill					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	most unlikely	26	17.3	17.3	17.3
	somewhat unlikely	30	20.0	20.0	37.3
	neutral	29	19.3	19.3	56.7
	somewhat likely	43	28.7	28.7	85.3
	most likely	22	14.7	14.7	100.0
	Total	150	100.0	100.0	

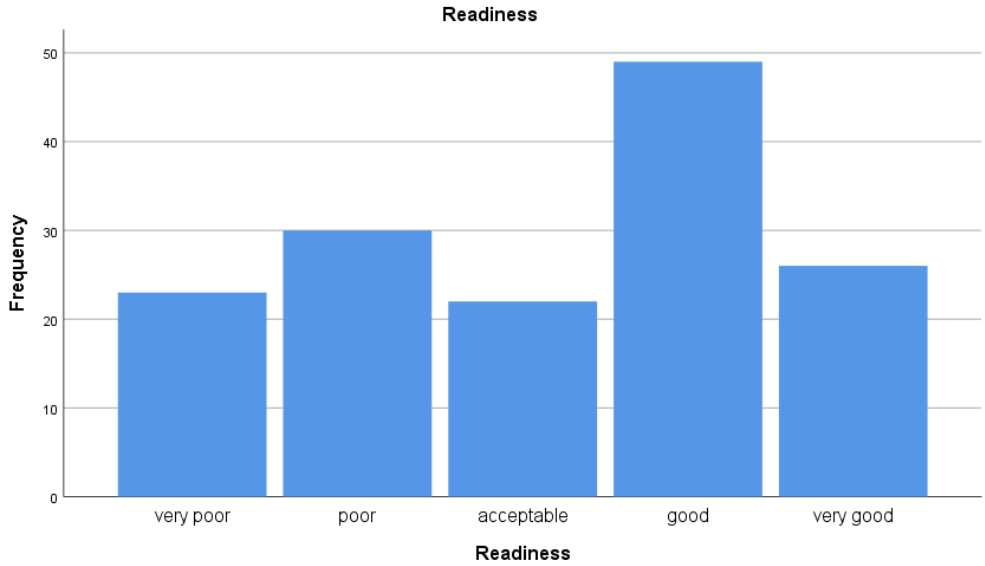
Comprehensiveness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	most unlikely	25	16.7	16.7	16.7
	somewhat unlikely	30	20.0	20.0	36.7
	neutral	28	18.7	18.7	55.3
	somewhat likely	37	24.7	24.7	80.0
	most likely	30	20.0	20.0	100.0
	Total	150	100.0	100.0	



Proactivity					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	most unlikely	26	17.3	17.3	17.3
	somewhat unlikely	36	24.0	24.0	41.3
	neutral	16	10.7	10.7	52.0
	somewhat likely	41	27.3	27.3	79.3
	most likely	31	20.7	20.7	100.0
	Total	150	100.0	100.0	



Readiness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very poor	23	15.3	15.3	15.3
	poor	30	20.0	20.0	35.3
	acceptable	22	14.7	14.7	50.0
	good	49	32.7	32.7	82.7
	very good	26	17.3	17.3	100.0
	Total	150	100.0	100.0	



Reliability of Survey Items

Our survey questionnaire had five-point Likert type questions. The survey had questions regarding factors of the 5S tool that could impact the academic lives of undergraduate students. Reliability refers to the consistency of a research study or measuring test. The reliability of our data set was measured using SPSS.

Normality Test:

The table below is the Reliability Statistics table. This gave us the Cronbach's alpha coefficient. If the coefficient scores over 0.7, it refers to high internal consistency. In this case, $\alpha = .961$, which shows the questionnaire is reliable.

Table 3.4: Reliability statistics table of the questionnaire

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.961	.961	9

The normality of data is a prerequisite for many statistical tests because normal data are an underlying assumption in parametric testing. There are two main methods of assessing normality: graphically and numerically. A normality test was done on our survey data to identify the right statistical method for our data set.

The above table presents the results from a well-known test of normality- the Shapiro-Wilk Test. The Shapiro-Wilk Test can handle both small and large sample sizes. For this reason, we used the Shapiro-Wilk test as our numerical means of assessing normality.

Table 3.5: Normality test for factors

Time Management

	Time Management	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Most Unlikely	.579	17	.000
	Somewhat Unlikely	.446	33	.000
	Neutral	.805	25	.000
	Somewhat Likely	.774	30	.000
	Most Likely	.618	45	.000

Competitiveness

	Competitiveness	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Most Unlikely	.	17	.

	Somewhat Unlikely	439	40	.000
	Neutral	.731	19	.000
	Somewhat Likely	.669	41	.000
	Most Likely	.527	33	.000

Confidence

	Confidence	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Most Unlikely	.308	25	.000
	Somewhat Unlikely	.502	38	.000
	Neutral	.778	19	.001
	Somewhat Likely	.684	32	.000
	Most Likely	.540	36	.000

Other Skills

	Other_Skills	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Most Unlikely	.307	25	.000
	Somewhat Unlikely	.551	35	.000
	Neutral	.756	13	.002
	Somewhat Likely	.706	41	.000
	Most Likely	.574	36	.000

Punctuality

	Punctuality	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Most Unlikely	.	19	.
	Somewhat Unlikely	.481	47	.000
	Neutral	.819	16	.005
	Somewhat Likely	.585	42	.000
	Most Likely	.555	26	.000

Organizing Skill

	Organizing_Skills	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Most Unlikely	.198	26	.000
	Somewhat Unlikely	.347	30	.000
	Neutral	.791	29	.000
	Somewhat Likely	.555	43	.000
	Most Likely	.551	22	.000

Comprehensiveness

	Comprehensiveness	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Most Unlikely	.203	25	.000
	Somewhat Unlikely	.518	30	.000
	Neutral	.761	28	.000
	Somewhat Likely	.685	37	.000
	Most Likely	.404	30	.000

Proactivity

	Proactivity	Shapiro-Wilk		
		Statistic	df	Sig.

