Bridging the Gaps through Multidisciplinary Studies

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Preface

In today's world, it is important to be able to think critically and solve problems across disciplines. This book provides an overview of the benefits of multidisciplinary studies and how they can be used to bridge the gaps between different fields of knowledge.

The world we live in today is more interconnected than ever before, a global village where information flows at unprecedented speeds. This interconnectedness has opened up new possibilities, but it has also presented us with multifaceted problems that defy simplistic, single-discipline solutions. It is in this context that the concept of multidisciplinary emerges as a powerful tool to bridge the gaps that limit our understanding and hinder progress. In this age of specialization, it is easy to confine ourselves within the boundaries of our chosen fields. However, by doing so, we risk missing out on the synergistic potential that emerges when diverse perspectives converge. This book advocates for embracing the richness of multiple disciplines to develop a holistic understanding of various phenomena.

This book is a valuable resource for anyone who wants to learn more about the benefits of multidisciplinary studies and how they can be used to bridge the gaps between different fields of knowledge.

Acknowledgement

It is with immense gratitude and joy that we extend my heartfelt appreciation to all those who have contributed to the realization of this book, "**Bridging the Gaps through Multidisciplinary Studies.**" This work would not have been possible without the support, encouragement, and dedication of numerous individuals and institutions who have selflessly shared their expertise, time, and resources.

First and foremost, we would like to express my deepest gratitude to our mentors whose invaluable guidance, encouragement, and unwavering belief in the significance of multidisciplinary studies have been the driving force behind this endeavor.

This book would not have been possible without the cooperation and participation of the numerous scholars, researchers, and practitioners from various disciplines who willingly shared their knowledge and experiences. Your contributions have provided a comprehensive and holistic understanding of bridging gaps through multidisciplinary approaches.

We express our deepest gratitude to our family and friends, for their unwavering support, love, and patience throughout the writing process. Your belief in us and your constant encouragement have been our pillars of strength.

We are indebted to Nex Gen Publications for their hand holding throughout the process of bringing this Book into life. Without their kind support we couldn't have even thought of Publishing this Book.

Last but not least, we want to extend my heartfelt thanks to the readers of this book. Your interest and engagement in the subject matter make the effort and dedication invested in this work truly worthwhile.

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About the Editors

Anjana Verma is dedicated educator with diverse experience, resourceful, goal-driven, self-motivated with over 12 years of teaching experience in degree college affiliated to University of Mumbai as Assistant Professor in commerce, 3 years of teaching experience as Post Graduate Teacher - Commerce in Junior College affiliated to Central Board of Secondary Education. she also has corporate experience of 5 years and have worked for Max New York Life Insurance Company Ltd. and Blue Dart Express Ltd. UGC NET Qualified (Commerce), Ph.D. scholar from University of Mumbai in Business Policy and Administration.

She has published quite a few articles and research papers in leading national and international journals with high impact factors. She is visionary educator who believe in imparting knowledge and inculcating a holistic vision among students. She has been awarded with Women Researcher Award, Education Leader Award, Best Teacher Award in Subject Accounting & Finance.

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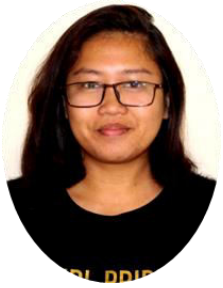

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She has authored numerous research papers in highly respected international and national journals, showcasing her expertise in the field. Additionally, she has had the privilege of sharing her research findings at prestigious conferences worldwide. Her commitment to advancing knowledge is evident through her acquisition of numerous certifications in Marketing & Research from esteemed institutions. Professionally, she has consistently achieved remarkable milestones, demonstrating her exceptional track record and garnering recognition for her accomplishments.

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ANALYSIS OF STUDENTS' MISCONCEPTIONS USING FOUR-TIER MULTIPLE CHOICE DIAGNOSTIC TEST

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INTRODUCTION

The educational process has a very close relationship with the achievement of educational goals. The main process of the educational process is the learning process which includes teaching and learning activities. However, learning and teaching activities are not only limited to learning or teaching activities but must go through a series of carefully planned activities, in accordance with the nature of teaching which is a process. The success of the educational process in building student character requires accurate education, because education will make a major contribution to achieving overall national development goals. Education in Indonesia has experienced a decline in the status of the meaning of educational values. So it is necessary to have a breakthrough in the world of education in Indonesia, which is able to provide enlightenment for students. Education that is much more open, directed and does not only discuss scientific technical issues, but is an education that is able to provide inspirational stimuli for changes in student character (Sudarsana, 2016).

The quality of education in Indonesia is not good, one of which can be the cause of the low achievement of values in learning. One of the reasons for this can be caused by the low understanding of students towards a concept being taught. The lack of understanding of concepts in the learning process can be due to the teacher's lack of support for students to build conceptual understanding and develop their thinking skills, the students themselves, the learning context, and the learning text books used. In science learning, students are required to understand the concepts in learning well. However, the fact is that there are still many students who have difficulty understanding concepts and even experience misconceptions, because most of the learning materials contain abstract concepts that allow students to have difficulty in forming their understanding (Pakpahan, et al, 2020).

Mastery of concepts correctly and precisely is very important, because it will give birth to mastery of laws, principles, and theories that are correct and appropriate as well. However, often students cannot understand the concept or even experience misconceptions so that it can cause learning difficulties for students and indirectly have an impact on the low achievement of student grades because if the misconceptions are allowed to continue and are not overcome, the misconceptions will be integrated in the student's cognitive structure and will stick together. strongly

in their minds so that it can hinder the process of assimilation of new conceptions (Pakpahan, et al, 2020, p.28). One of the learning difficulties of students in understanding a concept is when students experience misconceptions, so it is necessary to conduct an analysis so that the cause of the difficulty can be known and determine the solution. Misconceptions need to be detected to find out concepts that are considered difficult by students so that teachers can determine what remediation learning should be done. Another test tool is needed that can reveal students' understanding of a concept (Kurniasih & Haka, 2017).

One of the concepts that must be mastered by students is the concept of measuring Be and temperature. However, the concept of measuring Be and temperature is still considered difficult for students to understand because it is abstract so that it can make the material difficult to understand, it is very possible for students to have misconceptions about the concept. Therefore, we need a way to identify misconceptions that occur in students. One way that can be used to uncover students' misconceptions is by giving a diagnostic test. Diagnostic tests can be used to determine certain areas of a subject that have weaknesses and provide tools to find the cause of these deficiencies.

One of the diagnostic tests that can be used to identify misconceptions is the four-tier multiple choice. Thefour-tier multiple choice testhas a level of confidence in the answers and also a level of confidence in reasoning in the form of multiple choice which is able to reveal in depth the understanding of students' concepts. The advantage of the four-tier multiple choice is that it can distinguish between the level of confidence in the answer and the level of confidence in the reasons, so that it is deeper in diagnosing students' misconceptions, and determining which parts of a material need reinforcement, and the results can be used in planning a lesson that aims to reduce students' misconceptions. the four-tier multiple choice test is the best diagnostic tool to identify students' conceptual profiles (Wola, et al, 2020). This research needs to be carried out to determine the percentage of students' misconceptions and the factors that can influence misconceptions on the concept of measuring Be and temperature.

METHOD

This research uses mix method. According to Jalinus & Ganefri (2021), mix method is a type of research that combines or combines qualitative research types with quantitative research types in collecting, analyzing, and combining into one study, so that more objective, comprehensive, reliable, and reliable data can be obtained. valid. The research design used in this study is dominant-less dominant with an explanatory sequential design. explanatory sequential design aims that the

qualitative data obtained will help explain or build the results of the quantitative data obtained.

The variables in this study consisted of the dependent variable and the independent variable. The dependent variable is a stimulus to produce a response, while the independent variable is a variable that affects the dependent variable (Wijayanti & Hermuningsih 2020). The dependent variable in this study is the level of students' misconceptions about the concept of calculating Be and temperature, while the independent variables are four tier multiple choice instruments and interview instruments.

This research was conducted at SMP Negeri 1 Pakong. Determination of research subjects in this study using a selected sample technique (purposive sampling). Purposive sampling is a type of sampling with the consideration of researchers who are considered the most useful and representative (Jannah & Nurdiyanti, 2021). The sample in this study was class VII-A students at SMP Negeri 1 Pakong for the academic year 2021/2022, totaling 23 people.

The method of data collection in this study used the methods of observation, tests, interviews, and documentation. The test used in this study is a four-tier multiple choice.diagnostic four-tier multiple choice test is a test that has four levels in the form of multiple choice. The first level is a test with one answer and three distractors, while the second level is the level of students' confidence in choosing answers at the first level. The third level is the reason students choose answers at the first level, while the fourth level is the level of student confidence in choosing answers at the third level (Fariyani, et al, 2017).diagnostic test four-tier multiple choice will be easier and more detailed in distinguishing students who understand concepts, do not understand concepts, and misconceptions. The level of confidence is classified as high if it is selected on a scale of 3 (slightly sure), 4 (confident), 5 (very sure), or 6 (very very sure). The level of confidence is classified as low if it is chosen on a scale of 0 (guessing), 1 (very unsure), or 2 (not sure).

The data analysis technique carried out in this study, first grouped student test results into several categories, namely Understanding Concepts, Not Understanding Concepts, and Misconceptions according to the criteria contained in Table 1.

Table 1: Interpretation of four-tier multiplechoice

Category	**Type of answer**			
	Answer	**Confidence**	**Reason**	**Confidence level reason**
Understand concept	True	High	True	High

Don't understand concept	True	High	True	Low
	True	Low	True	High
	True	Low	True	Low
	True	Low	False	Low
	True	High	False	Low
	False	High	False	Low
	False	High	True	Low
	False	Low	True	Low
	False	Low	False	Low
Misconception	False	High	False	High
	False	Low	False	High
	True	Low	False	High
	True	High	False	High
***Error* (guessing)**	False	Low	True	High
	False	High	True	High

Then calculate the percentage of students who understand the concept, do not understand the concept, and the misconception use the equation as:

$$P = \frac{f}{n} \times 100\%$$

P is the percentage value of students, f is the frequency of students' answers, and n is the number of students. Third, the calculation of the percentage value is then described in tables and diagrams. Fourth, identify which items and subchapters have misconceptions and classify students' level of misconceptions according to the percentage in Table 2.

Table 2: Categories of percentage misconceptions

Criteria	Percentage
Low	0% - 30%
Medium	31% - 60%
High	61% - 100 %

FINDING AND DISCUSSION

This study aims to determine the percentage of students' misconceptions and the factors that can influence misconceptions in class VII-A students at SMP Negeri 1 Pakong, especially on the concepts of measuring Be and temperature. The data collection technique to find out students' misconceptions is by giving a multiple-choice diagnostic test to students, while to determine the factors that can influence students' misconceptions, it is done by conducting interviews with students and teachers. Diagnostic tests are very useful to find out learning difficulties and to make

improvements and evaluations in the teaching and learning process. The diagnostic test used in this study is a four-tier multiple choice. The four-tier multiple choice diagnostic test is a form of diagnostic test with a four-tier pattern. The first level is the answer to the question, the second level is the confidence of the answers at the first level, the third level is the reason for the answers at the first level, and the fourth level is the level of confidence in the reasons chosen by the students at the third level. The questions used in this study amounted to 15 items that have been tested for validity and reliability, so that they can be used by junior high school teachers as an accurate test to identify the profile of their students' conceptions because they can distinguish students who understand concepts, do not understand concepts, misconceptions and errors (guess). on the concept of measuring Be and temperature.

The validity test in this study usedexpert judgmentconducted by two science education lecturers and one science teacher. Calculation of the validity test using the Aiken's V formula as in the formula

$$V = \frac{\sum s}{[n(c-1)]}$$

V is the value of the validity test results using the Aiken's V, s is the value of the difference between r and I0, r is the number given by the expert or validator , I0 is the lowest number of validity assessment (number 1), c is the highest number of validity assessment (number 5), and n is the number of experts or validators. Validator assessment results can be categorized according to the criteria in table 3.1

Table 3: Validity criteria Aiken's V

Validity Interval (V)	Criteria
V > 0.35	Very useful
0.20 ≤ V < 0.35	Can be useful
0.11 ≤ V < 0, 20	Depending on the situation
V < 0.11	Useless

Based on the results of the validity calculation by the validator, the validity value is greater than 0.35 which states that the 15 four-tier multiple choice used in this study are very useful or valid.

The reliability test in this study can be known by using the Borich as in the formula.

$$PA = \left(1 - \frac{A-B}{A+B}\right) \times 100\%$$

PA is the value of the percentage of agreement (reliability), A is the highest score from the validator, and B is the lowest score from the validator. The results of the

calculation of the reliability of the questions can be categorized according to the criteria in the following table.

Table 4: Reliability criteria Reliability

Interval reliability (r)	Criteria
75,01% < r < 100%	Very good
50,01% ≤ r ≤ 75%	Good
25,01% ≤ r ≤ 50%	Fairly good
0% ≤ r ≤ 25%	Not good

Based on the average calculation results from the validator, a reliability value of 79% was obtained which stated that the 15 four-tier multiple choice used in this study were categorized as very good or very reliable. Thus, it can be concluded that four-tier multiple choice has met the validity and reliability requirements to identify the conceptual profile of junior high school students about the concept of measuring Be and temperature, so that it can distinguish students who understand the concept, do not understand the concept, misconceptions, and the error (guessing) on the concept of Be and temperature.

This research was carried out by conducting preliminary stages (determining the location of the research site, determining the research subject, making a research permit, and coordinating with subject teachers regarding the planned schedule of all research activities to be carried out), preparing the four-tier multiple choice test, activity validation test of diagnostic test instrument four-tier multiple choice test, activity of data analysis from validation sheet, research activity and data collection to SMP Negeri 1 Pakong, as well as data processing and analysis of research results. The results of the research on the research subject were students of class VII-A of SMP Negeri 1 Pakong, totaling 23 students, showing the percentage of students' misconceptions of 8.3%. The value of misconceptions in this study is in the range of values of 0% to 30% which indicates that the value of the results of the misconception research of class VII-A students at SMP Negeri 1 Pakong is in the low category.

Students' misconceptions can be influenced by various factors, according to Suparno (2013) misconceptions are divided into five groups, namely:

Table 5: Factors that influence misconceptions

No.	Main	Causes Special Causes
1.	Students	With preconception, associative thinking, humanistic thinking, incomplete reasoning, wrong intuition, stages of student cognitive development,

No.	Main	Causes Special Causes
		student abilities and student interest in learning.
2.	Teacher	Does not master the material, is not a graduate of the field of science, does not allow students to express ideas, and the relationship between teachers and students is not good.
3.	Textbooks with	Wrong explanations, spelling errors, especially in formulas, the level of writing material in books is too high for students, science fiction books deviate from their concepts just to attract readers, and cartoons that often contain misconceptions.
4.	Context	Student experiences, different colloquialisms, wrong discussion partners, beliefs and religions, as well as wrong explanations from parents and other people in the context of students' lives.
5.	Teaching method	Only contains lectures and writing, does not use misconceptions, does not correct homework, the analogy model used is inaccurate, and the demonstration model is narrow.

The analysis of factors that can influence misconceptions in the concept of measuring Be and temperature is carried out by interview. Based on the results of the interview analysis that has been done, the factors that influence the misconceptions on the concept of measuring Be and temperature include teachers, students, textbooks and tutoring. One of the misconceptions about the concept of measuring Be and temperature that has the biggest contribution is students with a percentage of 63.6%. This can be caused by students' associative thinking, wrong reasoning and low interest in learning.

CONCLUSION

Based on the research results that have been obtained, it can be concluded that the percentage of students' misconceptions in class VII-A at SMP Negeri 1 Pakong on the concept of measuring Be and remeratur is 8.3% in the low category. The factors that cause students' misconceptions include teachers, students, textbooks and tutoring. The sources of misconceptions that have the greatest contribution to this research are students with a percentage of 63.6% which is caused by students' associative thinking, wrong reasoning and students' interest in learning which is still relatively low. Suggestions put forward by researchers who have conducted this research, include that students need to read more references from various sources and not be fixated on memorizing theories or formulas but more emphasis on

understanding concepts so that there are no misconceptions. Then the teacher needs to conduct an evaluation at the end of each lesson to find out students' misconceptions early. And for other researchers, it can be used as a reference to continue research on the concept of measuring Be and temperature.

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USING VOA NEWS MATERIAL THROUGH VIRTUAL SMALL GROUP DISCUSSION ON THE STUDENTS' READING COMPREHENSION FOR UNIVERSITY LEVEL

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INTRODUCTION

At the university level, reading comprehension is critical. It will assist students in developing knowledge and the management of critical thinking in academic situations. University students with a reasonable degree of reading comprehension will grasp textual knowledge and process it as their own. The majority of the reading activity in the classroom still uses the material from the textbook. Even at the university level, most lecturer still uses textbooks. Understanding textbook activities as part of teaching practice entails cognitive processes supported by teachers' knowledge, skills, and beliefs, among many other psychological traits (Gao & Zhang, 2020).

As one of the learning materials, Textbooks are significant in the success of teaching and learning. A textbook is a collection of instructional materials. It contains a wealth of information and knowledge. It is the primary source used by the instructor in the learning-teaching process. Textbooks are not only useful for teachers in terms of assisting them in preparing materials and achieving teaching aims and objectives, but they also assist students in achieving their learning needs (Mulyarti,2013). In reading comprehension class, students become bored and unmotivated. The reading topics in the textbook are out of date and boring. Students require more challenging material that is relevant to their daily lives. The lecturers must renew the reading material to keep the students' attention by providing authentic reading material.

The study revealed that the student given authentic material had a significant impact on the learners' reading comprehension. The non-authentic group, on the other hand, did not perform well in the post-test stage compared to the pretest stage. According to the findings, the student who used authentic-based materials was more effective than non-authentic-based materials according to students' reading abilities' improvement. There was a significant difference between authentic-based materials and non-authentic-based materials in improving the reading comprehension of Iranian intermediate EFL learners. It proved that authentic reading material improves reading comprehension (Khoshbakht & Gorjian, 2017). Aftab and Salahuddin (2015) conducted a study on the effects of using authentic texts instead of traditional passages in an Asian ESL context. The findings revealed that using non-authentic reading texts cannot help language learners improve their reading

comprehension abilities, exceptionally high achievers, and average students in private sector schools.

News articles are one type of authentic reading material. VOA is an effective content for a reading comprehension class. It contains a broad scope of topics that are both interesting and diverse. Reading VOA news material enhances not only reading comprehension and vocabulary mastery. This study first assessed the vocabulary level of Voice of America (VOA) news for its potential as voluminous reading material for mid-frequency vocabulary learning. The experiment then looked into how much VOA news input is required to encounter the majority of the first 9,000-word families enough times for learning to occur. Every 500,000 words of VOA news were incrementally added to examine mid-frequency words for most words in the fourth to ninth 1,000-word-family levels. The figures can be used as a resource for English extensive reading practitioners and students interested in mid-frequency vocabulary learning (Hsu, 2019)**.** So, VOA can provide both challenging materials also not difficult for students. It is suitable for students' reading comprehension development.

Good reading material also needs to be supported by an appropriate learning strategy. The teachers or lecturers need to design the teaching and learning method to help students build their reading comprehension skills. Teachers can employ a variety of strategies when teaching reading. Anyone who teaches must understand the principles and assumptions on which each specific technique is based to use it effectively. There is no shortage of descriptions or labels for activities that can be classified as instructional. A strategy is an action that a teacher takes to achieve one or more of her teaching-learning goals. The strategy can also be defined as a broad framework for teaching. To keep students interested in reading, the teacher should employ various strategies, including the use of various methods, media, and games(Harmer, 2027). The primary function of teaching strategies is to make it easier to implement various teaching methods and techniques. The key is to create more interactive learning environments, incorporate technology into the learning experience, and employ appropriate collaborative learning strategies (Brown, 2004).

The teaching and learning methods have also been completely transformed into student-centered. As part of the changing method, they are asked to analyze and then produce something based on what they have already observed, they are exposed to understand what they learn on their own, and they are encouraged to be socially aware of their friends, surroundings, and aesthetic factors. (*The Analysis Of Reading Materials In English Textbook Based On 2013 Curriculum For The First Grade Of Vocational High Schools. Mulyarti English Education Department*, n.d.). Small group discussion is one of the cooperative learning methodologies in which students

work in groups of three or four students. According to Barker, adopting small group discussion tactics in education, particularly reading comprehension, will enable students to figure out the meaning of a piece by gathering information from their peers and teachers. It says that a small institution is a small group of persons who work together to achieve a common objective through interaction and interdependent courtship. Furthermore, small group discussion can help pupils improve their reading comprehension (Kaur et al., 2021). It implies that using small group conversations to teach reading comprehension is a viable option. According to Sagala, a group discussion group with three to four college students is more powerful since it allows students to readily share their critiques or opinions to various college students. (*WIYUDO SERENA-FITK*, n.d.) It takes an institutional approach to dialogue, which is a discourse in which humans engage with at least one another, sharing ideas and criticisms.

The small group discussion allows students to negotiate the meaning of a passage by giving and receiving suggestions. Students in a small group discussion must combine their various ideas with other students in the same group to fully comprehend the text. According to Kondo's (2010) theory, group work activities provide positive responses such as helping each other, reducing individual workloads, and encouraging students to participate in these activities. So, a small group discussion strategy is appropriate for teaching reading comprehension. However, the Covid-19 pandemic has changed the way people interact. The lecturers need to consider Virtual small group discussion is one alternative solution to present a dynamic reading comprehension development strategy. However, the distance should not prevent the group discussion (Ningsi et al., 2021).

Many studies have been conducted on the effectiveness of small group discussions in improving students' reading comprehension, but none have been conducted via virtual room. So, this research is focused on the use of VOA News reading material through virtual small group discussions.

METHOD

This section introduces the research design, population and sampling procedures, research instrument, and post-test scoring scheme. It emphasizes ensuring that the research design is appropriate for the research. Experimental design is "the blueprint of procedures that allow the researcher to test hypotheses by reaching valid conclusions about the relationship between independent and dependent variables. The research methodology is a quasi-experimental pre-test-post-test approach (Creswell, 2018). Some hypotheses offered to investigate the impact of VOA news material through virtual small group discussion. The author employs a writing post-

test, which is performed on the sample after the conclusion of the four-week experiment.