CGPA	Most Unlikely	.301	26	.000
	Somewhat Unlikely	.544	36	.000
	Neutral	.760	16	.001
	Somewhat Likely	.648	41	.000
	Most Likely	.462	31	.000

Readiness

	Readiness	Shapiro-Wilk		
		Statistic	df	Sig.
CGPA	Very Poor	.215	23	.000
	Poor	.404	30	.000
	Acceptable	.720	22	.000
	Good	.691	49	.000
	Very Good	.301	26	.000

As we can see the Sig. value of the Shapiro-Wilk Test is lesser than 0.05 for all factors, so the data is not normal. It significantly deviates from normal distribution.

Kruskal-Wallis H test using SPSS:

After doing a normality test the data showed non-normal distribution. So we have used nonparametric test the Kruskal Wallis H test for our data set. Here we have th dependent variable as 'Result' which had three levels – Not satisfactory, Moderate, Satisfactory. About nine factors were considered as the dependent variables. Each factor had 5 levels as we had done the questionnaire in a 5 point Likert chart. Both the independent and dependent variables were ordinal data. We have conducted the whole process in SPSS software. In this process, the grouping variable was considered as the result and the test variable was taken as Time Management, Competitiveness, Confidence, Other Skills, Punctuality, Organizing Skill, Comprehensiveness, Proactivity, and Readiness. After the Kruskal Wallis H test, Mann Whitney U test was done on the data set as a post hoc test.

Table 3.6: Kruskal Wallis H test and Mann Whitney U test for the factors

Time Management

Test Statistics[a,b]	
	Time Management
Kruskal-Wallis H	36.194
df	2
Asymp. Sig.	1.3825E-8
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Time Management
Mann-Whitney U	800.500
Wilcoxon W	3146.500
Z	-5.604
Asymp. Sig. (2-tailed)	2.0928E-8
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Time_management
Mann-Whitney U	800.500
Wilcoxon W	3146.500
Z	-5.604
Asymp. Sig. (2-tailed)	2.0928E-8
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Time_management
Mann-Whitney U	800.500
Wilcoxon W	3146.500
Z	-5.604
Asymp. Sig. (2-tailed)	2.0928E-8
a. Grouping Variable: CGPA	

Competitiveness

Test Statistics[a,b]	
	Competitiveness
Kruskal-Wallis H	78.083
df	2
Asymp. Sig.	1.1079E-17
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Competitiveness
Mann-Whitney U	303.000
Wilcoxon W	2649.000
Z	-8.230
Asymp. Sig. (2-tailed)	1.8644E-16
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Time_management
Mann-Whitney U	537.500
Wilcoxon W	2883.500
Z	-3.235

Asymp. Sig. (2-tailed)	.001
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Time_management
Mann-Whitney U	453.500
Wilcoxon W	831.500
Z	-3.017
Asymp. Sig. (2-tailed)	.003
a. Grouping Variable: CGPA	

Confidence

Test Statistics[a,b]	
	Confidence
Kruskal-Wallis H	78.049
df	2
Asymp. Sig.	1.1267E-17
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Confidence
Mann-Whitney U	341.500
Wilcoxon W	719.500
Z	-4.182
Asymp. Sig. (2-tailed)	0.000068
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Confidence
Mann-Whitney U	456.500
Wilcoxon W	2802.500
Z	-3.985
Asymp. Sig. (2-tailed)	0.000068
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Confidence
Mann-Whitney U	232.500
Wilcoxon W	2578.500
Z	-8.532
Asymp. Sig. (2-tailed)	1.4391E-17
a. Grouping Variable: CGPA	

Other Skills

Test Statistics[a,b]	
	Other Skills
Kruskal-Wallis H	71.013
df	2
Asymp. Sig.	3.7992E-16
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Other Skills
Mann-Whitney U	407.000
Wilcoxon W	2753.000
Z	-4.372
Asymp. Sig. (2-tailed)	0.000012
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Skills
Mann-Whitney U	416.000
Wilcoxon W	794.000
Z	-3.457
Asymp. Sig. (2-tailed)	.001
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Skills
Mann-Whitney U	325.500
Wilcoxon W	2671.500
Z	-8.068
Asymp. Sig. (2-tailed)	7.1601E-16
a. Grouping Variable: CGPA	

Punctuality

Test Statistics[a,b]	
	Punctuality
Kruskal-Wallis H	87.810
df	2
Asymp. Sig.	8.5566E-20
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Punctuality
Mann-Whitney U	361.500
Wilcoxon W	2707.500
Z	-4.931
Asymp. Sig. (2-tailed)	.000013
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Punctuality
Mann-Whitney U	178.000
Wilcoxon W	2524.000
Z	-8.888
Asymp. Sig. (2-tailed)	6.2215E-19
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Punctuality
Mann-Whitney U	330.500
Wilcoxon W	708.500
Z	-4.354
Asymp. Sig. (2-tailed)	8.184E-7
a. Grouping Variable: CGPA	

Organizing Skills

Test Statistics[a,b]	
	Organizing Skill
Kruskal-Wallis H	90.271
df	2
Asymp. Sig.	2.4994E-20
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Organizing Skill
Mann-Whitney U	291.000
Wilcoxon W	2637.000
Z	-5.363
Asymp. Sig. (2-tailed)	8.1968E-8
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Organizing_skills
Mann-Whitney U	341.500
Wilcoxon W	719.500
Z	-4.287
Asymp. Sig. (2-tailed)	0.000018
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Organizing_skills
Mann-Whitney U	166.000
Wilcoxon W	2512.000
Z	-8.885
Asymp. Sig. (2-tailed)	6.3909E-19
a. Grouping Variable: CGPA	

Comprehensiveness

Test Statistics[a,b]	
	Comprehensiveness
Kruskal-Wallis H	86.793
df	2
Asymp. Sig.	1.423E-19
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Comprehensiveness
Mann-Whitney	357.000
U	
Wilcoxon W	2703.000
Z	-4.785
Asymp. Sig. (2-tailed)	0.000029
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Comprehensiveness
Mann-Whitney U	342.000
Wilcoxon W	720.000
Z	-4.185
Asymp. Sig. (2-tailed)	0.000029
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Comprehensiveness
Mann-Whitney U	166.000
Wilcoxon W	2512.000
Z	-8.856
Asymp. Sig. (2-tailed)	8.3042E-19
a. Grouping Variable: CGPA	