Population and Sample

The population of the study refers to all of the participants (formerly referred to as "subjects") in the study (Creswell, 2018). For the objectives of this study, the population was selected from 222 second-year students at STIT Al-Kifayah Riau who was pursuing their studies in the academic year 2021/2022.

Purposive sampling was used to collect the sample. This is another general sampling approach in which participants are recruited based on pre-selected criteria related to a particular research subject. Purposive sampling is intended to give information-rich examples for an in-depth investigation that volunteers are people who have the necessary position or expertise, or are recognized to hold particular knowledge, to supply the researchers with the information they seek(Creswell, 2018). The researcher selects students who have a stable internet connection and are willing to participate in a discussion through Zoom conference. The sample was split into two equal groups of 24 students each. However, because one student could not participate in the study, the experimental group consisted of 23 students. For the context of this research, the experimental group of students is taught reading comprehension through virtual small group discussion using VOA news material, while the control group is taught reading comprehension individually using text books material. Furthermore, the pretest-posttest equivalent group design was used in this study. The following table shows the statistics of the experimental and control groups.

Table 1: Statistics of the Sample Experimental and Control Groups

Group	Number of	Strategy	Reading material
Experimental	23	Virtual small group discussion	VOA news material
Control	24	Individually	Reading material in text book

Instruments

The research instrument is a reading comprehension test. The test was constructed from the "Longman Complete Course for TOEFL test" by Phillips (2011). The test consisted of 50 questions. The tests were in the form of multiple choice. The multiple-choice technique is designed using four options of choice, and the students only choose one correct answer based on the questions. The questions were related to the components of reading comprehension.

The scoring methodology is the method through which the generated results are appropriately understood. The test was awarded a total score of (100). The test consists of fifty questions, each of which is worth tw0 points.

DISCUSSION

This part explains the data analysis, looks at the post-test findings, and confirms the hypotheses that were developed in the study. The hypotheses were formulated in connection to the use of the VOA News Material through Virtual Small Group Discussion is:

1. There is no difference between the experimental and control groups according to the mean score of the pre- test.
2. There is no difference of experimental and control groups according to the mean score of the post-test.
3. There is no difference between the mean scores for pre and post for the experimental group.

Pretest Comparison

In the pre-test, both the control and experimental groups had remarkably similar results. The experimental group had mean score of 66.87, whereas the control group received a score of (67.70), and a significance level of (0.674). The following parameters are shown in table below:

Table 2: Pre-test T-score for the two groups

Group	No. of Students	Mean Scores	t	DF	Level of Significance
Experimental	23	66.87	-423	46	0.674
Control	24	67.70	-423	41.066	

The statistical result proves that in the pre-test, there was no significant difference between the two groups. As a result, the first hypothesis is accepted, stating that "no significant variations in the mean scores of students' achievement in the pre-test between the two groups." This is a normal finding, and it may be explained by the fact that both the control and experimental groups were exposed to the same social and cultural environments while taking the same English language classes.

Post-Test Comparison

In the post-test, data analysis indicated a difference between the means of the control and experimental groups. The control group scored (74.16), whereas the experimental group scored (83, 08). As stated in table (3), the (0.00) level of significance was found. In the post-test, there are statistically significant differences between the two research groups, as shown in Table (3).

Table 3: Post-test T-score for the two groups

Group	No. of Students	Mean Scores	t	DF	Level of Significance
Experimental	23	83.08	5.214	46	0.00
Control	24	74.16	5.214	41.066	

As a result, the second hypothesis, "no significant changes in the mean scores of students' achievement in the post-test between the two groups," is rejected. In other words, when VOA News Material through Virtual Small Group Discussion was used, the students improved their reading comprehension skills.

Pretest and Posttest Experimental Group was Compared.

In the pre-test, the experimental group's mean score was (66.87), and in the post-test, it was (83.08). The formula for the two samples is used to see whether there are any statistically significant variations in the mean scores obtained. The level of significance is 0,00 .

Table 4: Results of the experimental group pre and post-test

Test	No. of Students	Mean Scores	SD	DF	Level of Significance
Pre	23	66.87	6.67	51	0.00
Post	24	83.08	7.74		

Table (4) reveals that the pre- and post-test scores of the experimental group, which is taught using VOA News Material in English classes through Virtual Small Group Discussion change statistically significantly in favour of the post-test. As a result, the third hypothesis, "no significant variations in the mean scores of the experimental group between the pre- and post-test," is rejected.

The following factors may have contributed to these results:

1. The impact of using VOA News Material in English classes through Virtual Small Group Discussion, which is improves reading comprehension.
2. Using VOA News Material in Virtual Small Group Discussions allowed students to express themselves and utilize the language effectively to reinforce their reading approach, expand vocabulary, and develop critical thinking skills.

CONCLUSION

This study came to the following findings based on the data analysis, outcomes, discussions, and hypothesis testing:

1. There is a significant improvement of the students reading comprehension through Virtual Small Group Discussions.

2. Using VOA News in Virtual Small Group Discussions allows students to approach the reading comprehension in a unique and productive way that is far superior to traditional techniques.
3. Using VOA News in Virtual Small Group Discussions allows learners to expand their vocabulary.
4. Using VOA News Material in Virtual Small Group Discussions allows students to communicate with one another as well as their instructor.

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ELIMINATING LANGUAGE LEARNING BARRIERS THROUGH USE OF DIGITAL TECHNOLOGY: A SURVEY

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INTRODUCTION

Educational bodily process is a nation construction and globally inter-related activity that unlocks the room access to modernization. It is imparted through formal, informal and non-formal ways. For this purpose, there is a need of interaction among the learner, educator and study material. Usually, educational system at the university level follows the medium of instructions in the subject language or mother tongue. In Pakistan, the students have to study English as a compulsory subject from K.G to graduation level due to the following reasons:

i. English is a means of understanding the foreign and higher educational work.

ii. English is an international language used in research, commerce, aviation, diplomacy and source of scientific and technological advancement.

iii. English is a symbol of power and high social status (Rehman, 2003).

Language is primarily a source of communication in terms of culture, values, beliefs and customs. Language by nature intrinsically stimulates the routine life of any race, doctrine, transit information and state of the world. It plays a fundamental social function, promotes morale of group identity and commonality, transfers and preserves culture, its traditions, values and realities. Languages have complex structures and one realizes this complexity when he tries to learn it as a second language and one can indeed value the intricacy of the knowledge that a child attains while learning a native dialect. Moreover, the potential to communicate in multiple languages is becoming more and more significant in the progressively assimilated world-wide trade community (Edward Sapir).

Language and communication are inextricably linked. Communication will cease to exist if language is removed from the scene. Language has been an important component of communication since the beginning of time and it is the reason we continue to speak with one another. Language plays an important function in communication since it molds realities while also limiting ideas and notions relating to a situation. When it comes to expressing our views, language has long been seen as a crucial tool. "Language is a non-intrinsic and human technique for conveying one's ideas, wishes and sentiments via freely formed symbols." (Edward Sapir).

English has become a vital means of acquiring and using a wide range of relevant information in the age of information and globalization. In addition, ICT and digital devices have been applied in numerous disciplines of education, allowing for the development of a technology-enhanced language learning (TELL) model in the field of language learning. CALL (Computer-Assisted Language Learning) has grown an importance in the field of language teaching. In the realm of language education research, Mobile-Assisted Language Learning (MALL), which is centered on employing mobile devices such as notebooks, podcasts, MP3s, cellphones and other gadgets, has recently been heavily advocated. The possibilities and effectiveness of language teaching and learning with various digital devices have been widely debated and demonstrated through study as a result of this.

Since Prensky (2001) coined the term "Digital Natives," which refers to a new generation that grew up with technology, it has been referenced in a number of studies (Bennett, Maton, & Kervin, 2008; Jones, Ramanau, Cross, & Healing, 2010; Yot-Domnguez & Marcelo, 2017) under the terms "digital generation," "new generation," "net-generation," and so on. A "digital native" is a person who was born into a generation where digital technologies and the internet are commonplace (Thomas, 2011, p. 2). As a result, according to Prensky (2001), teachers must acknowledge that today's students have different and distinct qualities than the students in the past. Because today's learners may acquire information in a variety of ways, teachers should make an effort to identify their qualities and adjust their teaching method to their learning strategies and carry out a variety of tasks in a variety of ways teachers, in particular, must comprehend how students react to digital devices in their classrooms by employing learning methodologies (Teo, 2013).

The use of digital gadgets in language learning can improve learners' motivation and attitudes toward language learning. This is because digital gadgets allow for flexibility based on the learners' linguistic abilities and traits as well as immediate feedback and active interactions. It also facilitates learner-centered education which allows students to organize, manage and assess their own learning processes. Many studies in the field of CALL and MALL have previously reported on the affective nature of digital language learning environments for learner-centered language learning. (Jung, 2012; Kim & Lee, 2017; Kim & Rha, 2014; Kukulska-Hulme & Shield, 2008; Ogata & Yano, 2005)

Until now, CALL and MALL research has primarily concentrated on confirming the impacts of various digital devices on language learning and investigating learners' attitudes and perspectives about digital language learning. However, seeing how learners use digital devices in the context of digital language learning or how the

qualities of a digital environment contribute to the usage of learning methods in a learner's learning process, has been rather rare.

Since the 1990s, researchers in the field of English language education have been pursuing research on learners in the study of learning strategies, and tools for measuring lists or categories of learning strategies have become increasingly fragmented and systematized (Li, 2005; McGroarty & Oxford, 1990; Oxford, 1990; Symons, Richards, & Greene, 1990). According to prior research, language learning environments, as well as individual learner factors such as gender, age, nationality, English learning aptitude, previous learning experiences, motivation, attitude and views about language acquisition, all influence the usage of learning strategies.

Recent research trends in English education have evolved in the direction of language teaching and learning utilizing various digital devices, thanks to the rapid advancement and widespread usage of digital technologies. The current study attempts to uncover the learning strategies that promote digital English learning by reflecting these changes. This study examines not just the many types of digital English learning techniques (DELS) used by language learners but also the link between DELS use and student characteristics such as gender and proficiency levels. English language competency, English language learning experiences and time spent in a digital learning environment are all factors to be considered.

Language Choice in Multilingual Society

Language is a social phenomenon as well as a means of communication. The field of language and society - sociolinguistics – is expected to show how human language use is influenced by characteristics such as class, gender, race and other elements. Various people in many countries live in multilingual societies where they may speak three or four distinct languages. Indeed, the number of people who speak two or more languages in the world exceeds the number of those who only speak one (Paulston and Tucker, 2003). Bilingual people who live in multilingual communities face the difficulty of deciding which language to use on a daily basis (Coulmas, 2013). Because it is difficult to choose only one language or multiple languages, multilingual people sometimes find themselves in such conditions where they must go back and forth between tongues. Because it is impossible to choose only one language, multilingual individuals will frequently find themselves in situations where they must switch back and forth between languages. Individuals who live in a multilingual community strive to make the best language choice possible, which is mostly determined by the area of usage and the linguistic preferences of speech participants. People who use more than two tones are specialists at improving performance in both verbal and written IQ tests, such as children who have a regular or has gone away to study. A native tongue demonstrated exceptional foreign

language skills and excelled in reading evaluation ratings. Changes in a community's various sectors of life are extremely likely to have an impact on language use. Education, technology and social interaction are all sectors that are prone to change. (Tucker, 2003)

In many multilingual communities, different languages tend to play diverse roles. One language is frequently used for informal communication among individuals, another for inter-ethnic contact and a third language is periodically used in the public domain - for education and media, as well as communication and institutions. Multilingual societies face the challenge of maintaining an efficient communication medium. Local governments and state governments may use any specialized dialects for the commitments but the state government and each municipality must use the same one. At least two official languages must be used by regional government. Individuals who are bilingual make up a bilingual society. However, many bilinguals who speak two languages virtually equally and do not demonstrate intentional language distribution do not require such a culture.

Techniques for Learning Languages

Learning techniques have been viewed as tools that language learners might employ to help them acquire a second language faster or more effectively. Language acquisition strategies, according to Rubin (1981), are the approaches or devices that a learner can use to acquire language. "Any set of operations, steps, plans or routines used by the learner to facilitate the acquisition, storage, retrieval and use of information" was also defined as "any set of operations, steps, plans, or routines used by the learner to facilitate the acquisition, storage, retrieval, and use of information" (Wenden & Rubin, 1987, p.19). Richards and Platt (1992), on the other hand, were resolute that learners' use of learning methods in their learning process might be a purposeful activity and thinking for them to better grasp, absorb or recall new knowledge. Learning strategies may therefore be characterized as distinct and purposeful ways of processing information to increase learners' comprehension, learning or retention of new knowledge based on multiple definitions of learning strategies from previous studies.

Previous research on language learning techniques attempted to categorize language learning processes based on different perspectives among experts. Learning strategies are classified as cognitive strategies that promote learning processes, metacognitive strategies that organize and analyze learning and socio-emotional strategies that impact social and affective learning, according to O'Malley and Chamot's (1990) cognitive theory. Oxford (1990), on the other hand, divided direct and indirect tactics into two categories. Due to the clear correlation between language learning methodologies and target language acquisition, memory

techniques, cognitive strategies and compensating strategies are examples of direct learning methods, whereas metacognitive strategies, affective strategies and social strategies are examples of indirect learning strategies. The Oxford taxonomy of learning techniques is often regarded as the most comprehensive (Brown & Lee, 2015; Ellis, 1994; Li, 2005). Following that, Oxford (2002) added communicative strategies to the category of compensation strategies and she released an updated version of the Strategies Inventory for Language Learning (SILL), which can be used to assess learners' language learning strategies and has been widely used in various fields. Motivation, attitude, belief, age, cultural background, main field, gender, language level and learning style are all elements that influence the usage of learning techniques and goal language accomplishment in language acquisition, target language learning style, personality and length (Hwang, Choi, Shin, & Lee, 2016; Oxford, 2002). It has been found that learner variables have a considerable impact on learners' selection and usage of learning strategies, as well as a strong link with the results of learning strategy training (Dreyer & Oxford, 1996; Griffiths, 2003; Ham, 2005; Lee, 2001; Nisbet, Tindall, & Arroyo; 2005). Related studies of learning strategies, on the other hand, left it unclear whether learner characteristics were important in defining patterns of learning strategy usage that lead to successful or failed language learning (Salahshour, Sharifi, & Salahshour, 2003; Wharton, 2000).

Along with the formation of wired and wireless network systems, the development of various mobile technology devices has lately opened up more engaging and beneficial language teaching and learning activities to many language professors, teachers and learners. As a result, language learners may use relevant and intelligible language learning resources whenever and wherever they desire (Kukulska-Hulme & Shield, 2008; Lyddon, 2016). Furthermore, social media sites and the internet have lately been employed to instruct students in digital English learning methodologies with promising outcomes in the digital learning environment (Alias, Manan, Yusof, & Pandian, 2012; Kim, 2017; Rahimi & Katal, 2012; Yoon, 2014). In this sense, unlike traditional language study, the usage of a digital environment has become a must for language learners. As a result, diverse digital devices have been used in various educational contexts as a result of technology advancements, allowing the development and use of countless valuable learning programs and instructional software. In a digital English learning environment, or DELS, certain learning tactics are required (Digital English Learning Strategies).

Language Learning Strategies in Digital English Learning Environments

Based on the current classification of learning techniques, CALL and MALL research have been done and implemented in the digital learning environment. When

learning a given language, a general language learning strategy is defined as a set of social and cognitive processes that learners engage deliberately in the process of comprehending, storing, remembering, retrieving and applying new knowledge or abilities (Wenden & Rubin, 1987). As a result, DELS encompasses the many English language learning techniques that learners employ to efficiently explore huge volumes of data and pick items that fit their English learning objectives. Learners, in the end, on their own, will learn new linguistic facts and contents. As a result, DELS encourages learners to pursue self-directed learning while also requiring them to employ a variety of conscious and unconscious tactics (Liang, 2009; Zhou & Wei, 2018).

As previously stated, in the realm of digital language learning environments, research into general language learning methodologies has been used (Bae & Kim, 2018; Jung, 2012; Khabbaz & Najjar, 2015; Kim, 2002; Kim, 2017; Lee & Kwon, 2007; Liang, 2009). According to these researches, learners are more likely to employ cognitive techniques such as conceptualization or deductive reasoning in relation to online content while using various digital devices and wired or wireless internet connection in their language learning (Bae & Kim, 2018; Lee & Kwon, 2007). During online surfing, learners utilize a variety of metacognitive techniques such as planning, organizing, self-monitoring, and others, as well as reading methods such as skimming, scanning, comprehending subjects and inferring (Bae & Kim, 2018; Jung, 2012; Kim, 2002; Lee & Kwon, 2007; Oh, 2014).

Meanwhile, Kim (2017) claims that through mobile-assisted listening practices and strategy training, the usage of compensating and metacognitive methods has grown. According to her research, learning English in a digital environment is beneficial for self-directed learning because it allows students to employ specific strategies such as identifying other resources to assist students with their deficiencies or planning, monitoring and evaluating their learning process in order to become strategic learners. Previous research on digital learning techniques has been confined to characterizing the learning process and tactics in terms of cognitive and emotional dimensions. There's also a limit to how much you can learn about the interrelationships between different learning techniques and the variables that influence how they're used. However, considering the recent digital environment's extensive adoption and the possible and realistic trend of digital language acquisition, it appears that DELS should be viewed as a holistic notion that encompasses cognitive, metacognitive and socio-affective strategies among other things. Furthermore, in the digital English learning setting, it is vital to understand how DELS interacts with the learner's elements in the actual learning process. As a result, the current research looked into the overall language approach employed by

IUB students enrolled in a digital English learning environment. It also looked into the link between DELS use and individual learner aspects, as well as the differences in digital learning strategy use based on learner variables including gender, English competence, English learning time and digital device experience (or digital learning environment).

METHOD

The study was descriptive in nature. Quantitative method was considered appropriate for data collection. All the students from the Islamic Learning faculty of The Islamia University of Bahawalpur-Pakistan were the population of study. The sample of the study was 200 students of BS 1st semester enrolled in Spring-2021 and were selected from 3 departments (Pakistan Studies, Islamic Studies and History). For descriptive analysis, the researchers calculated frequency, percentage, mean and standard deviation for each item. The responses were analyzed by using SPSS (17 versions).

RESULTS AND DATA ANALYSIS

Table 1: Digital technology helped the teachers for getting best academic outcomes from students

Sr. No.	Options	Frequency	Percentage	Mean Score
1	Strongly Agree	33	16.5	2.95
	Agree	37	18.5	
	Undecided	43	21.5	
	Disagree	60	30.0	
	Strongly Disagree	27	13.5	
	Total	200	100.0	

In Table 1, the respondents gave opinion that digital technology helped the teachers for getting best academic outcomes from students. According to the data 16.5% of the respondents were strongly agreed, 18.5% agreed, 21.5% undecided, 30% disagreed, and 13.5% strongly disagreed. The mean score was 2.95do not supported the statement. So the majority 43.5% of the respondents were disagreed about statement.

Table 2: Digital technology developed motivation among the teachers and the students.

Sr. No.	Options	Frequency	Percentage	Mean Score
2	Strongly Agree	79	39.5	3.53
	Agree	40	20.0	
	Undecided	18	9.0	
	Disagree	33	16.5	
	Strongly Disagree	30	15.0	
	Total	200	100.0	

In Table 2, the respondents opined that digital technology developed motivation among the teachers and the students. According to the data 39.5% of the respondents were strongly agreed, 20% agreed, 9% undecided, and 16.5% disagreed, and 15% strongly disagreed. The mean score was 3.53 supported the statement. So the majority 59.5% of the respondents were agreed.

Table 3: Lack of resources disturbed the teacher's teaching learning process.

Sr. No.	Options	Frequency	Percentage	Mean Score
3	Strongly Agree	57	28.5	3.38
	Agree	52	26.0	
	Undecided	18	9.0	
	Disagree	56	28.0	
	Strongly Disagree	17	8.5	
	Total	200	100.0	

In this table, the respondents gave opinion that lack of resources disturbed the teachers teaching learning process. According to the data 28.5% of the respondents were strongly agreed, 26% agreed, 9% undecided, 28% disagreed, and 8.5% strongly disagreed. The means score was 3.38 supported the statement. So the majority 54.5% of the respondents were agreed about statement.

Table 4: Using digital technology helped the teachers to eliminate language learning barriers.

Sr. No.	Options	Frequency	Percentage	Mean Score
	Strongly Agree	63	31.5	3.45
	Agree	37	18.5	

4	Undecided	48	24.0	
	Disagree	34	17.0	
	Strongly Disagree	18	9.0	
	Total	200	100.0	

The respondents gave the opinion that use of digital technology helped the teachers to eliminate language learning barriers. According to the data 31.5% of the respondents were strongly agreed, 18.5% agreed, 24% undecided, 17% disagreed, and 9% strongly disagreed. The mean score was 3.45 supported the statement. So the majority 50% of the respondents were agreed.

Table 5: Digital technology developed the confidence and higher skills among the learners.

Sr. No.	Options	Frequency	Percentage	Mean Score
5	Strongly Agree	55	27.5	3.41
	Agree	52	26.0	
	Undecided	27	13.5	
	Disagree	51	25.5	
	Strongly Disagree	15	7.5	
	Total	200	100.0	

In the given table, the respondents gave opinion about the statement that Digital technology developed the confidence and higher skills among learners. According to the data 27.5% of the respondents were strongly agreed, 26% agreed, 13.5% undecided, 25.5% disagreed, and 7.5% strongly disagreed. The mean score was 3.41 supported the statement. So the majority 53.5% of the respondents were agreed about statement.