Proactivity

Test Statistics[a,b]	
	Proactivity
Kruskal-Wallis H	84.308
df	2
Asymp. Sig.	4.9295E-19
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Proactivity
Mann-Whitney U	454.000
Wilcoxon W	2800.000
Z	-3.987
Asymp. Sig. (2-tailed)	0.000067
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Proactiveness
Mann-Whitney U	276.500
Wilcoxon W	654.500
Z	-4.891
Asymp. Sig. (2-tailed)	0.000001
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Proactiveness
Mann-Whitney U	190.500
Wilcoxon W	2536.500
Z	-8.785

Asymp. Sig. (2-tailed)	1.5579E-18
a. Grouping Variable: CGPA	

Readiness

Test Statistics[a,b]	
	Readiness
Kruskal-Wallis H	93.422
df	2
Asymp. Sig.	5.1716E-21
a. Kruskal Wallis Test	
b. Grouping Variable: CGPA	

Test Statistics[a]	
	Readiness
Mann-Whitney U	359.000
Wilcoxon W	2705.000
Z	-4.769
Asymp. Sig. (2-tailed)	0.000002
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Readiness
Mann-Whitney U	266.500
Wilcoxon W	644.500
Z	-5.121
Asymp. Sig. (2-tailed)	3.0467E-7
a. Grouping Variable: CGPA	

Test Statistics[a]	
	Readiness
Mann-Whitney U	134.000
Wilcoxon W	2480.000
Z	-9.075
Asymp. Sig. (2-tailed)	1.1328E-19
a. Grouping Variable: CGPA	

IV. Result and Discussion

This chapter contains the data collection method, result analysis of our method. At the end the discussion part covers the findings and limitation of our study.

a) Data Collection

Selection of Samples

Students from different universities from all over Bangladesh were considered as the population for this study. About 150 respondents were part of this study. The survey was carried out online and in-person through simple random sampling.

Collection of Data

Data were collected through primary sources. Students from different universities were approached directly. A survey was done with a five-point Likert chart type questionnaire with about 150 respondents with the majority of students from engineering universities.

b) Result Analysis

Here KruskalWallis H test is used to identify the impact 5S has on the academic career or students. The significance level for the test was considered 95% for a given factor. Based on KruskalWallis score a conclusion is drawn on Null Hypothesis.

The KruskalWallis test score had shown a significant difference in the levels of independent variables. To identify where the difference is we have done Mann Whitney test as post hoc test. The dependent variable Result had three levels –Not satisfactory, Moderate, satisfactory. The significance level divided by three is 0.015. So the Mann Whitney test score was compared with 0.015. If Asymp. Sig. is more lesser than 0.015 we can conclude that the levels have a statistically significant difference. This is what we expected from the study, for 5S tool to make statistical difference between the groups.

For 95% significance level we have seen that the P-value for the factor Time Management is 1.3825E-8 which is significantly lesser than α-value (0.05). In this case, we reject the null hypothesis. So time management factor of 5S has a good impact on student's academic life. In the same way P-value for Competitiveness, Confidence, Other Skills, Punctuality, Organizing Skills, Comprehensiveness, Proactivity, Readiness is 1.1079E-17, 1.1267E-17, 3.7992E-16, 8.5566E-20, 2.4994E-20, 1.423E-19, 4.9295E-19, 5.1716E-21. P-value for each of the factors has been lesser than α-value(0.05). In this case, we can reject the null hypothesis for all of the considered factors and conclude that each factor of 5S has a significant impact on improving a student's academic career.

c) Discussion

The method of our research gave us the result we had anticipated. The P-value of KruskalWallis test was significantly low than the confidence level that we considered. As a result we had to reject the null hypothesis. The null hypothesis was taken negatively. The alternative hypothesis proved that 5S has a deep impact on changing a student's academic career. All of the independent variables that we had considered of 5S tool and examined with respect to the student's result had shown a significant difference among the groups. Improvement of the nine factors- Time maintenance, Competitiveness, Confidence, Other skills, Punctuality, Organizing skill, Comprehensiveness, Proactivity, Readiness will help to change the academic result of a student.-

However, we think the result was too obvious for we had lesser respondents for the survey due to the pandemic situation. If there could be a diversity in the respondents, the study can be more uniform regardless of the geographic location.

V. Conclusion and Future Work

a) Conclusion

The main objective of our study was to see if the 5S tool could impact a student in his academics. The academic progress of the students was measured through their results and how much satisfied they were with them. The methodology and result of this study suggested that there was a good level of impact that 5S can have in a student's academic career. A student's success depends on the encouragement he gets while being in his academic life. A bad grade can put a negative impact on his mental stability and makes it harder to reach goals. So it is very important to identify the reasons why a student faces these issues and solve them with effective methods. This research proved that the 5S tool can help a student improve time management, competitiveness, comprehensiveness, readiness, other skills. It also enhances confidence, proactivity, and punctuality.

b) Future Work

More lean manufacturing tools can be used to solve the challenges that students face in their undergrad life. Students from all over the world pursuing higher education could be held as subjects. A better statistical tool could give more insightful results.