FINDINGS, CONCLUSIONS, SUGGESTIONS AND RECOMMENDATIONS

In the light of the information and communication technology available to the modern education systems, it makes sense for today's educational managers and administrators to re-think the classroom atmosphere. With the rapid development of various digital devices and wide spread of internet networks and Wi-Fi access, the adoption of digital technology is no longer a choice but a necessity. In most educational settings, including schools and universities, the infrastructure for a digital environment has already been established, and therefore, both language teachers and students are now exposed to, and are able to utilize, a wide range of digital materials. At the same time, students have the opportunity to learn and

practice language through interactions in a more natural setting. For this reason, it is critical to have deep understanding about learners' language use of learning strategies in a digital learning environment. The pedagogical implications of this study are as follows:

First of all, in order to effectively utilize the digital English learning environment in contemporary education, systematic guidance is needed so that learners can clearly understand the characteristics of digital English learning and the advantages of the digital learning environment to adapt it into their learning process appropriately. The digital environment provides English learners with various opportunities to take the desired quantity and quality of learning activities anytime and anywhere and this environment facilitates immediate interaction and cooperative learning for English learners (Kim & Rha, 2014; Kukulska-Hulme & Shield, 2008; Ogata & Yano, 2005). Thus, English teachers should provide students with clear guidelines on how to use DELS, so as to act as facilitators to help them select, train, use and check proper DELS.

Secondly, as the present study revealed, the individual learner factors showed significant influence on usage of DELS. This is highly related to the fact that the digital English learning environment provides an appropriate educational environment for differentiated learning or self-directed learning, which is tailored to the learner's individual features (Kim & Lee, 2017; Kukulska-Hulme & Shield, 2008). In order to effectively perform individualized self-directed learning, the learner needs to practice using required learning strategies and it is necessary for students to select, develop and use appropriate learning strategies to regulate their own learning (Yot-Domínguez & Marcelo, 2017). In particular, university students, nowadays, are in a digital generation which is naturally exposed to the digital environment. To enable them to use vast amounts of information and learning materials enabled by digital technologies, such as search functions, interactive SNS tools and collaborative activities, it is important for the students to cultivate appropriate learning strategies for actively planning, selecting, managing, controlling and evaluating their individual learning. In this process, the teachers should not only understand individual learner's differences but also carry out teaching activities taking various individual learner factors into account. In addition, teachers need to continuously develop and present individualized digital learning strategies to improve their students' digital English achievement (Meltzer & Hamann, 2005).

On the basis of research findings, following suggestions and recommendations were proposed:

1. Awareness seminars for students and teachers may be arranged at departmental level to sensitize them about importance and frequent use of latest language teaching techniques in classrooms.
2. Access, understanding and application of ICT tools in teaching-learning may be increased through trainings and workshops.
3. Social media tools (Watts App, face book, Skype) may be used to devise learning groups so that students feel motivated to learn.
4. Teachers may construct proper assessments which can be suitably used for self-evaluations and peer evaluations.
5. Teachers need to use more on-line activities such as reflective blogs, reflective videos to eliminate language learning barriers.

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TRANSDERMAL DRUG DELIVERY SYSTEM - A NON INVASIVE WAY OF DRUG ADMINISTRATION

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INTRODUCTION

Over the past few years, in just a few years, enthusiasm has been built to promote new drug delivery structures for existing drug particles. The development of a new transport structure for existing drug atoms not only improves the effect of the drug in terms of viability and safety, but also improves the constant sequence and overall recovery advantage to a critical degree (Jalwal et al., 2010). The transdermal drug delivery system (TDDS) is characterized by discrete and independent dose structures, also called "patches" (Bhowmik et al., 2011; Kumar et al., 2010), when patches are applied to perfect skin, transport the drug through the skin at a controlled speed main stream (Divya et al., 2012). TDDS are dosage structures designed to deliver a restorative, convincing measure of medication to the patient's skin (Jain et al., 2001)

The main objective of the transdermal drug delivery system is to transfer drugs at a fundamental flow to the skin through the skin at a predetermined rate with little burial and intraperstable diversity. 3 Transdermal transport is currently one of the most encouraging drug strategies (Rani et al., 2012). This reduces the amount that an oral course usually injects into the tract associated with the stomach and liver. It improves ongoing adherence and limits the ill effects of drugs caused by short-term over-supply, and is convenient for transdermal drugs that require decent use (Dhawan et al., 2009).

The primary transdermal base, Transderm SCOP, was approved by the FDA in 1979 to anticipate dizziness and arousal associated with movement. Most transdermal patches are designed for dynamic fixation at a zero application rate for a period of time from several hours to several days after application to the skin. This is especially useful for prophylactic treatment in endless conditions (Mehta et al., 2004). Evidence of percutaneous drug retention can be detected through measurable blood levels of the drug, noticeable excretion of the drug and its metabolites in the urine, and also through the patient's clinical response to treatment with controlled drugs (Loyd et al., 2005).

The beneficial transdermal framework is characterized by a discrete and independent dose structure, which, when applied flawlessly to the skin, transfers the drug through the flawless skin at an adjustable rate to the main stream and supports the fixation of the drug in the recovery window for a delayed period of time. Recently, the use of transdermal patches for pharmaceutical preparations has been limited due to the fact that it has been shown that several individual drugs are successfully transferred through the skin to achieve the goal of the main drug by topical application to a flawless skin surface. Over the past few years, enthusiasm for developing new drug delivery systems for existing drug atoms has not recovered (Rihan et al., 2015).

The development of a new transport structure for existing drug particles not only improves the effect of the drug in terms of physical fitness and well-being, but also improves the persistent consistency and overall recovery advantage to a critical degree (Pawan). et al., 2010). With the right structure and design for a specific drug, the new transport structure can overcome obvious obstacles associated with typical transport strategies, for example, drugs that experience incomplete or complete damage before they reach the site of action, can be transferred from a feasible method with improved bioavailability using new ideas for a planned or pulsating discharge, or gastro-safe transport

Transdermal transport suggests an attractive option as opposed to oral drug transport, and is also prepared to offer an option as opposed to subcutaneous infusion (Guy et al., 2003; Bronaugh et al., 2005). For many years, people have applied substances to the skin to achieve a restorative effect, and in modern times various thematic plans have been developed for the treatment of immediate signs. The primary transdermal base for main transport, a three-day solution for transporting scopolamine for the treatment of stroke, was approved for use in the United States in 1979. After 10 years, nicotine patches became the first.

In addition, systemic changes are not infiltrative and can be restricted in nature. They can leave in a lot of time (up to several weeks). They improve longevity against safety and take the job is usually cheaper. Another area of illicit gov is the exchange of antibodies (Glenn et al., 2006). Transdermal vaccines lead to a safer response by focusing on the conversion of skin into Logenhans cells, even at the hypodermic level. Considering the position outside the patches and the patient's command, it is similar to creating a customization or replacement that affects the control scheme. The reported pain removal is recommended in the United States, and it uses fentanyl (iontophoresis), which is controlled by force, to eliminate the harm.

Four Major Transdermal Systems

Single–Layer Drug in–Adhesive

The glue layer of the frame also includes a drug. And in this way should amend his ways, and not only to the orders of kelp at the same time it follows from the other offices of the glue and spread it in the net, is also guilty of a drug, as also the frame to cover all the skin. The glue layer is surrounded by permanent primary and sponsorship.

Multi-Layer Sedate in Cement

The multi-layered society is like the most perfect in one-frame is now in order, glue, and even then he responsible for the drug. In any case, it has another layer of cement is unique in medicine, that is typically a homogeneous lot of people. This training has permanent and continuous support for clinical coat.

Medication Repository in-Glue

The lake of transdermal drug in the frame of the world hath he any other layer. The drug contains a layer of fluid into the cell arrangement drug or suspension sponsorship with isolated layer. In such a framework, the discharge rate is zero demand.

Medication Framework in-Glue

This semi-solid frame has a duration of clinical need players arrangement comprises a drug or a suspension. That bond is a layer of bacteria, most often in drug superimposed on a layer of fat covering it.

Advantages of transdermal drug delivery: (Jalwal et al., 2010; Mehta et al., 2004; Yadav et al.,2012; Dhiman et al., 2011; Sharma et al., 2010; Sandhu et al., 2011;Rihan et al., 2015; Pawan et al., 2010; Ashvini et al., 2014;).

- Enhances chemical suppression and traps based on enzymatic degradation and pH dependence.
- Prevents premature exercise.
- Absence of plasma bacteria can reduce the risk of seizures, and these lines require high levels of attention. is good for transdermal drug delivery.
- By changing the production method The amendment provides for a continuous process rather than in line with the valley of the chemical standard associated with oral medicine.
- Immediate precautions of medication when a problem arises, such as the ability to reduce their risk quickly by removing them completely.
- Protection against termination of the system.

- Most are alert to the ward who needs to exercise once a week, a correction that we have with our practice to help with endurance treatment.
- Satisfy nightmares.
- Provide used medicine with half an hour of natural, useful windows.
- Avoid changes in stability that will reduce heat.
- Intercultural relationships.
- The end of treatment is always easy.
- Provide technical expertise.
- They do not interfere, the burden of the parents is reduced.
- Vegetable production is expanded with a shorter period of time by selling medicines in return and preservation methods.
- One of the preferred options for patients is not shy or retarded.
- Transdermal patches are a great way to get rid of what the stomach has to offer, not much to the worm, or to damage the liver.
- Transdermal patches are financially unstable.
- Transdermal path transduction is a wonderful option if transdermal therapy is effective and safe. Essentials to soothe the skin provide its essential ingredients:
- Transdermal therapies require continued use of medications for a period of time, to avoid adverse signs and open prescriptions of medications that are used in combination with impotent vaccines.
- The coordination program required for patients who are unable to perform the combination of oral conditions, for example.
- Avoid pre-combustion
- Illuminate the test
- Verify and trust the sentences
- Limitations of hate speech
- Make medicines with half-life of natural, lightweight cosmetics
- Improve vision in physical and pharmacological activities

Stay on top of different treatment options

- Strong and effective injection

Keep your blood pressure clean and powerful

- The end of treatment is always easy
- Remaining patient due to extensive medical history

Disadventages of transdermal drug delivery: (Dhiman et al., 2011; Sandhu et al., 2011)

- Transdermal medicines with regular dose cannot stimulate conventional medicine.
- Cannot reach high levels of chemicals in blood.
- Cannot create high-atomic mass.
- The drug cannot interact in a pulsatile manner.
- This may not occur if the medication or plan is harmful to the skin.
- Ability to push distance using.
- Aan cause movement.
- Precautions of proper water and odor, which keep P (octanol / water) wood in one place following lines 1 and 3 to be filled with varying sections of corneum and water.
- Drug resistance may be an advantage for transdermal replacement as it is the most common area in the medical field due to the inability of the skin to penetrate.
- Acceptance is a complex issue.
- Once taken, the medication is taken unexpectedly.
- Energy balance for transdermal transport by looking at the characteristics of end-to-end solutions reinforced by the skin.
- A few patients who develop dermatitis at the site of pain from the toddler need to stop.
- The circulatory system cannot be used for drugs that require high blood pressure (Saurabh et al.,).
- The use of transdermal transport may not be economical.
- No movement and movement is required when the skin is required to deliver the medicine.
- It is not possible to adjust blood pressure medication.

- Antidepressants that can cause discomfort or improvement.
- Does not come down to the surface, when exposed to too much of the skin and when applied too much prevents the entry of fragments into the skin.
- Not suitable for chemical, non-toxic, o / w chemicals
- Staying is the rate of relocation from one place to another because of people of the same age, year after year. [Nikhil et al., 2012]

Components Influencing Transdermal Saturation

Natural Factor: (Kumar et al., 2011; Singh et al., 2010)

Skin Conditions:
Perfect skin itself goes beyond the boundaries, but many operators, such as acids, salts, barrier cells and penetrate the skin, many solvents reveal the complex structure of the stratum corneum, solvents such as methanol, chloroform. removes false shunts through the drug and releases part of the lipid. The details can pass without difficulty.

Skin Age:
It is observed that the skin of adults and young people is much more accessible than the organized skin, but there is no sensational difference. There are also powerful steroids. , calcareous corrosion, hexachlorophene caused extreme symptoms.

Blood Supply:

Changes Infringe Dissemination Can Influence Transdermal Retention

Local Skin Site:
The thickness of the skin, the nature of the epidermis and the thickness of the limbs move. These elements affect access.

Skin Absorption:
The skin is treated with steroids, hormones, carcinogens and several medications. Thus, skin digestion determines the viability of drugs that pass through the skin.

Species Differences:
Skin thickness, leg thickness, and skin keratinization vary depending on the species and therefore affect the site of entry.

Physicochemical Elements:

Skin Hydration:
When in contact with water, skin growth is significantly increased. Moisturizing is an important factor in expanding skin penetration. Thus, the use of a humidifier is carried out in transdermal conductivity.

Temperature and pH:
The prevalence of drugs increases tenfold with changes in temperature. The dispersion coefficient decreases with decreasing temperature. Weak acids and weak bases depend on pH and pKa or pKb. The level of the combined drug determines whether the drug is directed to the skin. Thus, temperature and pH are important components that affect drug penetration

Dispersion Coefficient:
Infiltration of drugs depends on the coefficient of distribution of the drug. The coefficient of dispersion of drugs at constant temperature depends on the properties of the drug, the dispersion medium and the relationship between them.

Medication Focus:
The action is higher than the focal tendency and is higher if the drug convergence is excessive.

Parcel Coefficient:
An ideal parcel ratio (K) is required for optimal operation. K high drugs are not ready to leave the ipid segment of the skin. In addition, it is impossible to take drugs with low K levels.

Atomic Size and Shape:
Medication intake is mainly due to subtomal weight, small particles spread faster than large particles.

Natural Elements: (Singh et al., 2010)

Daylight:
Under the influence of sunlight, parts of the blood vessels become thinner, which leads to minor injuries in places where there is no sunlight. Also pigmentation: The most common area of sun exposure is a spot or sun-focused lentigo.

Cold Season:
Bring to suffer from dry skin forever. The formation of skin Reacts fat loss by increasing the effects of drought and copper. A good massage dry skin and help relieve the symptoms. Further, it shall loathe to drink plenty of water to moisturize your skin and make it look shiny.

Air Pollution;
The remainder will not clog pores and skin of the face and surface, and increase minimum of organisms, breakage or two spot on the skin. This belongs to penetrate the skin slices. Undetectable substances and toxins can be found everywhere inside the security system to determine any skin or mix with regular backup skin oils are taken to conserve moisture and suppleness.

Polymer Lattice/Drug Store Medication.
Enhancers of satiety.

Weight sensitive glue (hill).

Support coating.

Discharge of the liner.

Excipients such as plasticizers and different solvents

Polymer lattice/Drug store
The middle part of the TDDS polymers. It is installed on the right or to the polymer base is very winds drug product. For what is more like the case of the creation of the role of the drug in a number of polymers, and the structure of the TDDS, and the biocompatibility, for example, by infiltration of enhancers. Moreover, a stronger drug must be delivered reliably and in a safe state planned availability of the item. Representative polymers in TDDS ordinary polymers, for example cellulose subordinates, which gelatin, shellac waxes, gums and Chitosan etc. Elastomers to be produced: for example, poly butadiene, poly isobutylene, with silicone, nitrile, acrylonitrile, neoprene, butyl parts of the constant, etc., Polymers to be produced: for example, polyvinyl liquor, polyvinylchloride, polyethylene, polypropylene, polyacrylate, polyamide, polyurea, poly vinyl pyrrolidone, polymethyl methacrylate, etc.,

Ongoing Innovation utilized in Transdermal Drug Delivery Framework (Alexander et al., 2012; Syeda et al.,2017)

Iontophoresis.

Agrobacterium.

Microneedle-based Prov.

Already with fire

Needle free injection

laser irradiation

and microporation

A needle-free infusion;

Segments transdermal Drug Delivery System

Courses of Medication Infiltration through Skin:
During periods of saturation through the skin, the atoms of the drug may pass through the epidermis or spread through the sheath, especially those recommended

with separate hair follicles and encephalitis. In a temporary phase, soothing atoms can penetrate the skin along the hair follicles or sweat ducts and are then absorbed through the follicle epidermis and fat organs. The defect becomes the main route through the skin, where there is a constant condition for propagation through the stratum corneum (Jain et al., 2002).

Transepidermal Course:

In transepidermal transport, atoms cross a flawless horny layer. Two potential subsets of bipolar and non-polar substances spread through different devices with intermediate cells and intermediates. Polar atoms predominantly propagate through the pole, which consists of "bound water" within the liquid layer, but non-polar particles propagate through the anhydrous lipid network of the cornea. An important path through the passage is mainly selected by the package factor (K log). Hydrophilic agents are placed in specific intracellular compartments, while lipophilic conductive materials (octanol / water logic K> 2) move the corneal layer through the intercellular pathway. Most particles pass through the corneal layer through two passages (Jain et al., 2001).

The principle of skin breakthrough: (Jalval et al., 2010; Dovan et al., 2009). Skin saturation is subject to concentrated distribution1. The skin is the densest and most quickly available organ of the body because a small amount of millimeters of tissue separates its surface from the main thin network (Dawan et al., 2009). The emergence of a restoration specialist from the definition used on the surface of the skin and leads to a basic spread includes multi-stage treatment.

1) Distribution of the drug from the drug in the course management film.
2) It melts inside and separates from detail.
3) Adsorption with the cornea layer and passage through the epidermis.
4) Receiving drugs through the delicate system of the skin papillary layer.
5) Effect on target organs.
6) Divide into the longest layer of the skin, corneal.
7) Distribution of organic intermediate pathways.

Properties that Impact Transdermal Conveyance :(Yadav Et Sl., 2012)

1. Bring drugs from the car
2. Filter through the skin.
3. Use of pharmacological reactions.

First-Generation Transdermal Delivery Systems

Transdermal Conveyance Frameworks are responsible for the majority of primary transplants, which have been in clinical use until now. Significant advancements in Renewable and open source technologies have strengthened the existing floodplain of the transit market. In fact, these floods reduce the risk of downstream flow of chemicals with a reasonable risk. Easy-to-obtain results require low weight-atomic weight, lipophilic, and low efficacy. In many cases, their relocation is a better alternative to oral replacement because of oral health, a lower dose of the vaccine or a change in the content or composition.

Second-Age Transdermal Conveyance Frameworks

The second step of the protocol is to improve the penetration of transdermal drugs into the skin. By reversing the effect of sound on the skin, (i) increasing the depth in the skin, (ii) providing an additional effect on the transport to the skin, and (iii) movement by penetrating deep into the soft tissue.

However, new techniques developed in this era, for example, enhanced chemotherapeutic tools, iontophoresis, and non-cavitational ultrasound have struggled with the similarity of addition by transferring across a single layer of corn, while protecting many tissues from infection. Accordingly, this second phase has been successful in clinical practice by improving small atom substitutions for restriction, treatment, enhancement, and some basic applications, even suggest that mutations in macromolecules have no small effect (Guy et al., 2003; Brono et al., 2005).

Normal Synthetic Enhancers

Recognizing the need to create skin porosity, second generation transduction methodologies have significantly improved the improvement of synthetic enhancers (Williams et al., 2004; Smith et al., 2006). This methodology is a coherent extension of the stock of traditional pharmaceutical tools, because it essentially involves a new definition of structuring using synthetic excipients. Many viable synthetic activators incorporate amphipathic atoms found in the stratified stratum corneum to complicate subatomic compression or remove lipids using solvents and surfactants to measure nanometric lipid compression. It distorts and disrupts the deeply needed bilayer structure of intracellular lipids found in the stratum corneum. Many different formulation enhancers are contemplated, including commercially available blends and others which have been explicitly planned and incorporated for this reason. Liposomes, dendrimers and microemulsions are also used as complex enhancers with supramolecular structures which can increase the porosity of the skin, but further increase the solubilization of drugs and the administration of drugs to the skin during planning (Kogan et al., 2006; Touitou et al., 2007). Their supramolecular size and large blocks block their invasion into the skin and

consequently limit their effect on the stratum corneum. These methodologies have found the realization of an improved delivery of certain small particles, in particular for topical dermatology and orthodontic applications. Details of highly deformable liposomes are currently in the preliminary clinical stage of insulin administration. Pride is the use of prodrugs. Due to the expansion of cleavable synthetic assemblies that generally increase the lipophilicity of the drug, these prodrugs can facilitate the exchange of drugs through the skin. It is cultured, for example, by including an alkyl side chain with an enzymatically cleavable binder, such as an ester or a carbonate. A prodrug approach relies on the mutual bonding of two equivalents or two small particles that are diverse to each other due to the labile binding of the drug, which reduces hydrophilicity but increases subatomic weight. Is weak (Kiptoo et al., 2006).

Iontophoresis

Iontophoresis has been read for the transdermal transport of motoincrease for more than a century, generally by applying a constant current at low voltage (Banga et al., 1998; Kalia et al., 2004). Although skin permeability can be increased, iontophoresis provides the main electrical stimulus primarily for migration over the stratum corneum. Charged drugs migrate by electrophoresis, but lightly charged and uncharged mixtures do not contain fixed anions (such as keratin) in the stratum corneum but rather special polyvalent cations (such as Na +). It can be displaced by the electroosmotic flow of water produced by development 20. Since iontophoresis does not modify the skin itself, it is mainly suitable for small particles which transport energy and some macromolecules to thousands of daltons.

Non-Cavitational Ultrasound

Ultrasound was initially widely known as an enhancer of skin saturation when physicists discovered that using sonication tests to knead a sedative in the skin would increase its effectiveness. Machet et al., 2002; Wu et al., 2006). Ultrasound is a repetitive weight wave that people can also hear. While some have speculated that the angle and sway of body weight associated with ultrasound work as the main driving force that transfers the drug to the skin, the main effect is to disrupt the lipid structure of the stratum corneum, In this way, it creates the impression of increasing penetration. The effects of ultrasound without cavitation on the porosity of the skin are most often limited to improvements in less lipophilic mixtures. The use of increasingly strong non-cavitation ultrasounds is not directed towards the stratum corneum and is limited by the associated tissue warming which can damage other tissues. Under different conditions, ultrasound can be used similarly to create cavitation bubble effects with different effects.