References Références Referencias

1. Roy Balinado, Justine Roy O and Tri Prasetyo, Yogi, The Impact of 5S Lean Tool to Service Operation: A Case Study in Toyota Dasmarinas-Cavite Service Operations,. 2020.
2. Bakar, Nashirah Abu and Uzaki, Kiyotaka and Naim, Asmadi Mohamed and Abdul Manaf, Nor Aziah, title=Intention to Implement 5S Management Among Students in Higher Education Institutions,. 2020.
3. Chicago Jiménez, Mariano, Luis Romero , Manuel Domínguez, and Mari ´a del Mar Espinosa., "title=Intention to Implement 5S Management Among Students in Higher Education Institutions." 2020.
4. Witt, Christine M and Sandoe, Kent and Dunlap, Joanna C, "title=5S Your Life: Using an Experiential Approach to Teaching Lean Philosophy," 2018, vol. ={16}, number={4}, p. ages={264-280},.
5. Shaikh, Saad and others, "title=Review of 5S technique," 2015.
6. Sari, Amarria Dila and Rahmillah, Fety Ilma and Aji, Bagus Prabowo, "title = Implementation of 5S method for ergonomic laboratory," in booktitle = IOP Conference Series: Materials Science and Engineering, 2017.
7. Bharambe, Vaibhav and Patel, Shubh and Moradiya, Pratik and Acharya, Vishal, "title = Implementation of 5s in Industry: A Review," @article{bharambe2020implementation, vol. = {2}, p. ages={12-27}, 2020.
8. Chourasia, Ravi and Nema, Archana, "title=Implementation of 5S Methodology in Higher Education Institute," journal = {organization}, vol. = {6}, 2019.
9. Veres, Cristina and Marian, Liviu and Moica, Sorina and Al-Akel, Karam, "title=Case study concerning 5S method impact in an automotive company," journal = {Procedia Manufacturing}, vol. = {22}, p. ages = {900-905}, 2018.
10. Title=5s Techniques to Optimize Classroom Organization,. Publisher = {Polytechnic University of Puerto Rico}, 2020.
11. Ebuetse, Mercy Akunna, "title=Implementation of 5S at a Survey Laboratory in Western Kentucky University," 2018.
12. Mahalik, Pradeep, "title=A Practical Approach to the Successful Practice of 5S," journal= {Detailed Action Item List for S}, vol. ={5}, 2016.
13. Kumar, Pavan and Chauhan, Peeyush and Chaudhary, Rajeev and Juneja, Deepak, "title=Implementation of 5s and Kobetsu Kaizen (TPM Pillars) In A Manufacturing Organization," journal = {International Research Journal of Engineering and Technology (IRJET)}, vol. = {4}, no. = {07}, p. ages = {2987-2991}, 2017.
14. El-Sherbiny, Naglaa A and Ibrahim, Eman H and Younis, Asmaa, "title=Initiative on engaging the under-graduate medical students in implementing the 5S-KAIZEN at Faculty of Medicine, Fayoum University," journal = {Journal of Educational Research and Reviews}, vol. = {7}, no. = {2}, p. ages = {21-30}, 2019.
15. Gapp, Rod and Fisher, Ron and Kobayashi, Kaoru, "title=Implementing 5S within a Japanese context: an integrated management system," journal = {Management Decision}, 2008.
16. Patel, Vipulkumar C and Thakkar, Hemant, "title=Review on implementation of 5S in various organization," journal={International Journal of Engineering Research and Applications}, vol. ={4}, no. = {3}, p. ages = {774-779}, 2014.
17. Kumar, Kaushik and Kumar, Sanjeev, "title=Steps for implementation of 5S," journal = {International Journal of Management, IT and Engineering}, vol. = {2}, no. = {6}, p. ages = {402-416},.
18. Eisenberg, Daniel and Gollust, Sarah E and Golberstein, Ezra and Hefner, Jennifer L, "title=Prevalence and correlates of depression, anxiety, and suicidality among university students," journal = {American journal of orthopsychiatry}, vol. ={77}, no. = {4}, p. ages = {534-542}, 2007.
19. Valenzuela, Sebasti {\'a, "title=Is there social capital in a social network site?: Facebook use and college students' life satisfaction, trust, and participation," journal={Journal of computer-mediated

communication}, vol. 14, no. 4, p. ages={875-901}, 2009.
20. Dennis, Jessica M and Phinney, Jean S and Chuateco, Lizette Ivy, "title = The role of motivation, parental support, and peer support in the academic success of ethnic minority first-generation college students," journal = {Journal of college student development}, vol. = {46}, no. 3, p. ages = {223-236}.
21. Kuh, George D and Kinzie, Jillian L and Buckley, Jennifer A and Bridges, Brian K and Hayek, John C, title = What matters to student success: A review of the literature, vol. ={8},. Publisher = {National Postsecondary Education Cooperative Washington, DC}, 2006.
22. Zajacova, Anna and Lynch, Scott M and Espenshade, Thomas J, "title=Self-efficacy, stress, and academic success in college," journal = {Research in higher education}, vol. 46, no. 6, p. ages = {677-706}, 2005.
23. O'Brien, Heather L and Symons, Sonya, "title = The information behaviors and preferences of undergraduate students," journal = {Research Strategies}, vol. 20, no. 4, p. ages = {409-423}, 2005.
24. Robbins, Steven B and Lauver, Kristy and Le, Huy and Davis, Daniel and Langley, Ronelle and Carlstrom, Aaron, "title = Do psychosocial and study skill factors predict college outcomes? A meta-analysis.," journal = {Psychological bulletin}, vol. = {130}, no. 2, p. 261.

Appendix

Survey Questionnaire

1. 1. Gender *

Mark only one oval.

- ◯ Female
- ◯ Male
- ◯ other

2. 2. Education *

Mark only one oval.

- ◯ B.A
- ◯ B.Sc
- ◯ B.S.S
- ◯ B.Com
- ◯ LL.B
- ◯ other

Likert Scale Questions:

You need to answer the questions in this section according to a scale counting 1 to 5 . Where 1 represents most unlikely, 2 represents somewhat unlikely, 3 represents neutral, 4 represents somewhat likely and 5 represents most likely.

3. 3. According to you under which category does your academic result(CGPA) fall ? *

Mark only one oval.

- not satisfactory
- Moderate
- Satisfactory

4. 4. According to you, do you procrastinate while studying? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely						Most likely

5. 5. Do you think you are competitive? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely						Most likely

6. 6. Do you feel confident of yourself? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely						Most likely

7. 7. Do you engage in activities that may develop your skills beyond textbook knowledge? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely						Most likely

8. 8. Do you consider yourself punctual in academic activities? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely	◯	◯	◯	◯	◯	Most likely

9. 9. How organized are you in terms of academic activities? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely	◯	◯	◯	◯	◯	Most likely

10. 10. Can you comprehend your related subject matters easily? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely	◯	◯	◯	◯	◯	Most likely

11. 11. Are you able to take full marks preparation before going to the exam hall? *

Mark only one oval.

	1	2	3	4	5	
Most unlikely	◯	◯	◯	◯	◯	Most likely

12. 12. out of 5 what will you rate your readiness for assingments, lab reports, projects and other curriculums? *

Mark only one oval.

	1	2	3	4	5	
lowest	◯	◯	◯	◯	◯	highest

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Field Studies of the Bottom Sediments Movement in the Tuyamuyun Hydraulic Engineering Complex Lower Reaches of the Amu Darya River

By T Majidov & N Ikramov

Abstract- The study of sediment flow rates in eroded riverbeds has great practical importance, especially when solving a number of water management problems involving various hydraulic structures. It is important to take quantitative account of sediments in calculating the siltation of reservoirs, when solving issues of rational placement and design of water intake structures and channels that divert water from the river for irrigation and water supply needs. In the channels of watercourses, sediments are transported in a suspended state, distributed throughout the living cross-section of the stream and bottom sediments, moved in the bottom layer. Measuring the flow rate of bottom sediments in nature is much more difficult than measuring the flow rate of suspended sediments. Therefore, measurements of the flow rate of bottom sediments related to the geometric dimensions and dynamic characteristics of ridges are mainly studied in the laboratory. The article presents the object of research, the method of research and the results obtained for determining the flow rate of bottom sediments. Full-scale observations to determine the bottom, suspended and total sediment discharge were carried out in the lower reaches of the Tuyamuyun hydraulic engineering complex on the Amu Darya River, which flows through the territory of the Central Asian states.

Keywords: eroded riverbed, bottom sediments, suspended sediments, ridge movement, water turbidity, sediment consumption.

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T Majidov[α] & N Ikramov[σ]

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I. Introduction

There are 56 reservoirs in the Republic of Uzbekistan with the volume of about 20 billion m3 of water filled from the Amu Darya, Syr Darya, Zeravshan, Chirchik, Surkhandarya, Naryn, Karadarya rivers and 28 large irrigation channels with flow rates of more than 100 m3/s diverting water from these rivers. In this regard, it is very important to determine the amount of sediment in water sources to calculate the volume of channel cleaning from sediment, as well as to calculate the volume of filling the reservoir with sediment, i.e. the useful volume.

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In the channels of watercourses, sediments are transported in a suspended state, distributed throughout the living cross-section of the stream and bottom sediments, moved in the bottom layer [1-10].To determine the amount of suspended sediment in the stream, samples are taken at hydrometric stations, and their concentration is determined in the laboratory by various methods [11-19].Measuring the flow rate of bottom sediments in nature is much more difficult than measuring the flow rate of suspended sediments.

Due to the complexity of direct measurement, many researchers propose to determine the flow rate of bottom sediments by a very approximate ratio between suspended and bottom sediments. For example, S.T. Altunin [20] recommends taking the flow rate of bottom sediments of the rivers of Central Asia based on the following percentages of the flow rate of suspended sediments: in mountainous areas - 15-23%, in foothill-5-15% and on the plains-1-3%. A. G. Khachatryan [21] and H. S. Shapiro [22] suggest that for the conditions of the Amu Darya, the flow of bottom sediments is equal to 10-11% of the flow of suspended sediments. V.E. Tuzov [23] expresses the opinion that the share of bottom sediment runoff varies both along the length of the river and in each section, depending on the water content of the year. For a high-water year, the flow rate of bottom sediments in the Tuyamuyun formation is recommended to be equal to 18% of the flow rate of suspended sediments, and for a low-water year, even 33%. This approach to determining the flow rate of bottom sediments is very approximate and uncertain.

A.I. Turaev and other researchers [24] determined the flow rate of bottom sediments of the Amu Darya by the volume of deformations or by the movement velocity of bottom sand ridges. Based on the data obtained, they established the percentage ratio of bottom and suspended sediment discharge for different sections of the Amu Darya River in different periods of the year. For example, for the target at the beginning of the water intake section of the Amu Bukhara Machine Canal (ABMC), the flow rate of bottom sediments is: when the flood rises (April-May) - from 3.5 to 75% of the suspended flow rate; in the flood (June-July) - from 2.0

to 19%, when the flood falls (August - September) - from 3.7 to 32.5 %. For the lines located below the ABMC, the bottom sediment consumption is 2.5-21.4 % of the corresponding suspended sediment consumption. Repeated measurement work on the Amu Darya with the calculation of the volume of channel deformations allowed V.E. Tuzov to derive a formula for calculating the flow rate of bottom sediments, which has become generally accepted:

II. Materials and Methods

The construction of water intake and reservoir nodes on rivers with an eroded channel violates the natural regime of their liquid and solid runoff. As a result of the backwater created by the nodes, a significant part of the river sediments is retained in their upper stream, and the clarified stream discharged through the culverts of the dam into the lower stream is gradually saturated with sediments due to deep and planned deformations.

The purpose of field studies is a preliminary forecast of the solid runoff flow rate, taking into account the moving ridge forms and changes in the turbidity of the Amu Darya River. The object of research is the alluvial regime and riverbed processes in the section of the Amu Darya riverbed with the length of 20 km below the Tuyamuyun hydraulic engineering complex. The beginning of the section was section 2, located 900 m below the spillway dam of the hydraulic engineering complex, and the end was section 64, located 4 km below the Tashsakadamless spillway node.

The channel of the Amu Darya River at the research site is composed of disjointed fine-sanded soils, the products of erosion of which in the form of bottom sediments are moved by a stream in the form of sand ridges. The movement of ridge forms was studied by visual observations. During the observations, the planned movements of the skewed ridge located in the section 64 were recorded. The ridge velocity was 18.3 m/day. This velocity should be considered overestimated, since the natural movement of the ridge was disrupted by the dredging operations carried out: a hole was dug in the riverbed to artificially change the direction of the current, the head of which was located at the distance of 200-250m from the crest of the observed ridge. The sharp increase in the slope of the water surface caused by digging led to an increase in the ridge movement velocity. In addition, since the section 64 is located at the distance of 3-4 km below the head regulator of the Tashsaka, as a result of water intake into the channel, the water consumption in the section 64 decreased, and the average size of sediment in it increased due to the intensive entrainment of the smallest particles of sediment into the regulator. For these reasons, the ridge formed in the section 64 did not correspond to the hydraulic regime of the flowing flow.