Third-Generation Transdermal Conveyance Frameworks

The third era of transdermal transport frames is poised to have a huge effect on tranquilization, as it focuses on personal effects on the stratum corneum. This focus on allows a greater disruption of the soil of the excited layer, and therefore a viable progressive transdermal transport, while ensuring other tissues. In this regard, new compound enhancers, electroporation, cavitation ultrasound and even later micro-needles, hot removal and microdermabrasion (Arora, Prausnitz and Mitragotri, 2008) have emerged to transmit macromolecules, including useful proteins and immunizations. , on the skin. in human clinical preaching. These advances have been conceived to a limited extent by the development of innovations to limit impacts on the stratum corneum combined with the recognition that welfare managed by limitation should make these increasingly energetic methodologies satisfactorily satisfactory in terms of restoration.

Mixes of Substance Enhancers

Late research has recommended that reasonably structured mixtures of activators of substances can balance the trade-offs between improvement and discomfort, based on the theory that certain mixtures of activators are particularly strong when present in explicit pieces and boundaries. This methodology allows a technique to target the impacts that improve the penetrability of the skin in the stratum corneum, while avoiding disturbance in the deeper tissues where the organization of the details weakens or in any case changes.

Biochemical Enhancers

Recently, peptides have been inspected as improving skin porosity. In one methodology, the phage show was used to screen a peptide library, which yielded a corrosive peptide modified to 11 amino acids that extended transdermal insulin transport to diabetic rodents. Further examination suggested focusing on a pathway through the hair follicles. Work in one of our research facilities (Kim, Ludovice and Prausnitz, 2007) indicated that a characteristic pore-forming peptide, magainin, can be used to increase skin porosity through a proposed target system of disruption of lipid bilayer. the stratum corneum and not in the deeper tissues (Kim, Ludovice and Prausnitz, 2007). Magainin was a success when used in synergistic blend with a surfactant activator, which satisfied the dual need to expand skin penetration to the drug, as well as expand the infiltration of magainin into the excited layer. Using a medial approach, cyclosporine was covalently linked to a polarginine-heptamer peptide that enters cells, resulting in a broad topical ingestion that limited inflammation of the skin (Rothbard et al., 2000). In these models, deeply explicit bioactivity enhanced by peptide science may allow transport through targeted skin courses.

Electroporation

The use of high voltage short-circuit beats is remarkable as a technique for reversible disruption of cell layers for quality transfection and various applications. Electroporation also appears to disrupt the bilayer lipid structures of the skin (Denet et al., 2004; Li et al., 2008). Despite the fact that the electric field applied for milliseconds during electroporation provides a main electrophoretic traction, the dispersion through extended electropores can persist for hours, the ultimate goal being that the transdermal vehicle can be extended by size requests for drugs, peptides, small models, antibodies. and DNA. Recently, electroporation appeared to transmit a peptide model antibody to the skin of mice to produce a solid cytotoxic T lymphocyte reaction (Zhao et al., 2006).

Cavitational Ultrasound

Despite being hot, ultrasound is also known to cause cavitation, which is the rupture and occasional rupture of the air sac in the area of ultrasonic gravity. Cavitation is simply created under specific conditions (e.g., low-frequency ultrasound) that are different from ultrasonic heating or imaging devices. The open door for the delivery of transdermal drugs is that the cavitation vesicles concentrate the viability of the ultrasound, thereby allowing attention to be paid to the effect on air pocket activity (Ogura et al., 2008). The formation of blisters gradually becomes difficult and vibrates within the strongly pressed tissue, cavitation occurs, especially in the adhesive medium between the ultrasound transducer and the skin (e.g., hydrogel). The traditional component of cavitation ultrasound examination is that the air sac breaks down on the surface of the skin, creating limited waves and coordinated micro currents of fluid in the stratum corneum. (Palival et al., 2006).

Microneedles

A theoretically clear approach to the stratum corneum, especially the perimabilized, is to puncture it with very short needles. Over the past decade, micro-needles have been developed to deliver drugs through the skin through carelessness and disruption (Sivamani et al., 2007; Prausnitz et al., 2008). The rigid micro-needles seem to pierce the skin easily to deliver a porous solution that completely removes the porosity of the skin from a mixture of fine particles, proteins and nanoparticles. On the other hand, sedative details are coated or typed inside micro needles to allow peptides to reach the skin quickly and under control. Empty micro-needles were used to transport insulin and antibodies by suction.

Warm Elimination

Heat removal heats the surface of the skin, creating microscopic perforations in the corneal layer. Heating the skin surface from microseconds to milliseconds for a short period of time to several degrees limits the movement of heat to the skin surface

without allowing heat to build up in the subcutaneous tissue (Brahmson et al., 2003); Levin et al., 2005). This protects these tissues from pain or suffering.

Without thinking, hot removal can involve the rapid disintegration of water in the stratum corneum, and the ultimate goal is to remove micron-sized pits on the skin surface for subsequent volumetric development. Further research suggests that temperatures above the breaking point of water are necessary and that different treatments, such as tissue burns, may be needed (Park, Lee, Kim, and Prausnitz, 2008).

Microdermabrasion

The last method of removing the obstructed horny layer is to apply a microdermabrasion to the scratched spot or, on the other hand, mainly using sandpaper. Microdermabrasion is a strategy commonly used to modify and remove skin tissue for corrective purposes. This network system, which has little effect on sand, appears to have enhanced the effects of lidocaine and 5-fluorouracil, which can be used in the delivery of skin medications, including transdermal drugs (Park, Lee, Kim, and Prausnitz, 2008).

Skin transport of the vaccine was also stimulated by a fragmented patch of skin using Sandpaper Glenn et al., 2007). Animal introductory studies have shown strong reactions that have some immunosuppressive properties when highly regulated in a mixture of strong binders (e.g., heat-acting enterotoxin from Escherichia coli).

Transdermal flow and drug uptake capacity Skin: the largest organ: The skin is the largest organ of the human body occupying an area of about 2 m2. in addition, a 33% distribution of blood through the body (Jain et al., 2001). It prevents access to transdermal assimilation by various specialists in compounds and organics. It is one of the fastest penetrating organs of the body, its thickness is almost equal to a millimeter (2.97 0.28 mm),

- Separate the main circulation from the external one.
- Prevents physical, mixed and microbiological aggression.
- Acts as an internal regulator to ensure the internal heat level.
- Play the job in the pulse guide.

Percutaneous Absorption:

It must be passed through the cornea before using medicines that have a local or local effect. Skin retention is defined as the penetration of substances into different layers of the skin and the saturation of the skin as a fundamental distribution (Jain et al., 2002). The accumulation of harmful substances with drugs is particularly

important in the system of dermal administration, and drugs must be consumed at a satisfactory level and speed to achieve the same basic principles and to maintain them throughout the period of use. As a rule, when a sedated particle crosses the perimeter of the cornea, it divides into deeper layers of skin and is taken into the foundation, which is usually quick and effective (Mehta et al., 2004).

Pervasion Enhancers

The sum does not add to the penetration of the stratum corneum to arrive at a still higher grade is assigned in the expansion of medication make use of. And help to increase the porosity of the connecting parts of the stratum corneum.

Perfect Properties of Pervasion Enhancers-

Not poisonous, and the Annoying allergic.

For example, if it is made in the receptor, does not hold in that country round about, and do not I do not show pharmacological effects.

We must not be content with his own cosmetically skin feeling (Arti et al., 2013).

Weight Delicate Glue (PSA)

Complain about cement helps transdermal leather compel specific directions to the surface. Of course, without interest on the way. Old Polyacrylates, polyisobutylene and silicone adhesives are generally based on the TDDS.

Sponsorship Overlay

Sponsorship of coatings of material that is impermeable to drugs and strong satiety enhancers. Since many of the finished drug Enhancers, glue excipients different. Old vinyl, polyester, polyethylene and films.

Discharge Lining

Discharge bundle liner is a basic material can be used to provide for the amendment to the solid surface. The discharge line consists of a base layer, which is non-clogging (eg tissue paper), or clogging of time (for example, polyethylene, polyvinylchloride), and a discharge is not Teflon coating consisting of the silicone layer. Liner for the sake of porous, fulfill it and it would be useless synthetically sedatives, an inlet of the Enhancers of water.

Different Excipients like Plasticizers and Solvents

The solvents used are chloroform, methanol, CH3) 2CO and isopropanol dichloromethane. Dibutylmethalate use plasticizers, triethyl citrate, propylene glycol and polyethylene glycol.

Supply System

While these things are designed to arouse the interest of adequate reason, in the course of this drug tristique orci forth and laid hold of the power of grace in the midst of a lot. Drugs are discharged to rate microporous film. The drug is in the form of a response, suspension, or gel, or a strong polymer can be dusted on the grid in a storage cell.

Network System

The drug-adhesive frame to improve drug delivery to calmly calmed free polymer dispersed in the cement, and spreads them like a lighted torch, a non-soaked into the polymer cement or cement thanks impermeable layer (such as liquid softened Cements).

Lattice Scattering Framework

The scattering the lattice for this drug are hydrophilic and lipophilic uniformly dispersed in the polymer web. At this point, even to a point, that is bound to the polymer occlusive Prolyte baseplate which has room for about drug impedance.

Physicochemical Properties

The drug is not something solubility in both oil and water (rather than spoke more than 1 mg / ml).

In the liquefaction point of the substance should be below 200 ° F.

Retention agreements below 2.8, consectetuer

Low orbits weight (from 500 Dalton).

Natural features (Patel et al., 2011)

The drug is the most powerful, my understanding is that there was strong all day about the formula (perfect in the world below 25 mg / day).

There would be almost under the bow, on the demand of the basin but not in opposition to the mission of the transdermal matrix. That the drug can not state that it is able to make him irreversibly cancel it in the purple web. The drug can not be processed extensively in the skin 8 Limited useful windows.

Cement Considers

The manifestations of TDDS treatment may influence the nature of repair and contact between tissues. TDDS materials are obtained on the skin using PSA, which is found to be an appropriate level of adhesion to the balcony using heavy loads. The glue composition of TDDS can be explained by considering the following elements:

Strip Adhesion Properties

Tack Properties

Thumb tack test

Moving ball test

Snappy stick (Peel tack) test

Test tack test

Shear quality properties or creep opposition

Application and New Drug Application Submissions for Tdds

It needs to convert the mount and the element to the physical extension itself.

It controls the processing and use of toxicology requirements.

The Department of Immunology and the FDA should also monitor the body's use of IND and Drug Drug Administration (NDA).

Evaluation should be done carefully and the department organizes the assessment signal.

Examination of Transdermal Conveyance Frameworks

Despite more than 100 prescriptions describing ingredients such as creams and balms, there are ninety medications or mixtures that are administered using FDA-approved carbs. Many of these first-line plants are due to adherence to a prescription drug that swallows natural ingredients. Ideally, the progression from the second and the third phase to the translocation leads to the transdermal organization of the hydrophilic atom. he was so comfortable. The advantage of third-generation materials based on the assessment is that those who leave the large, small pieces that leave the building should be permanently stable, unless there is significant damage to living cells in the epidermis and dermis. . The report thus far suggests that this view is reasonable, mainly in the form of information from the variants of stage 1 disease progression and treatment promotion leading to Level 2, mainly study 3 ability to use microneedles and heating. This should not be a surprise given that the skin can be repaired without ulcers or infections when small bruises are constantly exposed to it, scalp, beard, hypodermic disease and other minor injuries. Not only is this combination of transdermal systems safe and efficient, but it is based on a transparent system that is less effortful and easier to use, because many transdermal systems are designed for processing. personal at home. The mixers can be customized with a reasonably small refrigerator that is well-suited to patients. Different tissue manufacturers can be a challenge to infect macromolecules, however vaccination is determined by a handheld device that requires light energy.

Because of this, the majority of active tissues are based on highly sensitive, recycled materials that have to be disseminated. Microneedles are a special case because they can carry macromolecules and antibiotics, and they must do anything to correct the loss that they do not need to source. In any case, microneedles are not really comfortable, which increases the safety and security of the rest.

Future Outlook and Conclusions

Looking to the future, it is almost certain that the first update will continue with the introduction of a few more atomic drugs and possible conditions, especially current medicine in oral administration and combined to break down from 'the patent. The two-year standardized medication should be regularly evaluated and used to describe in detail the dermatological acne and palliative care and basic procedures of the smallest drug. It is unlikely that the use of hydrophobic and macromolecular substances will be of minor consequence, since the optimal development and proliferation of the extracellular corneal group, results in the formation of other cells. Admittedly, the mix in three years is an exciting exercise and uses chemical engineering techniques to focus most on improving, as long as it stays true to the pace of growth. Two-year follow-up on the use of iontophoresis has been proven by medical professionals, especially fast and limited coverage for the skin. The power of electronics in the supply chain gives iontophoresis a unique property that can be used for misunderstandings as well, other mainstream media information. As far as possible, in view of iontophoresis it does not alter the skin barrier but it is shown far and wide to guide macromolecules or mobile antibodies, except when used in combination with various strategies to improve skin. skin. In this way, no ultrasound stimulant is known to have used it for transdermal delivery of the host material to treatment without indication, but it appears to be unfit to carry mixed results. . Three-year physical therapy using ultrasound and electromagnetic enhancement of transdermal media by disruption of corneum layers at nanometer size. There are recent ultrasounds that have been supported by transdermal administration of Coverocaine and may be validated for peptides and other small macromolecules. Despite the fact that ultrasound, the application of US ultrasound may be hindered by the need for advanced inks that build a pousseur at the nanometer scale and along these lines there may not be complete equipment with macromolecules and antibodies. Warm cold requires the development of a natural way to the surface of the corneum through the use of heat transfer; this technique has been used in the production of traditional medicine and to remove glucose. Insects that are now more and more open are opening the door to improving mechanical function, without seeing any harmful mosquitoes on the skin and inside. the larger the stone. A few needles are injected into the skin and antibiotics are inserted into the needle into the

affected area, using a crown with a large number of cells in addition to the skin, which has been released morphine from people using this technique. In the past decade, few combinations have advanced to synthetic and iontophoresis; carts and syntroporides; equipment and ultrasound; iontophoresis and ultrasound; electrical and iontophoresis; and electrical and mechanical components. TransPharma is at the heart of what our new platform offers across all existing treatments. These benefits may include good health and long-term use of antidepressants or improved survival and use of health care delivery programs, among others (Ubaidulla et al., 2007)

The ViaDerm platform can be used to deliver a combination of drugs for advanced applications in the field of dermatology and beauty care. The ViaDerm system can enable the injection, providing a convenient, safe and effective alternative to current intramuscular or subcutaneous injection methods. Altea Therapeutics is in the process of developing transdermal repairs to solve the major problem of ignoring e. Look at the different 'seasons' and offer better recovery options to deal with Parkinson's disease (Das et al., 2010)

It is widely used in chemicals for chemical distribution abroad. Their work could be altered by the repeal of a law that researchers have rejected along with the rapid development. While the drug has the right to be treated and treated, transdermal media is a great way to succeed. Due to the many ideas of TDDS, many new tests are still being conducted today against some of the new findings. With the gradual development of new and integrated drugs in the field of surgery without breaking the transdermal skin barrier, it has been transformed into the most well-known model of community medicine. This article provides important information on the analysis and evaluation of transdermal drug components in preparation of data for clinical studies with TDDS. Proving that TDDS has the only advantage, it has the option of using powerful hydrophobic and hydrophilic solutions for delivering reliable solutions.

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COVID-19 AND CHILDREN'S EDUCATION RIGHTS

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ABSTRACT

The Covid-19 pandemic has adversely affected the overall scenario of the world. The pandemic has devastating effect on global health, socio-economic conditions, and human rights. It has served impact on the children in their physical, social, cultural, mental, and psychological aspect. Mandatory closure of schools' and stay at home orders of the government has put children at the risk of exploitation even at their homes. The decision of shifting classroom from traditional to hybrid platform leads to learning inequalities. Although various initiatives have been taken by the government during pandemic to make use of online learning platform but because of sudden shift towards hybrid mode leads to learning disparities among children. All these causes have led to the violation of children's rights. As a result, the current article is an effort to investigate the influence of Covid-19 on children's educational rights during the Covid-19 epidemic.

Keywords: Acts, Children's Right, Covid-19, Digital Education.

INTRODUCTION

Human rights that are expressly tailored to a child's needs and overall development are known as children's rights. Every nation has distinct laws addressing children's rights in unique ways. In order to make laws or legal rules relevant to people who fall within the definition of "child," it is necessary to define what constitutes a "child." Varied legislation in India have varied definitions of Children. Some of them are:

The Plantations Labour Act, 1951 under section 2(c) defines "child a person who has not completed his fifteenth year". No youngster who has not finished his twelfth year should be permitted to labour in any plantation, according to Section 24 of the Plantation Act, which further divides young children into several age groups. Child is defined as a person who has not reached the age of fourteen under Section 2(ii) of the Child Labour (Protection and Regulation) Act of 1986. According to the 2006 Prohibition of Child Marriage Act, a child is someone who, if they are a man, has not reached the age of twenty-one and if they are a female, has not reached the age of eighteen. A child is defined as a person under the age of 18 under section 2(d) of the Protection of Children from Sexual Offences Act, 2012. According to the

Juvenile Justice (Care and Protection of Children) Act of 2015, a child is anybody under the age of 18.

The previously mentioned meanings led to the conclusion that since every legislation was created with certain goals and standards in mind, the term "child" was defined in a variety of ways to help achieve those goals. However, different meanings of "child" under Indian law led to uncertainty and confusion, thus it is crucial to provide a single, all-encompassing term. A child is therefore defined as "a human being below the age of 18 years" by the United Nations Convention on the Rights of the Child (UNCRC). Nearly all nations might use this definition.

United Nations Convention on the Rights of the Child

The UN General Assembly enacted the Declaration of the Rights of the Child (DRC) in 1959. It describes children's rights in 10 principles. However, this declaration was not signed by all the countries. The DRC laid the foundation for the Universal Declaration of Children's Rights also known as the United Nations Convention on the Rights of the Child (UNCRC). On November 20, 1989, the UN National Assembly adopted the UNCRC. This became the first internationally binding instrument which acknowledged all the fundamental/basic rights of the child. The UNCRC consists of 54 articles which include the social, economic, political, cultural, and civil rights of children. These rights are all interdependent and undividable by nature. The United Nations Convention on the Rights of the Child (commonly known as the UNCRC) is the most significant of all international legislation protecting children. The convention along with nations' Laws and constitutions determine the rights which children must have. However, human rights are applicable to all people, regardless of their age including children. As we all know, children need extra care and protection and they also need guidance therefore they also possess special rights. These special rights are called child rights and are laid under the UNCRC. India ratified the UNCRC in December 1992. The Government of India is obliged to implement or put in force the UNCRC's guidelines. The Government of India submitted its first report on the Convention of the Rights of the Child in February 1997. As of 2022, 196 countries have signed the UNCRC.

Constitutional Provisions for the Rights of the Children

The Constitution of India provides comprehensive provisions for the welfare of the society. It encompasses every section of the society including children, women, differently abled, senior citizens, and weaker section. The constitution provides the following provisions for the rights of the children:

Fundamental Rights (Article 14-32): These are basic rights enshrined in the Constitution which are guaranteed to all citizens of India. Article 14 provides that the state should provide equality before law which means everyone is equal in front of law i.e., men, women, children etc; Article 15 provides provision for Prohibition of Discrimination on grounds of class, caste, race, gender etc. The State may make specific measures for children and women in accordance with article 15(3), and article 19's right to freedom further protects six rights. Article 19(1) guarantees the right to freedom of speech and expression, with the understanding that children also have this right. Article 21 protects life and personal liberty, while article 21-A guarantees the right to education, i.e., free, and compulsory education for children aged 6 to 14 years. Article 24 guarantees the right to be protected from any dangerous occupation until the age of 14, while Article 23 forbids the trafficking of human beings and the use of forced labour, including child slavery.

Directive Principles of the State Policy: Although Directive Principles of the State Policy (DPSP) are not enforceable by law but it provides effective guidelines for the state and central government for making relevant laws. It comprises of articles from 33-51. DPSP guidelines for children are included in article 39(e) & 39 (f) which guarantees that children and young people will be safeguarded from moral and material desertion, as well as the right to be protected from being harmed and compelled by economic need. Additionally, article 45 guarantees all children the right to early care and education until the age of six, and Article 46 commands the state to advance the interests of children from the lower sections of society.

Fundamental Duties:

Article 51 of the constitution directs the State to follow the international laws and treaties that have been ratified by the government while formulating the policies and laws.

Legislations for Protecting the Child Rights in India:

- The first step pertaining to child rights in India was the Apprentice Act, 1850. This act did not create a separate juvenile justice system rather it worked within the adult justice system. In India, it was the Reformatories Schools Act of 1897 which separated children from adults in the criminal justice system.
- Children's Act of 1960
- The Juvenile Justice Act, 1986: The Juvenile Justice (Care and Protection of Children) Act, 2000 amended in 2006 and 2011. Further the Juvenile Justice (Care and Protection of Children) Bill, 2014.
- Child Labour (Prohibition and Regulation) Act, 1986: Child Labour (Prohibition and Regulation) Amendment Bill, 2012

- Ban on Corporal Punishment, 2000
- Enactment of Commission for Protection of Child Rights Act, 2005
- The Prohibition of Child Marriage Act, 2006
- The Right to Education Act, 2009
- The Protection of Children from Sexual Offences Act, 2012
- National Policy for Children, 2013
- National early Childhood Care and Education (ECCE) Policy, 2013

Impact of Covid 19 on Education

The COVID-19 pandemic, which started as a problem with health governance, eventually developed into an enormous political, economic, and social calamity. The pandemic brutally impacted public governance systems and crippled economies all over the World in an unprecedented manner. Although COVID-19 affected each country in a similar fashion, the way different countries are handling the crisis widely differs owing to factors such as population, economic development, health infrastructure, and awareness among people, etc. Government of India handled the crisis quite impressively by imposing national lockdown in a swift manner. Bringing a burgeoning economy such as India to a halt is not an easy task. There were consequences. Keeping an absolute number of people out of work for months in the name of lockdown did not seem to be working economically. Political factors also added fuel to the fire. The Government of India had to ease the lockdown in a phased manner at a time when the number of positive cases is on a sharp rise.

The COVID 19 pandemic has shut down schools, colleges, and disrupted learning. Most of the schools and colleges started shifted towards online education or digital education. But this sudden shift of online learning has raised several concerns such as issue of accessibility, health impact on students due to prolonged exposure to the screens of laptop and smartphone etc. So, in order to address these problem/concern and establish a set of standard guidelines for digital education. The ministry of Education has come out with the PRAGYATA guidelines for digital education. These guidelines have been formulated by the NCERT and they are only advisory in nature. The schools and colleges are encouraged to be abiding by them. But since education and online learning are comes or falls under the domain of state government, the state government has been given the flexibility to customise the guidelines and build upon the guidelines prescribed by NCERT based on local needs and demands. The PRAGYATA guidelines comprises of various steps for digital and online education. It also facilitates guidelines for school heads, Teachers,

Students and Parents to ensure the physical and mental wellness of children during the pandemic.

Education is another critical sector that is affected by slow internet speeds during the Pandemic. Students are the ultimate victims as they were restricted to their homes to ensure safety. As schools, colleges and universities are shut down, education has become online. Both teachers and students were forced into unchartered waters of online classes in which neither of the parties are comfortable. Digital Divide is one big challenge as not all students are having access to digital resources in terms of possession, knowledge, and use. Routine office administration to be carried out by teachers suffered and lead to enormous wastage of time while uploading or downloading files and other important documents. Due to slows internet speed, it takes so much time for both teachers and students to join classes, once joined, video quality gets blurred, audio clarity gets indistinct and constant leaving and joining of students make the online classes a formality and render teachers frustrated. For students, these issues are both impediments and excuses. Over a period, they lose their interest and take online classes flippantly. There were instances where students travelled distances to get to online for fulfilling a variety of educational purposes like attending online classes, giving interviews, downloading material, and filing applications. Those students who somehow managed to get too online were affected by poor internet speeds.

Concerns & Issues in Digital Education

A student needs two essential tools in order to access digital education: first, a communication device such a laptop, desktop computer, or smartphone, and second, a high-speed internet connection. But every student may not have access to these resources thus creating unequal access to education. Ever since the pandemic broke out and ever since the school shifted to online domain experts have pointed out that the unequal access to technology among students will promote inequality in education. This major concern has been considered by NCERT and the MHRD and the issue of unequal access to technology has been considered in the PRGYATA guidelines. This concern has been given highest priority under the PRAGYATA guidelines and it recognizes that within the same class students might have different levels of access to these devices but their access to internet might be limited. Whereas in rural areas few other students might have access to just a television with DTH or cable connection or they might just have radio or basic phone connection and we cannot ignore the fact that few students may not have any kind of access to any communication devices and they might be completely cutoff from the internet. So, this unequal access to technology among the students of the same class is the result of the economic status of the student's families and the result of their remote

location. But these factors should never be allowed to hindrance to learning and it should never be allowed to created inequalities in education. So, the PRAGYATA guidelines takes these factors into account and recommends that every school should conduct a survey to determine the kind of digital infrastructure that can be access by students and teachers and then decide upon the mode of teaching based on the survey. The PRAGYATA guidelines points out that the school should not assume that the synchronous communication is the only available mode of teaching.

Apart from this, schools have also been advised to make students aware of various threats that they might face in the cyber domain including instances of cyberbullying. So, these guidelines are very much needed to address the concern that has been raised due to the sudden shift towards online learning and it is expected to help the standardized digital education.

Impact of Covid 19 on Children's Education

The international rights of children to education have been significantly impacted by the COVID-19 epidemic.

School Closures: As part of lockdown procedures, numerous nations closed schools to stop the virus's spread. These closures interfered with the education of millions of children, which may have had long-term effects such as learning loss.

Unfair Access to Remote Learning: The move to remote learning brought attention to the digital divide and the disparities in access to technology and internet connection. Many students, particularly those from underprivileged origins or rural regions, lacked the resources required to fully engage in online education, aggravating already-existing educational disparities.

Learning Loss: For many pupils, there was a major learning loss because of extended school closures and interrupted learning settings. Academic achievement was negatively impacted by the loss of in-person teaching and decreased social connection, particularly for younger children who depend on interactive and hands-on learning experiences.

Children's mental health and well-being have been negatively impacted by the pandemic and its related disruptions. Children who were denied access to mental health treatments and a safe social environment as a result of school closures had a rise in worry, tension, and feelings of loneliness.

Increased Dropout Rates: The pandemic's effects on families' finances, along with the difficulties of distant learning, led to a rise in dropout rates. Many kids, especially those from disadvantaged backgrounds, had to drop out of school to help support their families or were unable to return to school after lengthy absences.

Child Protection: When schools are closed, the likelihood of child abuse, exploitation, and labour is enhanced. Many vulnerable youngsters faced increased dangers to their safety and well-being in the absence of a safe environment of schools and teachers.

CONCLUSION

It is crucial for governments, communities, and international organizations to prioritize the recovery of children's education rights in the aftermath of the pandemic. Efforts should focus on addressing learning gaps, bridging the digital divide, ensuring equitable access to quality education, providing mental health support, and promoting child protection.

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INDUSTRIAL IMPURITIES CONTAMINATION IN MUSI RIVER GROUND WATER AREA IN HYDERABAD ZONE

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ABSTRACT

Water an essential requirement for the world, the need of saving water when natural resources are available. Present study focuses on the river MUSI which is started from Anathagiri hills and finally connect with river Krishna after travelling nearly 256 KM in state of Telangana state, India. Urbanization and industrialization factors in growing capital Hyderabad changes the natural flow phenomenon of river Musi when it compared with a century back word, around 1925 to 1932 most of the people depends on lakes for drinking water like himayathsagar, usmansagar and some more. On behalf of development taken place in capital of state, water requirements are highly appreciable. But true factors showing that Musi River being polluted from past 2 to 3 decades rapidly, studies needed to rectify the heavy metal additions which are health hazardous includes sewage, chemical industrial dump. The paper focused on the level of impurities with causes and need of purification.

Keywords: Musi River, factors for pollution, Sewage, Chemical dump

I. INTRODUCTION

River Krishna having so many tributaries, in one of the major is river MUSI [1]. The river starts from Ananthagiri [2] Hills, Rangareddy District area of Vikarabad and flows through the Hyderabad, finally mix with river Krishna at vadapalle in Nalgonda district, a far distance of 40km from Nagarjunasagar dam. A total area of 256 km in Telangana covered by Musi giving drinking water to capital Hyderabad[3] but after crossing Hyderabad, most of the hard metals and industrial impurities added to river Musi, a name converted from original name of Muchukunda [4], a saint lived in anatha hills worship with lord Krishna. Many of the banks covered in Hyderabad [5] the riverbed becoming polluted by the sewage, chemicals, pharmacy industries in capital mixed with rain water and river water. By the bottom of the riverbed the water used for the agricultural [6] and encroachments, some areas at the end they are using for vegetable crops and leaf vegetable crops grown on regular basis [7]. A medium irrigation project at aleruNalgonda district near suryapet was built in 1963 nearly 216km from the origin of Musi.Ground water reservoirs for drinking water since 1591[8], Hyderabad mostly depends on the ground water tanks namely Hussainsagar [9] and Mir Alam Tank [10] were built in

1575 and 1806, these two polluted heavily by the sewage mixes. There are two ground water reservoirs namely Osman sagar and Himayathsagar [11] supplying 205,000m3 per day.

because of urbanization these suppy increased drastically from 1965 to 1982. A dam named Manjira a part of Krishna River supplying water to capital Hyderabad [12]. Government declared the drinking water after treatment TDS < 300 mg/L, the water should not be contaminated at any level, for that the ground water should be organized in a proper way to reduce impurities and heavy metals after treatment [13]

II. SOURCE OF POLLUTION

The growing of urbanization and industrializations are main cause of city and Musi pollution, as per the government census the population studied for 2001, 2011and estimated present are 3,637,483,[14] 6,809,970 more than 1,12,00,000 respectively. The migrations are more than 24% from rest of India and 87% from local areas which are 100% addition in each decade. Due to this an addition of industrialization taken place to fulfil the needs of urban people, this causes pollution rate and sewage waste to Musi and the river become highly polluted when compared with the past five decades. Since the rapid growth of the city in the 1980‟s, River Musi flows continuously which resulted in the year-roundcultivation of rice and green leafy vegetables in the downstream that was confined to the months following the monsoon season in the past [15]. Due to exponential populace explode inside the remaining five a long time, the river bed and the bounds of lakes are encroachments and a few are disappearing and the population and their unorganized offerings together with electroplating, leather tanning, engineering, oil extraction and commercial processing are heavily polluting the tanks, lakes and River Musi.As a result the river bearing ability to float appreciably reduced 12 months after yr inflicting surprising floods in lots of regions in the metropolis frequently even for a touch rain. The boom of the city with availability of vacant land, educational establishments and extraordinarily knowledgeable professional humans are main chemical processing industries to the want of pharmaceutical requirements, formulations and heavy engineering products.

2.1 Hydrogeochemistry of Ground Water:

The pH estimations of groundwater of study territory somewhere in the range of 6.7 and 7.3 with a normal estimation of 6.97, demonstrates the marginally acidic nature of water tests. Electrical conductivity and all out broke up solids in certain examples are surpasses as far as possible by WHO (2004) conductivity esteems fluctuated from 2,150 to 1,400 µs/cm. the most extreme cutoff points of EC in drinking water is depicted as 1,500 µs/cm according to WHO standard. The most extreme incentive in GW – 1 example was recorded, 3,460 µs/cm. The TDS worth range from 1305 to

2214 μs/cm The TDS esteems all are fall in blackish stage (based on saltiness order). The mean convergence of cations is organization Ca2+>Mg2+>Na+>K+ while for anion it is NO3->Cl->SO42->HCO3-. Sodium fluctuated from 100 to 250 mg/l with a normal worth 176.25 mg/l, Potassium shifted from 40 to 100 mg/l with a normal worth 70.5 mg/l, Magnesium particle focus changed from 25 to 385 mg/l with a normal worth 162.08 mg/l, the attractive estimation of Mg2+ for 50 mg/l, about 80% of tests surpass the alluring as far as possible. Calcium focus changed from 28 to 390 mg/l, with a normal value137.5 mg/l. as far as possible for Ca2+ for drinking water is 75 mg/l, 40% of groundwater tests from the examination territory are inside passable points of confinement according to WHO (2004) standard. The Carbonate substance is nil, whereas Bicarbonate run between 45 mg/l to 111 mg/l, Chloride particle fixation changed from 145 to 889 mg/l, the attractive furthest reaches of Cl- for drinking water is determined as 200 mg/l, and 90% of tests surpass as far as possible according to WHO (2004). Sulfate happens normally in water because of draining from gypsum and other regular minerals. The sulfate substance changes fundamentally with time during invasion of precipitation and ground water. The centralization of sulphate is probably going to respond with human organs if the worth surpasses the most extreme admissible farthest point of 400 mg/l and cause a purgative impact on human framework with the overabundance magnesium in groundwater. Notwithstanding, the sulphate fixation shifted somewhere in the range of 50 and 200 mg/l with a normal estimation of 108.3 mg/l and found inside the most extreme suitable point of confinement in all example areas according to WHO detail.

2.2 Need of Research

The downward percolating water is not inactive, and it is enriched in CO2. It can likewise go about as a solid enduring operator separated from general arrangement impact. Therefore, the substance synthesis of ground water will fluctuate contingent on a few variables like recurrence of downpour, which will drain out the salts, time of remain of downpour water in the root zone and halfway zone, nearness of natural issue and so forth. It might likewise be called attention to that the waterfront doesn't move in a uniform way as the dirt strata are commonly very heterogeneous. The development of permeating water through bigger pores is considerably quicker than through the better pores. An essential explanation behind this is all Three significant wellsprings of contamination (industry, horticulture and residential) are focused along the streams. Enterprises and urban communities have truly been situated along streams on the grounds that the waterways give transportation and have generally been an advantageous spot to release squander. Horticultural exercises have would in general be thought close to waterways, since stream floodplains are outstandingly

ripe because of the numerous supplements that are stored in the dirt when the waterway floods.

III. RIVER WATER QUALITY & ENVIRONMENTAL FACTORS

There are three significant normal wellsprings of broke up and solvent issue conveyed by waterways: the environmental contributions of material, the corruption of earthbound natural issue and the enduring of surface rocks. These substances by and large travel through soil and permeable rocks lastly arrive at the streams. On their way, they are influenced by various procedures, for example, reusing in earthbound biota, reusing and capacity in soils, trade among broke down and particulate issue, loss of unpredictable substances to the climate, generation, and debasement of sea-going plants inside streams and lakes and so forth. Because of these various sources and pathways, the convergences of components and mixes found in streams rely upon physical variables (atmosphere, alleviation), compound elements (solvency of minerals) and organic elements (take-up by vegetation, corruption by microbes).

IV. URBANIZATION IN HYDERABAD WITH INDUSTRIAL GROWTH EFFECTS ON RIVER WATER OF MUSI

Hyderabad was built up along the banks of Musi River, which now never again exist because of urban infringement and direct arrival of urban waste into this water body (Van Rooijen et al., 2005). Hyderabad has 6,809,970 occupants and spread along the banks of the Musi River. It has a metropolitan populace of 7.75 million, which is the fourth most crowded city and 6th most crowded urban agglomeration in India (Census of India, 2011a). In the worldwide positioning for 2025, it will be at 31st spot with populace of 11.6 million because of high populace development rate (United Nations, 2012). Like some other urban agglomeration in India, Hyderabad is additionally encountering a fast increment in populace. From 1.09 million of every 1950, the urban populace has now contacted the characteristic of 7.75 million out of 2011. The accompanying chart in Figure 3.2 shows the urban populace development since 1950 and anticipated up to 2025 in the United Nations report "World Urbanization Prospects-The 2011 Revision" (United Nations, 2012)

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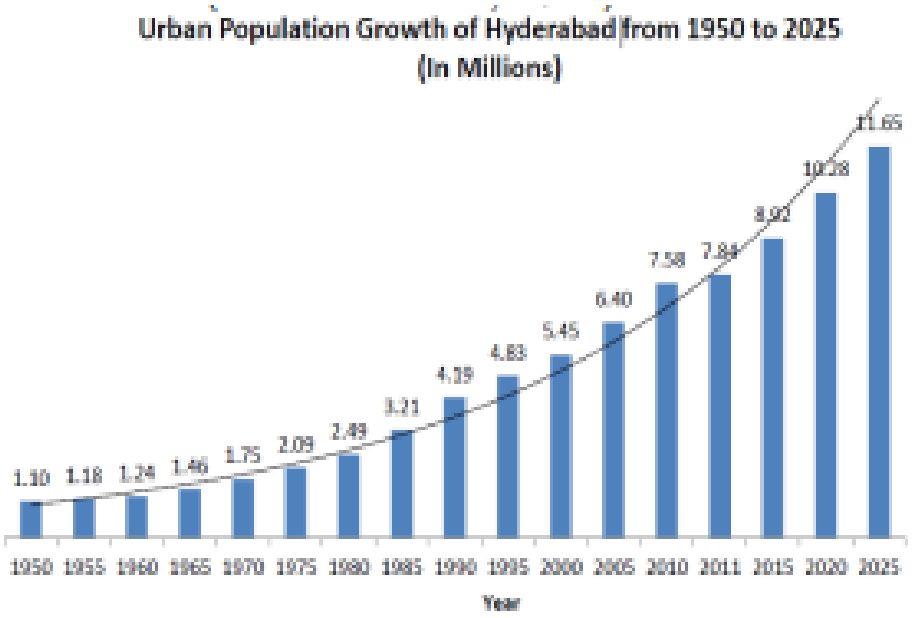

V. AREA CONSIDERED FOR WORK

The ground water samples are collected from the area which is contaminated with industrial effluents. Since the last decade, Hyderabad, the capital of Telangana, Southern province of India, has turned into a center point for pharmaceutical enterprises. The ground water has been seriously tainted with the effluents discharged from these businesses. Bollaram (17033l13.46llN, 78021l14.64ll E), Patancheru(17031l41.70llN, 78016l32.1ll E) and Isnapur (17032l33.56ll N, 78010l49.46ll E) are the three significant rural areas of Hyderabad; where about in excess of 300 businesses are found. These ventures incorporate mass medications, pesticides, pharmaceuticals, plastics, earthenware production and paints. The ground water in these regions is exceptionally polluted with the organics discharged from these businesses.

Table: List of Initial Characteristics of the studied samples in industrial zones

S.No	parameters	BOLLARAM	ISNAPUR	PATANCHERU
1	pH	7.54	6.92	5.72
2	Electrical Conductivity	2.11	2.43	3.94
3	Total Dissolved Solids	3530	5160	1970
4	Total Hardness	940	2000	2100
5	Calcium Hardness	600	1125	1000
6	Ca	240	450	400
7	Non-carbonate	580	1540	1795
8	Hardness	360	460	305
9	Alkalinity	974.87	1435.72	1152.1
10	Chlorides	241.52	134.28	251.76
11	Sulphates	54.93	27.67	7.017
12	Nitrates	156.9	120.3	141.2
13	Sodium	5.8	1.0	4.1
14	Potassium	0.66	1.22	1.40
15	Fluorides	0.98	2.24	4.69
16	Fe	0.047	5.01	0.045
17	Zn	0.47	0.02	0.3
18	Ni	0.015	0.11	0.01
19	Ba	229.75	245.9	38.35
20	Ca	0.02	0.006	0.03
21	Co	0.01	0.01	0.01
22	Cr	0.05	0.001	0.01
23	Cu	0.007	3.09	2.7
24	Mn	0.08	0.07	0.02
25	Pb	120	140	80

Table: Verification of heavy metal zones in water of MUSI near industrial zones

Heavy metal	Summer	Monsoon	Winter	Mean
Iron (mg L-1)	0.073	0.075	0.076	0.075
Zinc (mg L-1)	0.050	0.046	0.050	0.049
Copper(mg L-1)	0.045	0.046	0.068	0.053
Manganese(mgL-1)	0.07	0.031	0.023	0.042
Nickel (mg L-1)	0.051	0.041	0.036	0.042
Chromium(mgL-1)	0.054	0.030	0.037	0.040
Cobalt (mg L-1)	0.008	0.005	0.008	0.007

5.1conninvestigations of Substantial Metal Fixations Were Led Along and Over the Musi

Investigations of substantial metal fixations were led along and over the Musi River bowl from Amberpet Bridge (station M1) to Nallachervu (station M12), including 2 km on either side of the waterway. Topographically the Musi bowl is secured by rocks of archean age and intercalated with quartz veins to a great extent and is at a height of 500 m above mean. Huge numbers of the modern domains are situated in the foreshore regions of the lakes. Consistent release of untreated mechanical

effluents into the water bodies has transformed them into 'poisonous lakes' practically without any life. 12 Some of the significant waterways/streams contaminated by the mechanical effluents are Bollaram, Isakavagu, Nakkavagu, and Manjeera (upstream of Nakkavagu conversion). Because of leakage and invasion from these dirtied water bodies/channels and other waste dumps, the groundwater and drinking water sources in the zone are profoundly contaminated. These regions are straightforwardly or in a roundabout way contaminating the stream MUSI. ocean level (M1) and 470 MSL (M12). The area of the Musi River stretches alongside the 12 examining locales (M1–M2) is appeared in Figure 1. The examination territory comprises of roughly 23.33 km2 under private use, 4.95 km2 with estates and gathered land, and 18.12 km2 land with clean.

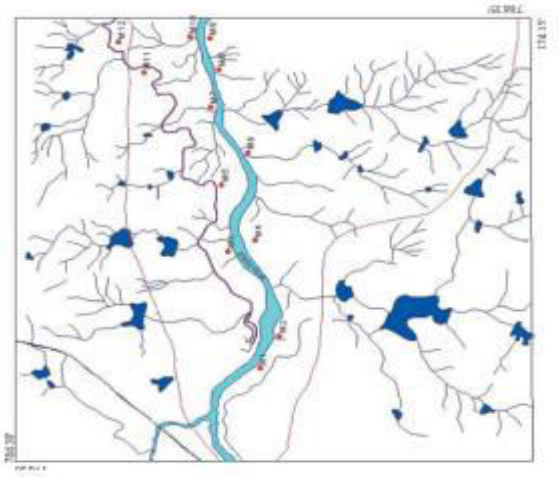

Figure 1: shows the connectivity of water canals to MUSI river.

Table shows the Environmental quality criteria for soils compared with Musi soils(µg/g).

					Musi soil values	
					Background values[@]	Concentrations from our study area
Zn	200	250	1–100	6.5–13	26–60	227–401
Cr	8	8	0.03–14	2.7–8.5	1.4–2.5	26–38
Cu	150	100	5–20	1.8–5.7	12–30	21–35
Ni	60	80	0.02–5.2	0.9–2.3	10–20	33–63
Co	40	40	5–20	6.5–13	4–10	12–19
Pb	200	300	5–15	11–23	15–25	303–637
As	10	20	0.2–10	0.002–0.01	0.3–0.8	0.08–0.14
Hg	0.8	2	0.05–5	0.005–0.01	0.03–0.2	0.03–0.06
Cd	3	5	0.25–15	0.01–0.08	0.04–0.5	0.12–1.12

[$]: Ashwatharayana (1999); [#]: Alloway (1990); Mc Bride (1994); [@]: Venkateshwarlu (1981); Venkateshwarulu and Kumar (1982); Syamala (1999); Stephanie (2002).

Figure2 shows industrial waste mix up to canal connectivity MUSI

VI. CONCLUSION

The pH of surface and groundwater ranged between 6.9–7.7 throughout near MUSI. The overwhelming metal focuses were low and well inside the allowable furthest reaches of the water system water quality, affirming discoveries of prior examinations. For every one of the metals there exist a few presentation pathways that rely upon the specific debased media of air, water, soil, and nourishment and on the receptor populace (Caussy et al. 2003). Nourishment is a significant pathway for a few metals, especially in populaces devouring provincially defiled nourishments. This would be valid for individuals expending vegetables or grains developed on soils polluted with metals. The analytical data shows most of the water samples were contain heavy metal concentration below permissible limit and nickel concentration is above permissible limit in groundwater as per prescribed by BIS and WHO. But this examination accentuates the requirement for ordinary groundwater quality observing to survey contamination action occasionally, for conversing with proper administration measure to alleviate the force of contamination action. Thus, to keep groundwater free from excess level of Fe, Mn, Zn, Cu, Ni etc and other ions the following recommendation should be considered. A much-needed researches required to check the additional information for corrective actions on the banks of Musiriver.