Similar observations were made for a skewed ridge in section 40, located 9.3 km downstream of the dam. The flow rate of water in the line is equal to the flow rate of releases to the lower stream. The horseshoe-shaped crest of the skewed ridge occupied the entire width of the riverbed. The tongue of the ridge was located at a distance of 1/38 from the left bank. The small turbidity of the water in the river made it possible to clearly distinguish the position of the ridge crest on the bottom up to a certain depth of the stream. At great depths of the stream, the outline of the ridge crest was traced by the pronounced difference in the free surface of the water, which was distinguished on this surface by an oblique dark line.

In the course of visual observations from the boat, not only the planned position of the ridge crest in the riverbed was determined, but also the ridge height was measured at 11 characteristic points. To determine the ridge movement velocity at these points of its crest, metal pegs with the length of 80 cm were fixed or a heavy load was placed. Then two floats were attached to the fixed points, connected by the 20 m long cord, one of which showed the position of the ridge at the initial moment of time, and the other - the direction of ridge movement and the water flow. The figure 1 shows the schematic plan for placing floats on the ridge crest under study. After fixing the time of setting the floats exactly after 1-3 days, the position of the ridge crest was measured in relation to the floats showing the initial position of the ridge, and based on changes in this position, the length of the path of movement of the ridge crest from the point under consideration was determined. The ridge movement velocity was determined by dividing the path length by the time intervals between observations (1-3 days). The ridge height was determined by the difference in the depth of water in its basement and on the ridge. The ridge length was taken as the distance from its crest to the crest of the ridge located downstream or upstream. The distance between the ridges of neighboring ridges was measured as follows: first, the planned outline of the ridge located above the studied one was established, and metal pegs were fixed on it, to which cords 50 m long were tied, ending in floats. After pulling the cords by the current, which showed its direction, metal pegs were installed above the floats, to which the upper ends of the cords were tied, which were untied from the pegs on the crest of the upper ridge. The described procedure was repeated until the crest of the studied ridge was reached.

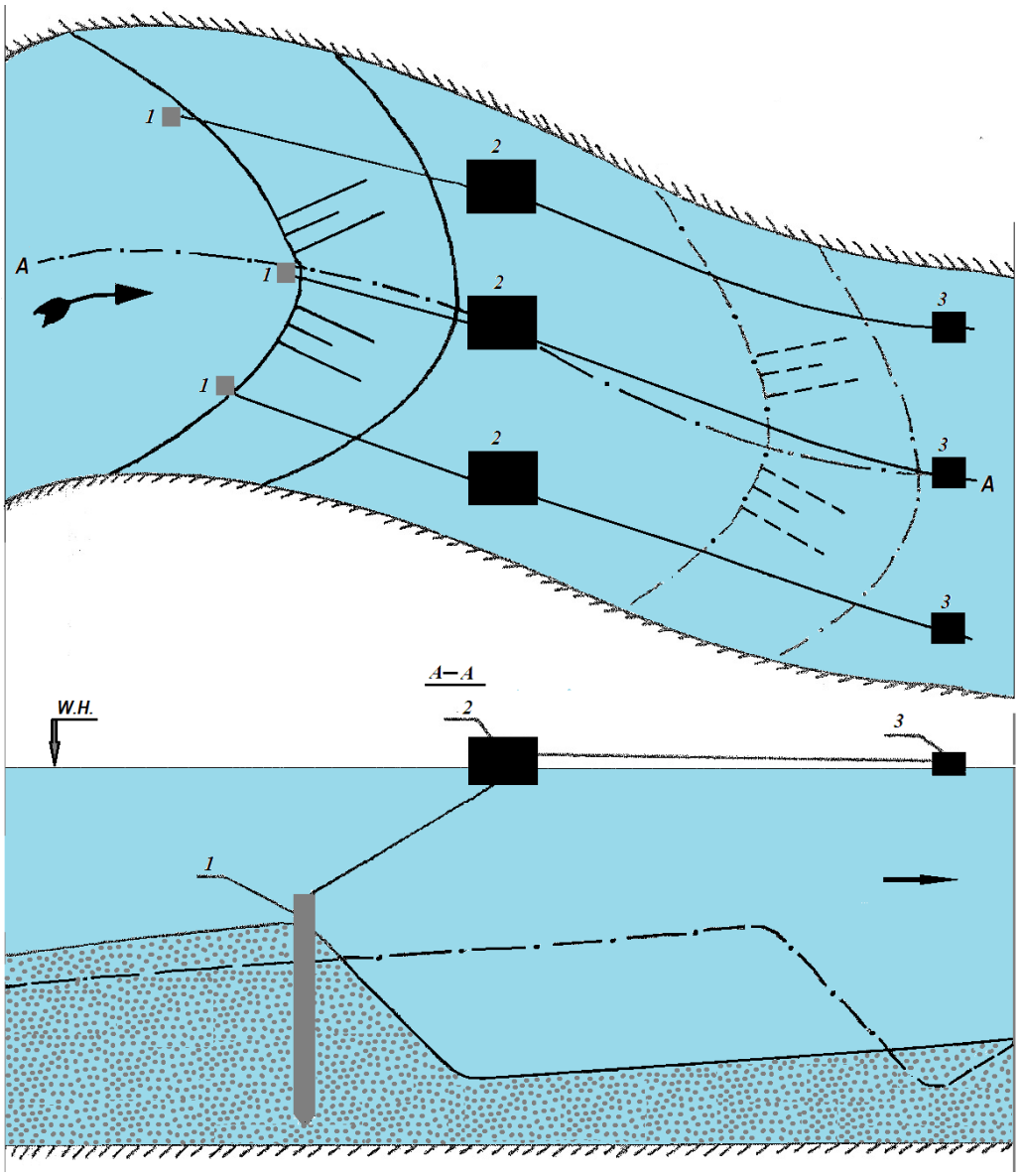

Fig. 1: Schematic layout of the floats in determining the ridge movement velocity:
1 - pegs or bottom cargo; 2-floats above the pegs; 3-floats to determine the direction of the flow of the stream.