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PHARMACEUTICAL COCRYSTALS – A PATENTABLE COMPOSITION: WHAT PATENT LAW SAYS

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ABSTRACT

The major topic of this review study involves the connection between particular scientific, legal, and regulatory elements of pharmaceutical crystal forms. By referring to current scientific advancements in this area, the article provides an examination of pharmaceutical cocrystals as patentable inventions. The following few potential business benefits of pharmaceutical cocrystals and the other recent court rulings concerning important problems are compiled. The essay offers a perspective on the potential effects of cocrystallization on the landscape of pharmaceutical intellectual property.

Keywords: Pharmaceutical cocrystal, Solid form, Intellectual property, Patent

INTRODUCTION

Certain crystals are known to cohabit as supramolecular synthons. There have been several modifications since the first cocrystal urea with NaCl was discovered in 1773. [1] The first cocrystal of benzoquinone and hydroquinone (also known as quinhydrone) with a 1:1 ratio was produced in 1844. Quinhydrone electrodes were later developed to gauge the amount of hydrogen ions present in an acidic solution. Few investigations on the characteristics of the cocrystals were published as the interest in comprehending the chemistry of cocrystallization somehow faded. When viable supramolecular synthons like Depakote for epilepsy (1983), Calcit for infantile apnoea (1993), Lexapro (2002), and others received FDA approval, the prospective uses for the construction of pharmaceutical cocrystals once again revived the topic of cocrystallization.

The pharmaceutical industry has been prompted by the success and acceptance of supramolecular cocrystals in the medical, material science, and pharmaceutical fields to seek patent protection for such novel supramolecular crystals before obtaining FDA approval for their introduction in the disease management sector. At that point, the pharmaceutical industry began to focus on developing more cocrystals of APIs and other synthons for the patient care product market rather than only polymorphs, metabolites, prodrugs, isomers, etc.

Cocrystals as Inventions

Like the claimed subject matter of any patent application, a pharmaceutical cocrystal must be novel, useful, and nonobvious to be awarded a patent. [2-4] A cocrystal is a distinct solid-state material with, in general, a unique and unpredictable structure and physical property profile. A broad definition of cocrystals, "crystalline molecular complexes", encompasses hydrates and solvates: pharmaceutical crystal forms with a proven record of patentability. Similarly, cocrystals in which the API is complex with the other types of counter molecules should also qualify as patentable inventions. Evaluating certain features that make cocrystals generally patentable helps reveal the importance of ongoing research into this emerging class of pharmaceutical crystal forms

Novelty

Cocrystallization offers an alternative to pharmaceutical salt production for solid-state alterations of APIs; in this way, it performs a similar purpose. [5] Cocrystals should satisfy the novelty criteria in the same way that salts do because they are innovative and distinctive solid-state structures.

The Importance of Pharmaceutical Cocrystal Patents

As with patents on new molecular entities, patents on pharmaceutical cocrystals may be important to the pharmaceutical industry in a number of key respects.

Commercial Advantages

Soon after realizing an API's medicinal value, a research organization typically submits a patent application covering its chemical structure to prevent another organization from independently filing on the same molecule. As a result, claims pertaining to an API's chemical composition frequently serve as the main basis for a patent's protection of a marketed pharmaceutical product. However, in some circumstances, further patent protection might be acquired by patenting brand-new solid forms of the API that were found while it was being developed.

Cocrystal Patentability: Indian Perspective

A new chemical entity, solid form, or formulation, as well as manufacturing procedures (for example, a chemical synthesis pathway), are typical subject matters that are eligible for pharmaceutical patents in India. Even techniques of use or specific second medical indications are permitted in some patent jurisdictions. A real invention may be patented under Indian patent law. [6] The evergreening of a patent is not supported by the Indian patent system. Therefore, under Section 3(d) of the Patents Act, neither the novel use nor the new form of a known substance may be considered patentable. To the extent that their properties are not dramatically different, they include salts, esters, ethers, polymorphs, metabolites, pure forms,

particle sizes, isomers, mixes of isomers, complexes, combinations, and other derivatives of recognized substances. Cocrystals are new compounds that can readily pass the novelty test under Section 2(1)(j) when we examine how they are formed. Since it is not evident how to successfully obtain the cocrystals in practice, the obviousness barrier is not a concern. Even with the use of conventional cocrystallization techniques, getting cocrystals suitable for pharmaceutical applications is a time-consuming and difficult operation. Cocrystals, in contrast to other types of solid forms, have distinct scientific benefits that make them patentable and give them access to regulatory advantages, new intellectual property opportunities, and intellectual property problems.

Position in the United States of America and the European Union

In the US and Europe, numerous patents for cocrystals suitable for use in pharmaceuticals have been approved[7-9]. As an illustration, take the cocrystal of (carba)cephalosporins and parabens (US 60001996). [10] Itraconazole cocrystals with a carboxylic acid (US 7446107), AZD1152 cocrystals with a phosphate prodrug and maleic acid (US 7625910), SGLT-2 inhibitor cocrystals with l-proline (US 8097592), and so forth. Cocrystals are covered by several European patents, including (EP1755388B1) for mixed cocrystals of modafinil, (EP2185546B1) for cocrystals and telaprevir (VX-950), and (EP2334687B1) for SGLT-2 inhibitors, l-proline, and pyroglutamic acid. Celecoxib with nicotinamide cocrystals (EP1608339B1), among others. Similarly, a large number of patent applications for Drug-Drug Cocrystals are pending. Examples include Quercetin-metformin (antioxidant and antidiabetic); Metformin-oleoyl ethanolamide (antidiabetic and anti-obesity); and Mesalamine with alpha-amino acids, flavones, and nutraceuticals (anti-inflammatory).

Meeting the Criteria for Patentability

[6] The main question raised by the patent application for cocrystals is whether the chosen molecules will pair together to create a cocrystal within a crystal lattice as opposed to crystallizing separately as the physical mixture itself. If such occurs, an objection would be a difficult hurdle to clear under Section 3(d). [11] In certain circumstances, the applicant may investigate any therapeutic synergy of the combination. whether cocrystals meet the criteria for patent eligibility or not. Much will rely on how the applicant responds to each individual objection the examiner raises. However, the petitioner needs to provide evidence for that.

(1) Cocrystallization of a particular pair or more of molecular components in a specific cocrystal structure.

(2) Primary intermolecular interactions, such as hydrogen-bond motifs,

(3) Overall packing arrangements, and are all formed.

Observing Forward

In addition to looking beyond polymorphs, hydrates, salts, and amorphous solids, chemical informatics may aid in the search for pharmaceutically acceptable cocrystals. It is noteworthy that numerous pharmaceutically acceptable cocrystals have received approval from drug regulatory agencies. Drug-drug cocrystals can also form when two physiologically active compounds come together. For instance, a cocrystal between the antiviral medications zidovudine and lamivudine, both of which are effective against HIVF, has been documented. It is noteworthy that Indian researchers from the Institute of Life Sciences at the University of Hyderabad have submitted a patent application (WO Patent 2009136408A4) for medicinal cocrystals. [12,13] The goal of creating multidrug cocrystals is to create appropriate combination medicines to stop multi-drug resistance, and find therapeutic combinations that work well together or to lessen negative effects. [14] The cocrystallization of an active pharmaceutical ingredient (API) with another molecule can result in a solid form with different physical properties compared to other classes of solid forms, as evidenced by a flurry of research reports that show how cocrystallization can produce an API with different physical properties.

[6] The Indian examiner is not opposed to granting a patent on cocrystals, at least as far as the Indian Patent Office is concerned. Prima facies co-crystals meet the criteria for a patent to be granted. The current state of medical engineering in the pharmaceutical industry will be impacted by the new drug cocrystals. It goes without saying that Drug-Drug cocrystallization also gives generic producers a chance to create brand-new, pharmaceutically acceptable crystals in order to obtain patent protection for already-marketed compounds or to avoid being subject to existing patents on similar molecules. To acquire a patent on pharmaceutically approved cocrystals, expert guidance would be helpful.

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MORPHOLOGICAL AND CRYSTALLOGRAPHIC ASPECTS OF BIOGENIC CALCIUM OXALATES AND THE USE OF BIOPOLYMERS TO MIMIC THEM

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ABSTRACT

With respect to the principles of biomineralization, it is of interest to study the crystallization of calcium oxalates under various experimental conditions. Calcium oxalates play decisive roles as biominerals in plants and as pathological "urinary/kidney stones" in vertebrates. Calcium oxalate exists in three different hydration states; calcium oxalate monohydrate (COM, monoclinic, a = 6.290(1)Å, b = 14.583(1)Å, c = 10.116(1)Å, β = 109.46°, $P2_1/c$), calcium oxalate dihydrate (COD, tetragonal, $a = b$ = 12.371(3)Å, c = 7.357(2)Å, $\alpha = \beta = \gamma$ = 90°, $I4/m$) and calcium oxalate trihydrate (COT, triclinic, a = 6.11(1)Å, b = 7.167(2)Å, c = 8.457(2)Å, α = 76.5(2)°, β = 70.35(2)°, γ = 70.62(2)°, $P\bar{1}$). Monoclinic COM and tetragonal COD are the most common phyto-crystals and the main constituents of kidney and urinary stones. The occurrence of calcium oxalates in plants represents a useful biogenesis (protection against herbivores) unlike the devastating occurrence in renal tubules. In order to understand the pathological biomineralization of uroliths, it is necessary grow calcium oxalates comparable in morphology under similar growth conditions. The formation of calcium oxalate stones within a gelatinous state of proteins, polysaccharides, lipids and other biomacromolecules under a flow of supersaturated urine supports the fact that an "organic" gel model can simulate the process of urinary stone formation under *in vitro* conditions.

In nature, calcium oxalate exists in three different hydration states: the monoclinic calcium oxalate monohydrate (COM, $CaC_2O_4 \cdot H_2O$, whewellite), which is thermodynamically the most stable phase at room temperature, the tetragonal calcium oxalate dihydrate (COD, $CaC_2O_4 \cdot (2+x)H_2O$; $x \leq 0.5$, weddellite) and the triclinic calcium oxalate trihydrate (COT, $CaC_2O_4 \cdot (3-x)H_2O$; $x < 0.5$, caoxite).

The generally accepted crystal structure analysis of COM was performed by Tazzoli and Domeneghetti [1,2] (JCPDS database entry 75-1313). Accordingly, COM relates to the prismatic class of the monoclinic system; there is one symmetry plane and the second-order axis (b) is perpendicular to the symmetry plane. The elementary cell has the symmetry space group $P2_1/c$ with the parameters a =

6.290(1) Å, b = 14.583(1) Å, c = 10.116(1) Å, β = 109.46°, Z = 8, V = 876.228 Å^3. The unit cell and the calcium coordination polyhedron are shown in figure 1 (A,B).

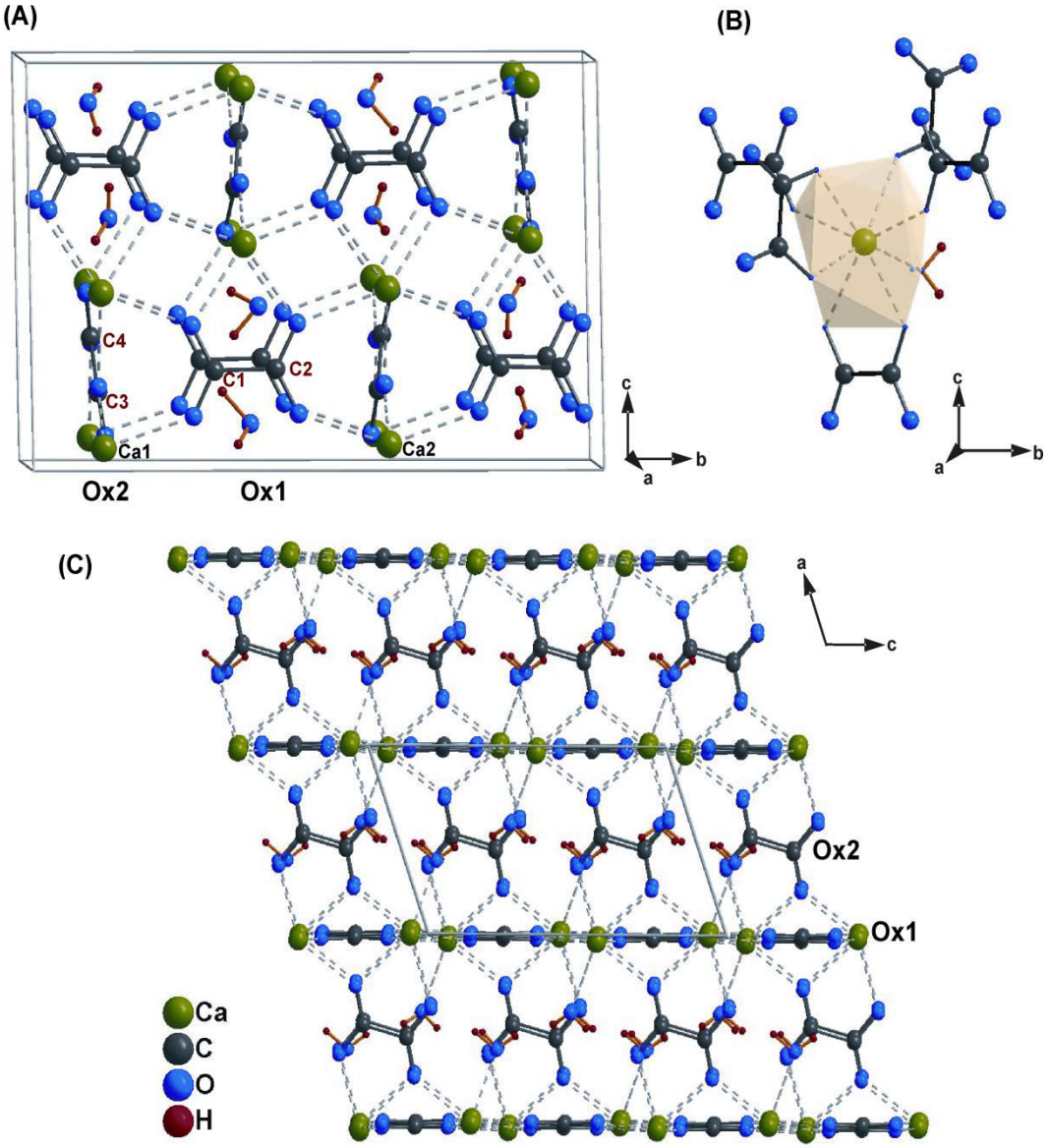

Fig. 1: Crystal structure of COM: (A) unit cell of COM, (B) CaO8 polyhedron, (C) stacking of Ca together with Ox groups along [100].

The coordination polyhedra of the pseudo-equivalent atoms Ca1 and Ca2 are distorted square antiprisms with each Ca ion coordinated by eight oxygen atoms. Two oxalate ions are two-fold coordinating to calcium where as three oxalate ions act as monodentate ligands (Fig. 1 B). The eighth oxygen atom is from a water molecule. Each Ca polyhedron shares three edges with three adjacent Ca polyhedra. In this way, polyhedral layers are formed running parallel to (100). There are crystallographically two non-equivalent oxalate ions, Ox1 and Ox2 which are in two

different structural environments: Ox1 is in a planar coordination by six calcium ions and Ox2 is surrounded by four calcium ions and two additional water molecules are connected *via* hydrogen bonds to the oxygen atoms of Ox2 . Ox1 units are disposed parallel to the (100) plane with the C1-C2 bonds nearly parallel to the *b* -axis (Fig. 1. A). Ox2 units alternate with water molecules and form ribbons lying in the (010) plane running along *c*. The Ca-Ox1 layers are connected to one another through Ox2 and the water molecules (Fig. 1. C). In other words, the crystal structure of COM contains layers consisting of Ca together with Ox1 (layer1) and of Ox2 (layer2), respectively, which are stacked along [100].

Rarely known is that COM presents three polymorphs. One of them is obtained only by the dehydration of the dihydrate form of calcium oxalate at 118 °C [3]. It has orthorhombic symmetry with lattice parameters, a = 12.088(9) Å, b = 10.112(7) Å, c = 14.634(12) Å, $\alpha = \beta = \gamma = 90$ ° and the space groups $A2_1am$, $Ama2$ or $Amam$ are reported to be possible, whereby only $Amam$ has a centre of symmetry like the space group of the parent weddellite structure.

The other two phases transform reversibly in the temperature range 38 to 45 └C. Both have monoclinic structures and are designated as basic/high temperature (HT) structure (stability range *ca.* 45 to 152 └C) and the derivative/low temperature (LT) structure (stability range *ca.* 20 to 45 └C) according to Deganello [4-6]. The transition from the HT to the LT form takes place upon ordering below 45 └C. The HT form possesses a unit cell with *b* -parameter one half of that of the LT form (Table 1).

This space group setting and the accompanying unit cell choice differs from those proposed by Tazzoli and Domeneghetti ($P2_1/c$, a = 6.290(1) Å, b = 14.583(1) Å, c = 10.116(1) Å, β = 109.46 °, Z = 8) [1]. The crystal structures of both collected at room temperature are identical. Tazzoli and Domeneghetti [1] report the space group of whewellite as $P2_1/c$, actually the same space group (C_{2h}^5) as $P2_1/n$ but with a different choice of axes.

Table 1: Unit cell parameters for the HT and the LT structures of whewellite

Whewellite	***a*** **(Å)**	***b*** **(Å)**	***c*** **(Å)**	***β*** **(°)**	**Space group**	***Z***
Basic structure (HT)	9.978(1)	7.295(1)	6.291(1)	107.04(2)	$I2/m$	4
Derivative structure (LT)	9.9763(3)	14.5884(4)	6.2913(3)	107.03(2)	$P2_1/n$	8

For both LT and HT forms [4-6], like the Tazzoli structure [1], there are two sets of crystallographically non-equivalent oxalate groups which are in a nearly perfect orthogonal orientation to one another, Ox1 and Ox2. Both the oxalate groups together with Ca layer along the [-101] direction (Fig. 2 A,B).

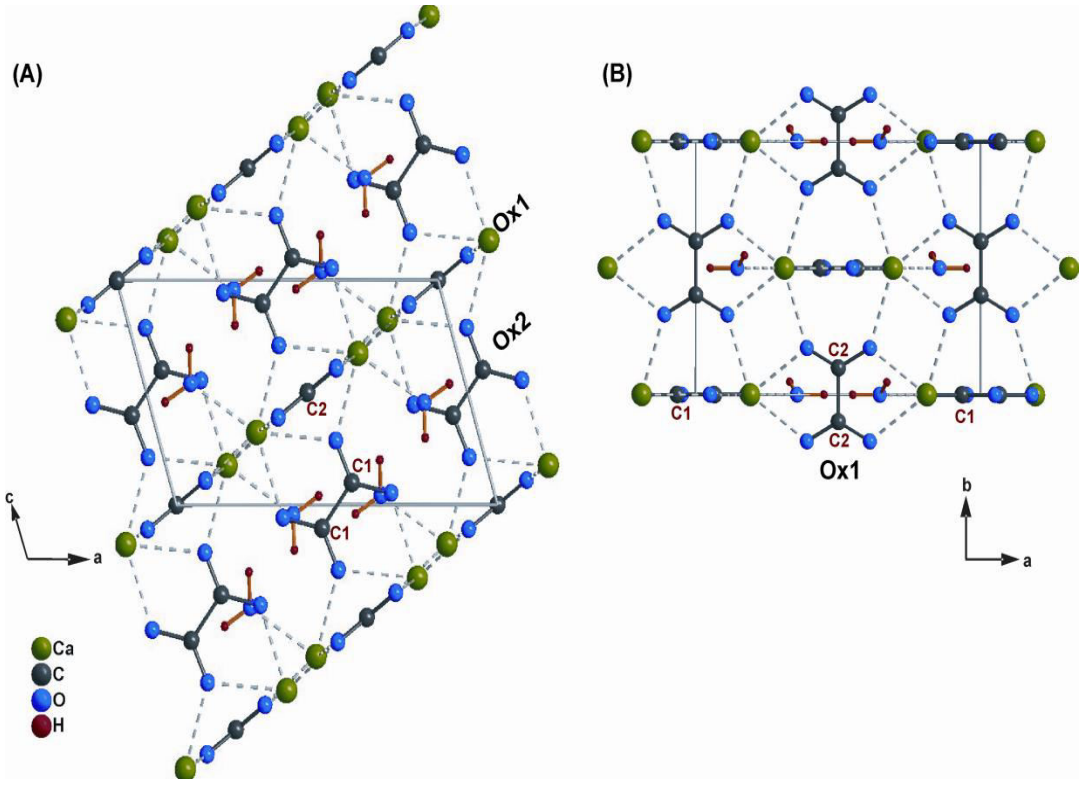

Fig. 2: The crystal structure of COM according to Deganello [4]. (A) The stacking of Ca together with Ox groups along [-101]. (B) The crystallographic projection along [001].

Both the LT- and HT-forms are identical with respect to the ion coordination as well. The main difference concerns Ox1. A comparison of the oxalate groups is depicted in figure 3. In the LT form, Ox1 ions suffer a slight distortion of bond angles (a few tenths of a degree) and bond distances (differences lower than 0.01 Å) (Fig. 3).

At the same time, they get slightly off the (-101) crystal plane and are no longer coplanar. In this way, they lose the 2/*m* local symmetry and the dimensions of the *b*-axis are doubled. Whereas for the HT form, the space group is *I*2/*m* (C_{2h}^3) and Ox2 is bisected by a mirror plane normal to the C-C bond which is located along the unique monoclinic axis. At the same time Ox1 is located on the mirror plane and the C-C bond is bisected by a two-fold crystallographic axis (Fig. 2 B). This results in identical C-O distances and planarity of Ox1 (Fig. 2).

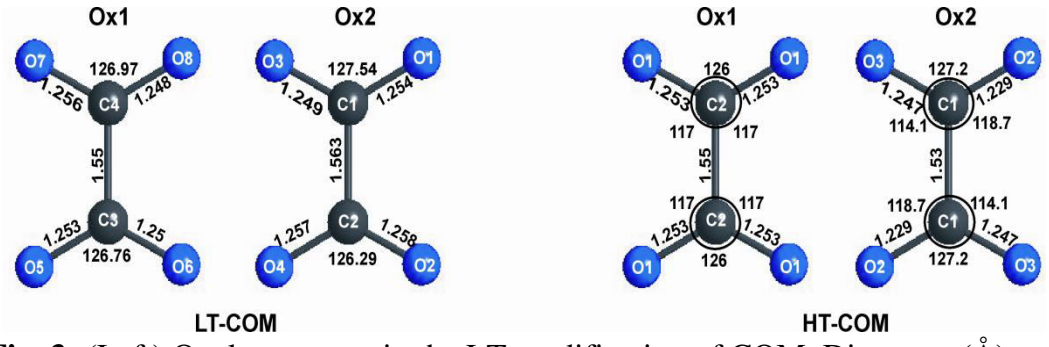

Fig. 3: (Left) Oxalate groups in the LT modification of COM. Distances (Å) and angles (°) have average e.s.d.'s of 0.004 Å and 0.4°. (Right) Oxalate groups in the HT modification of COM. Distances (Å) and angles (°) have average e.s.d.'s of 0.008 Å and 0.6° [4,6].

It is well known that twins and intergrowths of twins, rather than single crystals, are more frequently seen in both natural and synthetic COM [7]. Twinned crystals are described as *contact twins* if a definite composition plane is present; *penetration twins* if two or more parts of a crystal appear to interpenetrate each other, the surface between the parts being indefinable and irregular. Single crystals of COM exhibit monoclinic prismatic habit (also called polyhedral habit) bound by (100), (010), (021) and (12-1) faces (Fig. 4 A). Twinned crystals of COM show two types of twinning morphologies as shown in figures 4 B and 4 C. They are often classified by crystallographers as penetration and contact twins respectively, even though they do not appear to be so [7-9]. In both the twins, the twin planes are (100). COM crystals grown from high ionic strength media are six-sided platelets bound by (100), (010) and (121) faces (mostly called in literatures as elongated hexagonal, even though the crystal system is monoclinic). It is known that in contact with the mother liquor for adequate time, plate-like crystals gradually transform into typical COM polyhedral crystals (Fig. 4 A) or elongated multiple twins with acute edges at the ends [8].

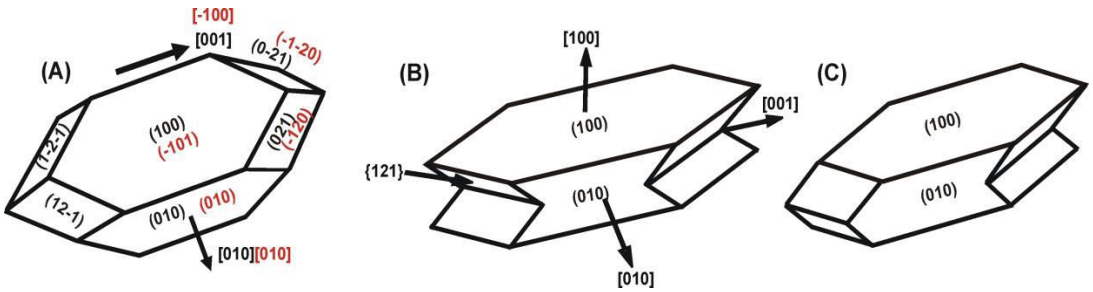

Fig. 4: (A) The crystal faces developed and major crystallographic directions indicated for a COM single crystal of six-sided polyhedral habit. Twinned crystals of COM which are often classified as penetration twin (B) and contact twin (C) [7-9]. Indexing with black letters corresponds to Tazzoli's notation and with red to Deganello's notation [8].

Calcium oxalate dihydrate (COD) belongs to the tetragonal crystal system with the unit cell parameters, $a = b = 12.371(3)$ Å, $c = 7.357(2)$ Å, $\alpha = \beta = \gamma = 90°$, $Z = 8$, $V = 1125.937$ Å^3 and space group $I4/m$ [1,12,13]. Clearly, eight water molecules are coordinated with the four Ca ions so forming a dihydrate $CaC_2O_4 \cdot 2H_2O$ (Fig. 5 A,B).

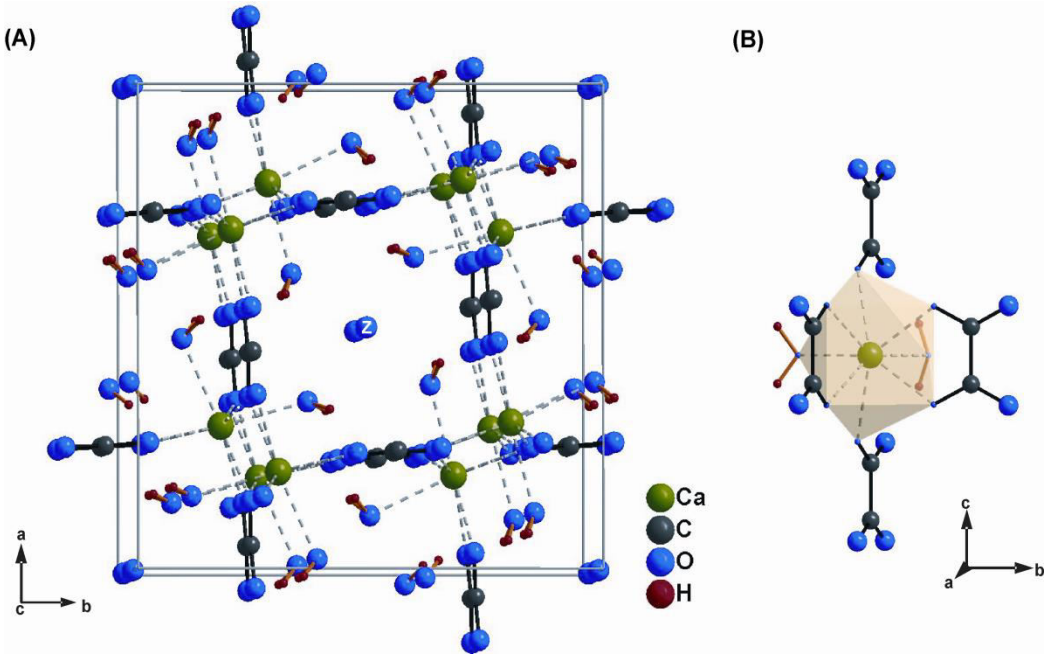

Fig. 5. The crystal structure of COD viewed along [001] (A) and the coordination polyhedron around Ca (B).

The Ca ion is coordinated by eight oxygen atoms from two water molecules and four oxalate ions. The coordination polyhedron around Ca is a distorted square anti prism and forms an open space/channel in the centre of the structure running along the four-fold axis, in which the zeolitic water (denoted as z in Fig. 5 A) molecules are placed. The maximum water content of 2.5 H_2O, described with split positions was confirmed by Tazzoli and Domeneghetti [1].

COD crystals grown from aqueous solutions are generally tetragonal bipyramids with dominant (101) faces and tetragonal prisms with (100) prism faces and (101) pyramidal faces (Fig. 6) [9-10].

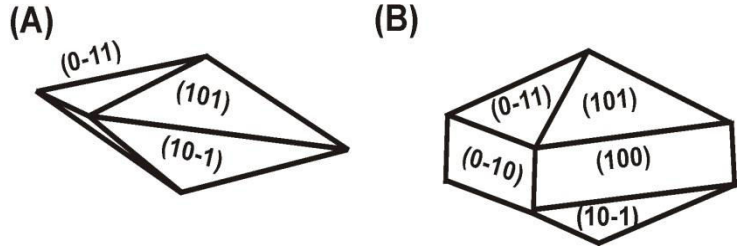

Fig. 6*:* Crystal habits of COD. Tetragonal bipyramid (A) and tetragonal prism (B).

Calcium oxalate trihydrate (COT) crystallizes in the triclinic crystal system ($P\bar{1}$, a = 6.11(1) Å, b = 7.167(2) Å, c = 8.457(2) Å, α = 76.5(2) °, β = 70.35(2) °, γ = 70.62(2) °, Z = 2, V = 325.9(2) Å^3) [2,14,15]. In COT, three of the eight Ca-coordinating oxygen atoms belong to water molecules, four are from two oxalate ions and one oxygen is from a third oxalate ion (Fig. 7 A,B). Generally, COT crystallizes in triclinic prismatic or in parallelogram-like platy morphology (Fig. 7 C) [9-11,16].

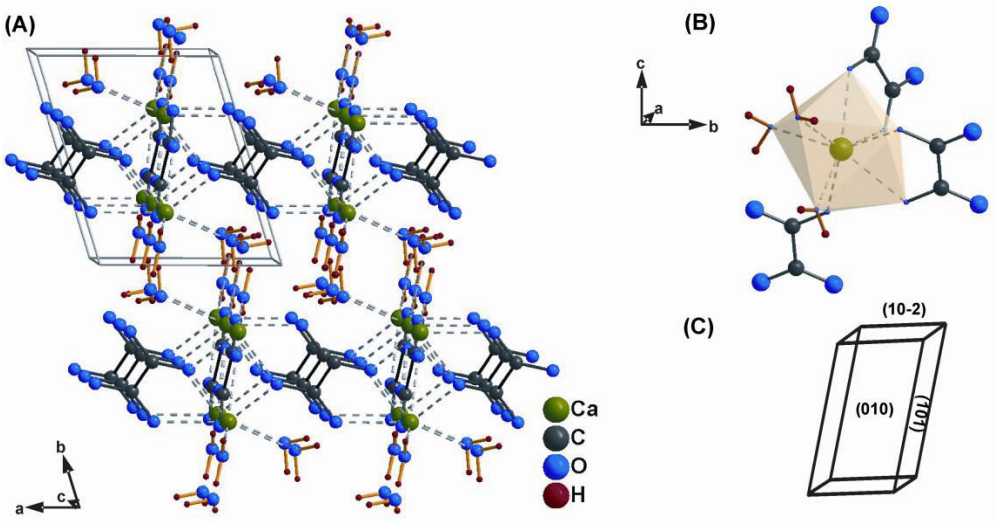

Fig. 7: Crystal structure of COT (A) and the Ca coordination polyhedron (B). Triclinic prismatic habit of COT grown from aqueous solution (C).

Monoclinic COM and tetragonal COD are the most common phyto-crystals and the main constituents of kidney and urinary stones. Even though the triclinic COT is rarely found in kidney stones, it is assumed to be a precursor of COD [17,18].

The occurrence of calcium oxalates in plants represents a relatively harmless biogenesis unlike the devastating occurrence in renal tubules. Vascular plants accumulate crystals of calcium oxalate in a striking range of shapes, sizes, amounts and spatial locations. Both the morphology and distribution of calcium oxalate crystals within plants exhibit 'species-specific' patterns, indicating that their development is genetically controlled.

The morphologies of calcium oxalates in plants are classified into five categories as: druses (spherical aggregates with many facets radiating from a central core, Fig. 8 a), raphides (needle-like crystals formed in bundles, Fig. 8 b), styloids (acicular crystals (needle-like) that form singly, Fig. 8 c), crystal sands (small tetrahedral crystals formed in clusters, Fig. 8 d) and prismatic crystals (regular or twinned prismatic shape, Fig. 8 e). These crystals are important in calcium regulation, defence against grazers, detoxification, ion balance, tissue support/plant rigidity and even light gathering and reflection [19,20].

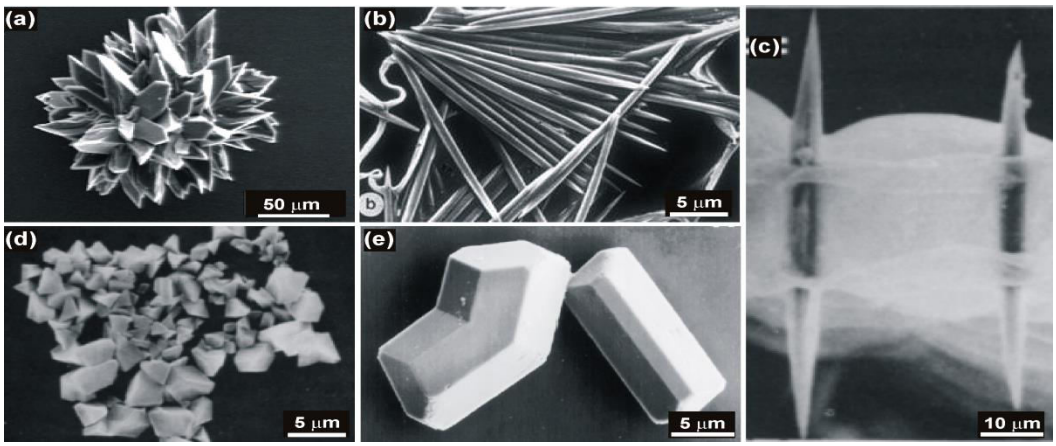

Fig. 8: (a) COM druse crystal isolated from the cactus *Opuntia auranthiaca*, (b) COM raphides from a ruptured *Pistia* idioblast, (c) Two styloid COM crystals from *Eichhornia*, (d) crystal sand (COM) from *Nicotiana glauca*, (e) prismatic COM crystals from the seed coat of bean.

Kidney stones like their salubrious counterparts always contain a macromolecular matrix distributed throughout the structure which is a complex stew of proteins, lipids, glycosaminoglycans, polysaccharides and cellular debris [21-24]. The identified macromolecules in urinary stones are listed in table 2. The organic matrix is an inevitable and integral part of the stones, meandering throughout the entire structure and occupying far more space than would be expected from its contribution of only 2-3% to the total mass. The scheme for the formation of calculi is demonstrated in figure 9. COD is more likely prevalent in voided urine where as the stones found in the kidney are mainly COM. This is due to the reduced capacity of COD to form stable aggregates and strongly attach to renal epithelial cells [21].

Table 2: Macromolecules so-far detected and identified in urinary stones [24].

Proteins	Albumin, α−1−microglobulin, α−1−acidglycoprotein, α and γ globulins, α−1−antitrypsin, Apolipoprotein A1, β-2-microglobulin, Calprotectin, Haemoglobin, Inter-α-Inhibitor, Nephrocalcin, Neutrophil elastase, Osteopontin (Uropontin), Porin, Renal lithostatin, Retinol binding protein, Superoxide dismutase, Tamm-Horsfall Protein, Transferin
Glycosaminoglycans	Heparan sulfate, Hyaluronic acid
Lipids	Phospholipids, Cholesterol, Glycolipids
Small molecules	Pyrophosphate

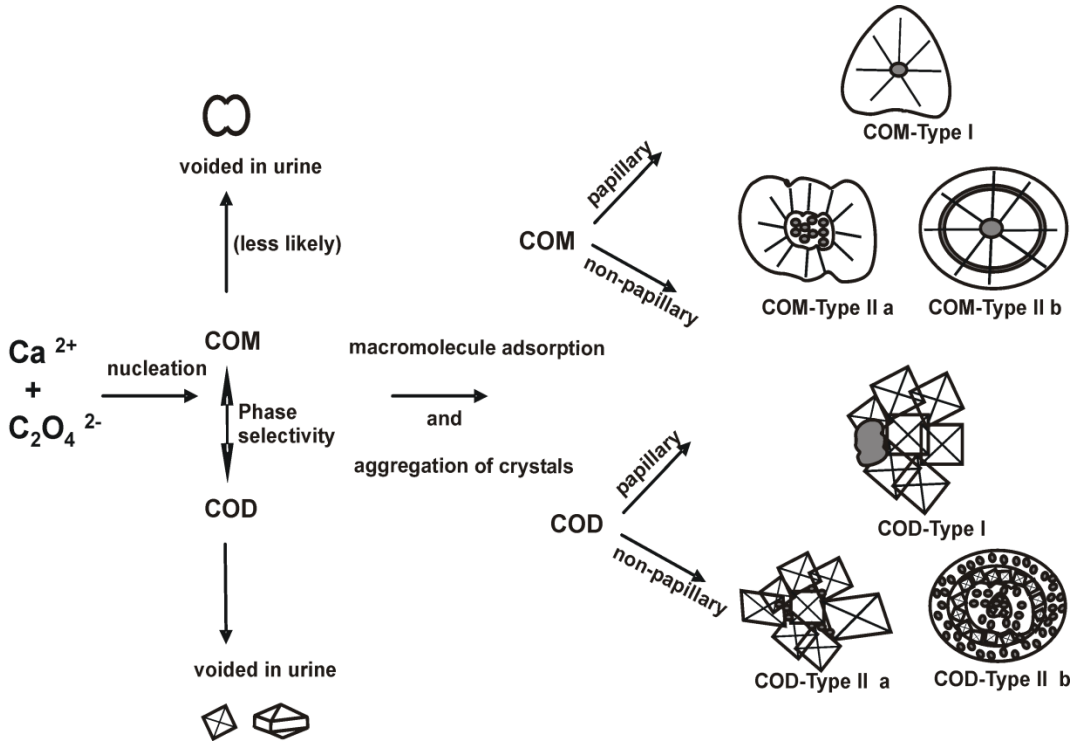

Fig. 9: Pathway for the formation of COM and COD calculi. The crystals which are not voided through urine are aggregated through the adsorption of macromolecules and grow into larger aggregates. The morphology of COM and COD calculi are generally classified as type I (papillary) and type II (non-papillary). The regions shaded with grey colour are either organic matter or hydroxyapatite or a minor fraction of COM. For further details refer to the text.

COM calculi are classified into two groups: (Type I) papillary calculi and (Type II) non-papillary calculi (Fig. 9). Type I calculi have conical appearance and appear attached to the renal papillae. It contains a core, a radially striated intermediate layer and a concentrically laminated peripheral layer. The core may consist of inter grown COM crystals or organic matter or hydroxyapatite. The outer region of the core is covered with a layer of organic material on which the columnar juxtaposed sheet-like crystals grow perpendicular to the core surface. The concentric laminations are formed by the interruption of the columnar crystals by the accumulation of organic matter.

Type II COM calculi are typically spherical and are formed in the renal calyx. They are classified into two groups; IIa and IIb. The IIa type calculi contain no core but contain a number of cavities irregularly distributed over the stone interior which may enclose small spheres of hydroxyapatite. The IIb calculi contain a core made up of organic matter (alone or mixed with hydroxyapatite or COM) and a shell of columnar COM crystals emerging from the core. Such calculi are spherical with

radial striations and concentric lamination [25-27]. The type IIb calculi is relevant to the present study.

COD calculi are also divided into type I (papillary calculi) and type II (non-papillary calculi). Type I COD calculi are large aggregates of COD crystals formed on a very small COM papillary calculus or on a hydroxyapatite papillary deposit. Type II COD calculi are further classified into IIa and IIb calculi. Type IIa calculi consist of COD crystals with variable amount of COM or hydroxyapatite irregularly distributed. Type IIb calculi also may contain variable amounts of COM and characterised by alternative layers of COD crystals and hydroxyapatite combined with organic matter. COM found in COD calculi is demonstrated to have formed by the transformation of COD into thermodynamically stable COM. The causes of COD calculi include high Ca^{2+} to oxalate ratios, high ionic strength and existence of urinary pH values superior to six.

Calcium oxalate crystals are also observed in neutral and alkaline urine, where COM forms oval or dumbbell shaped [28] crystals and COD forms tetragonal crystals (Fig. 9). Excessive amount of dumbbell shaped monohydrate form is also observed in the case of ethylene glycol (anti-freeze) poisoning [29]. The dumbbells are formed by the stacking of plate-like COM crystallites with flat (100) faces on one above the other (Fig. 10 a) [25,30,31].

In general, COM stones are formed by the aggregation of micro crystals to form various morphologies ranging from dumbbells to spherulites (Fig. 10 a,b). The agglomeration of COM crystals is recognized as an important step in renal stone development [30]. The organic matter embedded within the stones promotes aggregation and crystal attachment to cells by acting as an adhesive [21]. It has been reported that a combination of primary agglomeration of crystals forming stones and the nucleation of new crystals on a (glyco-) muco-protein layer partially covering their surface constitutes the possible mechanism of stone development [26,27].

The surface of spherical COM calculi (Fig. 10 c) often exhibit stacks of microscopic plate-like COM crystals under higher magnification [25,28-32] (Fig. 10 d,e). This indicates that the peripheral layer of such stones is composed of stacking of smaller crystals with flat (100) faces. Such plate-like arrangement of the crystals also account for the radial striation of the spherulitic stones. The macromolecules are situated between the COM crystal plates in a sandwich arrangement (Fig. 10 f-bottom) in contrast to that grown from aqueous solutions (Fig. 10 f-top) [25].