III. Results and Discussion

The observations showed that the movement of the skewed ridge movement occurs mainly as a result of the movement of secondary smaller ridges on its surface, along the body of which, in turn, even smaller dune ridge forms move. Table 1 shows the average hydraulic characteristics of the flow and soil, as well as the parameters of the main and secondary ridges determined by field studies.

To determine the flow rate of bottom sediments, various measuring devices, calculation dependencies and methods are used. However, to date, there is no generally accepted method.

Table 1: Characteristics of the flow, soil and ridges in the section 40 on the Amu Darya riverbed

S. No.	Flow, sediment, and ridge characteristics	Dimension	Meaning
1	Water consumption at the time of observations	m^3/s	1380
2	Streamwidth	m	542
3	Averageflowdepth	m	2,45
4	Averageflowrate	m/s	1,02

5	Surfaceflowrate	m/s	0,833
6	Flowturbidity	g/m^3	48
7	Range of fractions change in the sample	mm	0,1÷2,0
8	Average size of bottom sediments	mm	0,270
9	Volume weight of sediment samples	g/cm^3	1,61
10	Height of the main ridge	m	1,65
11	Ridgelength	m	252
12	Ridge movement velocity	m/day	1,4
13	Ridgeshape	Skewed	-
14	The sediment size on the ridge crest	mm	0,110
15	The sediments size in the ridge basement	mm	0,250
16	Heightofsecondaryridges	m	0,21
17	Lengthofsecondaryridges	m	2,45
18	Formofsecondaryridges	RifflePlate	-

Since the bottom sediments movement occurs in the form of ridge forms in eroded channels, it is easy to calculate the amount of bottom sediment consumption by measuring the parameters of these forms and their movement velocity. The method of measuring ridges parameters was described in the works of a number of researchers [25-30]. One of the first analytical expressions of the elementary flow rate of bottom sediments in the ridge form belongs to M.A.Velikanov [31]:

$$q_r = \alpha \cdot h_r \cdot C_r, \quad (1)$$

Here: α - dimensionless coefficient, depending on the ridge shape and equal to 0.5-0.6;

h_r and C_r - height and movement velocity of the ridge.

To determine the flow rate of bottom sediments at one of the studied sub-sites, the parameters and ridges velocity were measured using a very unconventional method of visual observations. A small number of measurements did not allow us to establish the connection between the ridges parameters and the flow characteristics. It was difficult to use the existing formulas for calculating the ridges parameters due to the special conditions in the lower reaches of the Tuyamuyun hydraulic engineering complex. Therefore, the preliminary calculation of the flow rate of bottom sediments was carried out on the basis of the initial data of Table 1 according to the formula (1), which was supplemented with the measured values of the ridge height and its movement velocity.

There are three permanent hydrological posts at the research site, where samples are taken to determine the different characteristics of liquid and solid runoff. Data on the amount of suspended sediments were taken from the post "OGMS Tuyamuyun", located 9.3 km below (section 40) of the dam.

Calculation Example

1. Consumption of bottom sediments in the ridge form of movement.

Data for the calculation:

- Stream width, $B = 542$ m;
- Soil density, $\gamma = 1610$ kg/m^3;
- Ridge height, $h_r = 1,66$ m;
- Ridge movement velocity, $C_r = 0.0000162$ m/s;
- Ridge shape coefficient, $\alpha = 0.55$.

$$P_{bot} = \alpha \cdot h_r \cdot C_r \cdot \gamma \cdot B = 0,55 \cdot 1.66 \cdot 0.0000162 \cdot 1610 \cdot 542 = 12,91 \text{ kg/s}$$

$$P_{bot.\,day} = 12.91 \cdot 86400 = 1115.5 \text{t/day}$$

2. Suspended sediment consumption

Data for the calculation:

- Water consumption - $Q = 1380$ m^3/s;
- The turbidity of the flow is - $p = 0.048$ kg/m^3.

$$P_{sus} = Q \cdot p = 13\,80 \cdot 0.048 = 66.24 \text{ kg/s}$$

$$P_{sus.\,day} = P_{sus} \cdot T_{day} = 66.24 \cdot 86\ \ 400 = 723.14 \text{ t/day}$$

3. Total sediment consumption

$$P_t = P_{bot} + P_{sus} = 1115.4 + 5723.1 = 6838.6 \text{ t/day}$$

4. The proportion of bottom sediments from suspended sediments:

$$P\,\% = P_{bot.day} \cdot 100 / P_{sus.day} = 1115.4 \cdot 100 / 5723.1 = 19,5\%$$

Thus, during the observed period, the flow rate of bottom sediments moving in the form of bottom ridges was 19.5 % of the flow rate of suspended sediments.

IV. Conclusions

1. In the lower reaches of the Tuyamuyun hydraulic engineering complex, the bottom sediments movement occurs in the ridge form.
2. With clarified water in the lower reaches of hydraulic engineering units, the geometric and dynamic characteristics and ridges shapes, as well as the process of ridge formation, can be studied by direct observations and measurements.
3. In the riverbed at the research site, the bottom sediments movement occurs in the form of movement of skewed large ridges (mesoforms), along the body of which secondary ridges (riffles) move, in turn, covered with moving dune forms of ridges.
4. The calculation of the solid flow rate, based on the data of direct measurements of the geometric and dynamic parameters of the ridges, and the water turbidity, showed that for the moment of measurement, the flow rate of bottom sediments was 19.5% of the flow rate of suspended sediments.

References Références Referencias

1. Knox E. M.and Latrubesse R.L. (2016). A geomorphic approach to the analysis of bedload and bed morphology of the Lower Mississippi River near the Old River Control Structure. Geomorphology. Volume 268. pp 4–35.
2. Gunsolus E.H. and Binns A.D. (2018) Effect of morphologic and hydraulic factors on hysteresis of sediment transport rates in alluvial streams. River Res. Appl. Volume 34, issue 2.
3. Philip H. (2004). Alternating bar instabilities in unsteady channel flows over erodible beds Mechanics. Volume 499. pp 49–73.
4. Yang C.T. and Marsooli R. (2010). Recovery factor for non-equilibrium sedimentation processes. J. Hydraul. Res. Volume48. Issue 3. pp 409–413.
5. Wang S., Flanagan D.C., Engel B.A. (2019). Estimating sediment transport capacity for overland flow. J. Hydrol. Volume 578.
6. Lu X., Wang X., Ban X., Singh V.P. (2020). Transport characteristics of non-cohesive sediment with different hydrological durations and sediment transport formulas. J. Hydrol. Volume591.
7. Ikramov N., Majidov T., Kan E., Ikromov I. (2020). The height of a damless water intake structure threshold. IOP Conference Series: Materials Science and Engineering. Volume 869. Issue 7. 072009
8. Ikramov N., Majidov T., Kan E., Akhunov D. (2021) The height of the pumping unit suction pipe inlet relative to the riverbed bottom. IOP Conf. Ser. Mater. Sci. Eng. Volume1030.
9. MajidovT. and IkramovN. (2021) Influence of flow hydraulic characteristics on the ridge lower escarpment angle. E3S Web of Conferences. Volume264, 03015.
10. MajidovT., Ikramov N., Mamajonov M., and Chulponov O.(2021)Hydro-abrasive wear reduction of irrigation pumping units. E3S Web of Conferences. Volume264, 03019.
11. Ivanov B.A. (2002). Forecasting of channel deformations in the lower reaches of hydraulic engineering units on a hydromorphological basis. Trudy GGI, issue 361. pp.110-134. (In Russian)
12. Klaven A.B. (2002) on the question of the mechanism and forms of movement of channel sediments. Trudy GGI, issue 361. pp. 184-195. (In Russian)
13. Kondratyev N.E. (2000) Riverbed processes and deformations of reservoir banks. St. Petersburg. 258 p.(In Russian)
14. Petrovskaya O.A. (2018) Optimization of methods for calculating the flow rate of bottom sediments taking into account the hydraulic parameters of rivers. Abstract of the dissertation for the degree of Candidate of Technical Sciences, St. Petersburg. 27 p. (In Russian).
15. Tsubaki T., Kawasumi T., Yasutomi T. (1953) on the influences of sand ripples upon the sediment transport in open channels. Reports of Research Institute for Applied Mechanics, Kyushu University. Volume 11, No. 8. pp. 241-256.
16. Kopaliani Z.D. (2013) Calculations of the flow rate of bottom sediments during their structural transport in the rivers of the mountain-foothill zone. III International Scientific and Technical Conference "Modern problems of environmental protection, Architecture and Construction", Tbilisi-Borjomi, Georgia. pp. 117-125.(In Russian)
17. Kopaliani Z. D., Kostyuchenko A. A. (2004) Calculations of the flow rate of bottom sediments in rivers. Collection of works on hydrology. No. 27. pp. 25-40.
18. Snishchenko B.F., Muhamedov A.M., Majidov T.SH. (1989) Bedlam composition effect on dune shape parameters and on flow characteristics. International Association for Hydraulic Research. XXIII Congress, Ottawa. pp. 105-112.
19. MazhidovT.Sh. (1984) Calculated hydraulic characteristics of flows and parameters of sand-gravel ridges taking into account the composition of sediments. Abstract of the dissertation for the degree of Candidate of Technical Sciences. Leningrad. -16 p.(In Russian)
20. Altunin S.T. (1956) Results of field studies of channel processes at a large hydroelectric power plant. Proceedings of the Institute of Structures. Tashkent. Issue 7. pp.3-101.(In Russian)
21. Khachatryan A.G. (1959) Determination of the flow rate of bottom sediments of rivers with the help of water intake structures. New methods and

equipment for the study of channel processes. Moscow. pp. 60-62. (In Russian)
22. Shapiro Kh.Sh. (1974) Regulation of solid runoff and channel processes of the Amudarya river in connection with a sharp increase in water intake for irrigation in its middle course. Collection of reports of the All-Union meeting on water intake structures and flow processes. Tashkent. pp. 439-446. (In Russian)
23. Tuzov V.E. (1968) on the issue of determining the flow rate of bottom sediments by the volume of channel deformation. Tashkent. Issue 114. pp. 93-114.(In Russian)
24. Turaev A.I., Kuchkarov M.M., Sheremetovsky A.A. (1984Results of research on determining the flow rate of entrained sediments in the middle course of the Amu Darya. Development of research in the field of channel hydraulic engineering in Central Asia: Collection of scientific papers / SANIIRI. Tashkent. pp. 96-100. (In Russian)
25. Lopatin G.V. (1952) Rivers sediments of the USSR. Moscow:Geografgiz.366 p. (In Russian)
26. Lyubimov V.E. (1960) on methods of accounting for the flow of bottom sediments on rivers. Trudy Vsesoyuznogo hydrologic heskogosresda. Volume 5. L.: Gidrometeoizdat,. p. 366-376.(In Russian)
27. Goncharov V.N. (1938) the movement of sediments. L.-M. 312 p. (In Russian)
28. RatkovichL. Ya. (1966) Experience of field studies of the ridge movement of sediments. TrudyGGI. Issue 132. pp. 139-148. (In Russian)
29. Karaushev A.B. (1977) Theory and methods of calculating river sediments. L.: Hydrometeoizdat. 272 p. (In Russian)
30. Snishchenko B.F. (1966) the movement of sand ridges in natural water flows. Trudy GGI. Issue 136. pp. 82-91. (In Russian)
31. Velikanov M.A. (1958) Channel process. Moscow. 104 p. (In Russian)

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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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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.

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

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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.

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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).

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Tips for Writing a Good Quality Engineering Research Paper

Techniques for writing a good quality engineering 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 research engineering 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.

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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.

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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.

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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:

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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.

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

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- 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.
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- Avoid use of extra pictures—include only those figures essential to presenting results.

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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.

Describe generally acknowledged facts and main beliefs in present tense.

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Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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