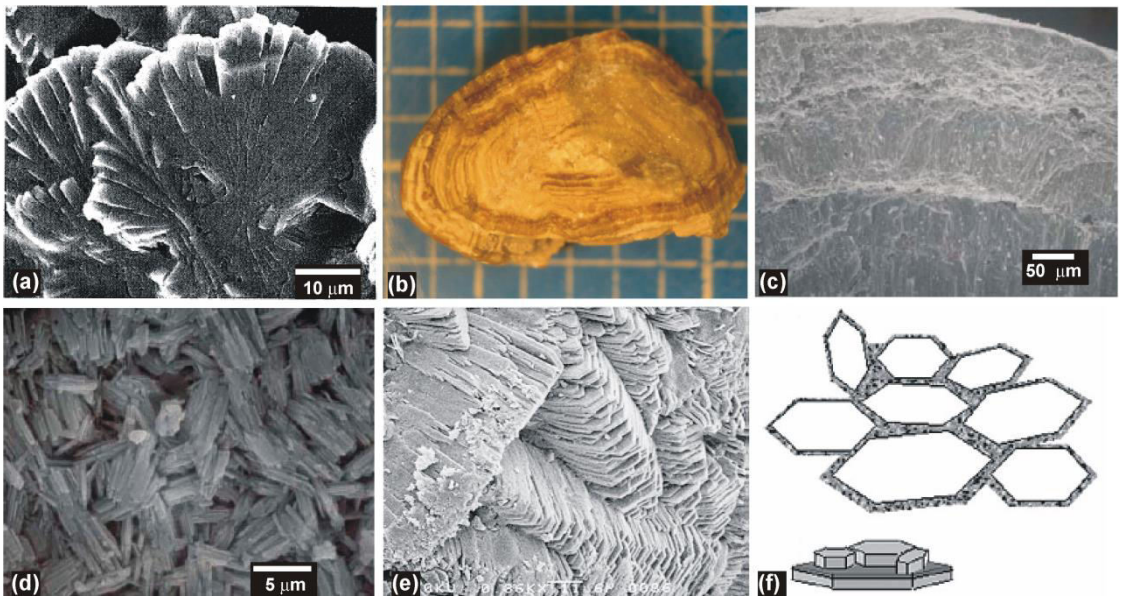

Fig. 10. (a) COM stone with dumbbell /fan-like morphology [28]. (b) Cross-section of a COM spherulitic stone representing concentric laminations [21], (c) fractured surface of COM stone showing radial striation and concentric lamination. Concentric lamination arises due to outward growth of the stone. Radial striation is due to the arrangement of plate-like COM crystals [25]. (d,e) The surface of a COM stone exhibiting the edges of the plate-like crystals. These crystals are stacked by contacts between their (100) faces [21,25]. (f) Mode of aggregation of COM in aqueous solutions (top) and in renal calculi (bottom) [25]. In renal calculi, the aggregation occurs by stacking on the (100) crystal faces.

The dumbbell and spherulitic morphologies of biogenic calcium oxalates suggest that the crystallization phenomenon of spherulites which is discussed as a consequence of rapid crystallization in a highly viscous medium is relevant to this system. Moreover, it has been opined that the formation of stones in gel-like media of macromolecules by the flow of supersaturated urine, is one of the probable causes for the spherulitic growth [17,27]. The spherulitic structure represents a fundamental form of crystallization in viscous media. It is common in nature and frequently associated with biomineralization. True spherulites are polycrystalline aggregates consisting of radially arranged micro crystallites forming an approximate sphere [33,34].

Biomimetic Morphogenesis: Self-Assembly or Self-Organization

Generally, the morphologies of inorganic crystals are categorised as self-assembly or self-organization depending on the degree of the driving force for the crystallization (Fig. 11).

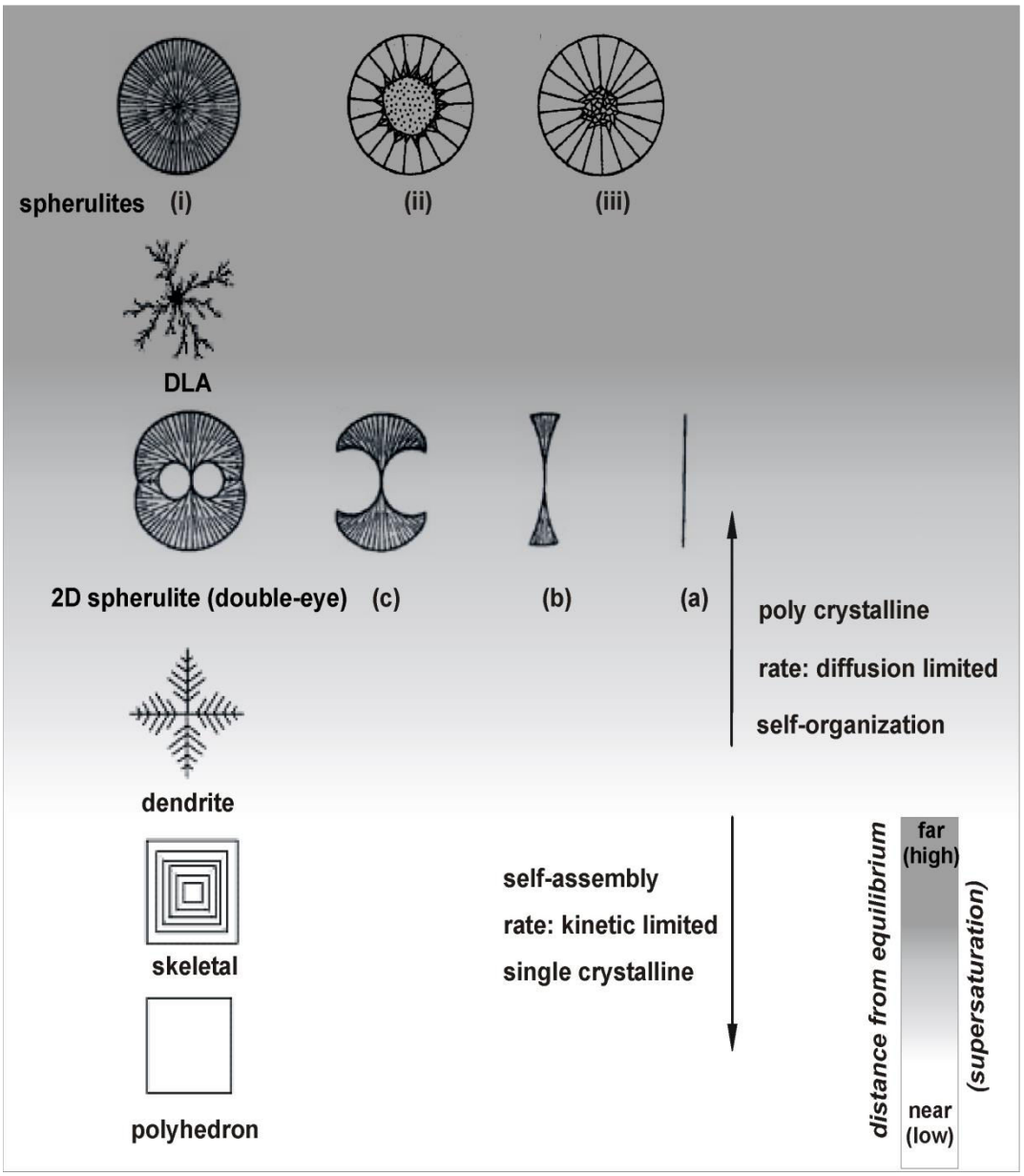

Fig. 11: Self-assembly and self-organization on morphological variation of crystals [35]. The sequence from (a) to 2D spherulite represents the ontogeny of spherulites formed by split growth mechanism as proposed by Grigorev [37] and Maleev [39]. At higher supersaturation complete spherulites are formed: (i) by dense branching (ii) on a spherical particle of a foreign material or (iii) on a polycrystalline aggregate of the same species [33].

At very low supersaturation levels or when the crystal growth occurs near the equilibrium state, polyhedral crystals bound by flat faces are formed by spiral growth mechanism. As the supersaturation increases, crystals grow by two-dimensional nucleation mechanism and develop hopper (skeletal) morphologies. With further increase in supersaturation, the growth rate is governed by mass

diffusion and dendrite forms are produced by the competition between the promotion and suppression of the crystal growth (the interface will be rough and adhesive-type growth mechanism prevails). When the driving force greatly increases, spherulites and diffusion-limited aggregates (DLA) are formed with disappearance of the original crystallographic symmetry. The crystallization process of polyhedral and skeletal forms are categorised under self-assembly as the macroscopic shape of the crystal reflects the arrangement and the symmetry of the microscopic atomic lattice. When the crystallization processes of morphologies occur by ordering at far-from equilibrium and depends on the diffusion rate of the components, it should be categorised as self-organization.

Likewise, the morphogenesis and pattern formation in biomineralization can also be discussed in terms of self-assembly and self-organization. In biomimetic systems, the mass transport during mineralization process is controlled by the organic matrix and the molecular recognition between the inorganic crystals and the organic substrates modulates the formation of inorganic crystals with biomimetic hierarchical architectures.

Spherulites are a form of polycrystalline aggregates occurring under a high driving force condition. In such situations, spontaneously nucleated crystals grow with various orientations and the crystals are selected simply by their geometric relation with the substrate surface (geometric selection predicted by Kolmogov's theory, see ref 33 for details). As a result, various textures of polycrystalline aggregates appear that are controlled by the form of the substrate surface. Spherulites are formed if geometric selection takes place on a spherical substrate particle. Substrate particles may be a different material from those forming the spherulites (Fig. 11 ii) or a spherical particle of the polycrystalline aggregate of the same species (Fig. 11 iii). Crystals whose *habitus* is characteristically thin platy exclusively take the spherulitic form under high driving force conditions (Fig. 11 i).

Sometimes, instead of formation of a perfect (completely developed) spherulite, various incomplete spherulites such as sheaf-like (Fig. 11 b,c) and two-dimensional spherulites with two-eye forms appear (Fig. 11. 2D spherulite). Such crystals grow initially as threadlike fibres, subsequently forming new grains at the growth front (Fig.11 a) [35]. This branching of the crystallization pattern ultimately leads to a crystal "sheaf" that increasingly splays out during growth (Fig.11 b,c). At still longer times, these sheaves develop two "eyes" (uncrystallized regions) on each side of the primary nucleation site and settles down into a two-dimensional spherical growth pattern, with eye structures apparent in its core region (Fig.11 2D spherulite).

Since long time, the origin of spherulitic morphology was predominantly described and discussed on the base of "classical crystal splitting" growth mechanism, which is generally associated with fast crystal growth and caused by existence of internal crystal strain and high supersaturation of the medium [36-39]. According to Grigor'ev, split crystals partially separate during growth into sub individuals as a result of the accumulation of structural defects *(mechanical splitting)*, or when different ions are incorporated as impurities from the parent solution *(chemical splitting)* [37].

However, the mechanism of formation of spherulitic biominerals remains subtle. Very few examples are reported which analyses the exact growth mechanism of such biominerals. One such well investigated biomimetic system is the hexagonal prismatic seed crystal of fluoroapatite, formed in a gelatine gel, which further grows to spherical particles *via* dumbbell intermediates which gives the first experimental evidence for a direct correlation between intrinsic electric fields and the self-organized growth of fluorapatite–gelatine [40-42]. Some evidence has been reported that in organic-inorganic nanocomposite structures with complex morphology, such crystallization events are not categorized as classical single crystals and polycrystals, but as non-classical crystallization involving particle-mediated pathways, which describes the formation of such types of aggregates by special mechanism such as oriented attachment of subunits [43-46], mesoscale transformation of nanoparticles from amorphous precursor [45] and formation of mesocrystal by "brick-by-brick" self-assembly mechanism [47-49].

The formation of spherulites with the aid of organic macromolecules is commonly associated with calculi. Therefore, it is obligatory to investigate the structure and morphology of calcium oxalates crystallized in the presence of organic additives which is a recent trend in this field. The influence of additives on controlling the morphology of calcium oxalates crystallized from aqueous solutions and from organic gel matrices can unravel the mechanism of calculogenesis.

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IMPACT OF EDUCATION DURING COVID-19 AND MODERN RESEARCH IN EDUCATION

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INTRODUCTION

The world is terrified by a horrifying epidemic of coronavirus. It is a severe challenge for every kid and grown up. No matter where you live, in the city or village, it may find you all over. People discuss the most efficient measures to properly take care of their health, how long to wash hands, what meal to consume, and so on every daytime. Educational systems of all countries greatly suffer as well. The impact of coronavirus on the teaching system is one of the most currently relevant topics discussed by educators, students, parents, and political leadership.

As people cannot gather in great masses and must continue in the dwelling, it's impossible to say. What to undertake in this position? As every school, college and university are closed, students cannot receive education, expand their knowledge, and develop skills. They hold to remain at home and the most obvious answer is to find out there. Otherwise, every child and the adult student will miss several crucial months. It may make a large gap in knowledge and so, the youngsters will remain unequal to. This will be a huge impact on any educational system with multiple negative effects.

The regimes of every country try to back their educational systems. It seems that online or distance learning is the best answer. Governments have to close educational institutions that offer a traditional on-campus way of scholarship. They all should move on to the Internet. It's a pretty long and complex process and teaching will suffer because of it. However, every school/college superintendent will say that it's a lot more serious than just wasting time in isolation.

Possible Benefits of ELearning

The experts shed some illumination on the benefits of online scholarship. What are the positive facets of distance learning via the Internet? Regard the accompanying benefits:

- More time to read;
- Admittance to all forms of learning importation;
- New efficient ways to take;
- The flexibility of learning methods;

- Active collaboration with parents to get them closer to their kids.

Prudence (2008) stated that Pupils are welcome to connect any special community, which is fussy with the issues of eLearning. Such communities likewise shed more light on various learning aspects. Pupils can choose different learning methods, which perfectly fit their learning styles. This benefit, solves the "eternal" problem of the lack of flexibility of the standard course of study. There are nearly no restrictions and students are free to design their learning schedules and write a composition agreeing to their demands and possibilities.

I would wish to add that parents should be active participators too. Every family should actively participate in eLearning to make this process efficient. Parents should be close at hand to serve their children because many of them don't recognize how to study online.

41% of our population are under 20 years of age. This makes up for a sizable chunk of the school-going population in need of instruction and skills for a robust workforce in the hereafter. Nearly 1.5 million schools were shut in India for 315 days, a significant part of 2020 and early 2021, due to the pandemic impacting about 250 million kids. With the second wave now gripping the nation, most schools are closed once again, with year-end exams cancelled or deferred. The pandemic has exacerbated concerns of fairness and equality in several aspects of life, access to education being a substantial one.

Across 190 countries, 1.7 billion students were moved by the closing of educational organizations. While the modern nations had the means and the method to offer remote learning to their pupils, the low-income countries faced several challenges in providing the same. According to UNESCO, high-income countries' digital education offerings covered 80% of the population, and in low-income countries only 50% of the student population received digital education. Erratic electricity supply and limited digital literacy coupled with the lack of devices were major impediments in access to digital instruction in most developing and under-developed countries.

Therefore, a significant third of the world population was unable to access remote learning. In India, too, unstable internet connection and low broadband penetration in semi-urban and rural areas impacted digital learning opportunities. The adoption of digital technology was smoother among private schools in India, but government schools and the bulk of lower end schools were not able to accept that digital leap seamlessly. In Brazil, for instance, 95% of the children from privileged families had computers at home, while only 14% of the scholars from low-income households

had computers at home. In the USA, 100% of students from wealthy households had computers at home, while only 25% of poor folks did.

With the long break in scholarship, coupled with differential access, unreliable assessment standards and inadequate checks and balance, the students are inevitably facing major learning gaps. Vast deficits were too apparent in the societal and communication science, listening skills, spoken language, phonics and motor skills. Some students could not even take a pencil!

7 immediate changes required in the Indian education system

We cannot deny the fact that the Indian government and institutions have been working to reclaim the existing training model. Nevertheless, there are however various matters which are needed to be taken charge of.

While we totally see how important education is to shape our lives, it has also been a major trouble in our nation. In that respect are several issues that the Indian education system is grappling with. We cannot deny the fact that the Indian government and institutions have been working to reclaim the existing training model. Nevertheless, there are however various matters which are needed to be taken charge of.

Here are 7 immediate changes required in the Indian education system:

Rote Learning

We have progressed with time; however, we still have not been able to move away from rote learning. While we know that IB schools are changing the education system at their level, but we also need to understand that the population that goes to IB schools is very limited in nature. Not everyone can afford the education system that they offer. Hence, the government needs to take the baton in their hands and eradicate rote learning from the schools at all the levels. The schools must be encouraged to introduce conceptual learning which avoids students to mug up what they are being taught. While this will help students to understand the concepts better, they will also be able to retain and apply them better.

Rating Scheme

Marks still continue to meet the most important card in deciding the future of kids and this frequently gets down upon students as a burdening factor. The pressure of marks often makes students underperform. Instead of focusing the evaluation on a three-hour exam, the focus of evaluation should be classroom participation by a student, projects, communication and leadership skills and extra-curricular activities. But then will the students commit their best and be evaluated at their best.

Equal Respect to all the Issues

We continue to subsist in the education system where science stream topples the stream hierarchy. Students are forced to become a machine which only works for high-profile subjects and subjects like languages, communications, the arts are looking down and are not considered high-profile. Students should rather be forced to pursue the discipline that they like instead of creating a differentiation between subjects.

More Serious Preparation of Educators

According to Henson (2015), teachers take on the most important role in schools and hence, they should be granted the best of class preparation. Afterwards all, they are influencing the future of the body politic, the tykes. Instructors are frequently viewed as second parents. Therefore, they should be imparted their training in a manner that they can behave as parents to the children out from their families. While instructing, they should make a congenial and homelike atmosphere where students can experience the empathy and love in the classroom and which can then be reflected in their conducts.

Introduction of Engineering Science

We all know we have inserted in the epoch of the fourth industrial revolution. We are living the Renaissance of technology and in such a state, technology and education system cannot be held aside. Pupils must be taught about technology right from the early years of their training so that it does not come like a foreign thing in their later times.

Indian schools must adopt technology and teaching with an open heart and propagate the same to the students as it is in that location, where their future rests.

Personalize Education

Indian education needs to realize that the absorption power of every student cannot be the same. Hence, the teaching method also cannot remain the same for every student in a class of 30. Some students have faster learning pace and some are slow. Instructors must possess a great eye for observing each of their pupils. While it is not humanly possible for a single teacher to pay attention to every student, schools must start looking at the role of technologies like artificial intelligence and chatbots who can become the helping hand to the instructors as well as pupils.

Teach Them the Aim of Instruction

Our training system is nevertheless experiencing the features what colonial educators inbuilt. Pedagogy is not always about getting a big, productive person. It should be about humanism.

Pupils must also be taught in-depth about the morals of life and inculcated with humanistic values. They should be taught that life is much beyond money and success is not quantified in money. If the Indian education system sets about getting these points into serious consideration, we can reach the level of the best education system in the universe. It is eminent that we as a nation, start calling for education above the mediocre level that we have been ingrained with and perceive education from the holistic approach.

Modern Research in Education

Training is the imparting and gaining of knowledge through instruction and learning, particularly at a school or similar establishment. The earliest educational processes involved sharing information about gathering food and providing shelter; making weapons and other instruments; reading the words; and acquiring the values, behavior, and religious rites or practices of a committed civilization. Before the invention of reading and writing, people lived in an environment in which they struggled to make it against natural forces, animals, and other humans. To survive, preliterate people developed skills that developed into cultural and educational practices.

Education originated from the human struggle for survival and enlightenment. It may be formal or loose. Informal education refers to the general social process by which human beings take the knowledge and skills required to serve in their cultivation. Formal education refers to the operation by which teachers instruct students in classes of study within institutions.

Traditional Education

Traditional training is also called customary education or formal teaching. The primary motif of traditional pedagogy is to communicate on the values, manners skills and the social practice to the next generation which is necessary for their endurance. In traditional education the student learns about the customs and tradition of the society in which he exists. This character of training is generally given to the students by the substance of oral reading.

In that respect is very less written work or practical employment. The students simply sit down together and listen to the teacher or another who will retell the lesson. The custom does not include written examinations, but it includes some oral exams which are not very stately. Traditional instruction is really far from the use science and technology. Ogy. Neither the education about the sciences, we study today in a great detail is imparted in the traditional education system. The traditional education system basically included the knowledge about customs, traditions, and religious beliefs. That is why it is called traditional education.

Modern Education

Modern education is very different from the traditional education. The teaching which is instructed in the schools today is the modern education. Modern education teaches about the skills required today, that is, the skills of science and applied science, science of medical science, etc. In addition to listening, the modern education includes writing, imaging, thinking, and thinking skills. This character of training also includes written exams to analyze if the pupils are reading properly or not. This is performed in a very conventional manner. The methodology employed for teaching is very synergistic. Modern teaching is merely an evolution of the traditional teaching which was lent to the students a few years back.

Traditional Education vs. Modern Education

Traditional and modern educations are both connected to each other and different from each other as well. In the early history of our nation, there was a fourth dimension where there were no schools. The children took on the education or knowledge of their antecedents. At that time this knowledge focused only on the skills needed for endurance. The people who held out in jungles got the instruction from their ancestors who taught them how to hunt animals for their food, how to use animal skins for different intentions, how to make tools. They were taught about their rites or the customs they observed. They were taught about the religions the followed.

They taught them the tales of their deities and big businessmen from which they could learn good ethics. The big businessmen used to ship their sons to schools which were called gracious in India. In these gracious they were instructed how to use different weapons, how to protect themselves and how to lash out their foes. They were likewise taught the basic principle of governing an empire. These cases of schools were not meant for the local population. It could only be accessed by the imperial families. The residue of the children in the empire learnt the skill which their parents possessed of them. As the popular regime was set up in the coming age, the importance of teaching spread throughout the state. Schools were opened where any kind of students could do and read. This was the organization of innovative teaching http://businessnewsthisweek.com/education/how-dudes-and-dolls-school-changing-the-concept-of-learning-in-pre-schooling/

Today's Scenario

According to Beck (2009), the scenario of education which now is completely dissimilar from the scenario which was a few years back, At that time modern education was not reckoned serious and today traditional education is not seen enough. As the demands of the masses are changing, the education system also has to alter. And this alteration should be borne by the masses. In the beginning the

people used to teach their kids how to meet their demands. This was the basic aim behind education. And the objective now is even the same. The sole affair which has changed is the need of the great unwashed. With the passing time, the things which were a luxury at that time have shaped the basic needs at present. As the needs grew, the education had to rise. If the instruction did not evolve, and so it would be difficult fulfill the demands of today.

Equality in Education

Traditional education which was supplied in schools was not meant for all the kids. Thither was a great deal of favoritism between the kids. It was seen that education was meant for only high society people. The children who belonged to the families of lower society were not admitted to go into the schools. The traditional teaching was not meant for everyone. The innovative education is accessible by all. Anyone can require admission in a schoolhouse and learn the modern education. We can read that it is because of the advanced teaching that modern education is accessible by all the kids. Every bit the modern education spread, the precept of equality was taught.

The Knowledge Conveyed

As noted supra, in the traditional education the students are taught about traditions, customs, rites, and religious belief. In the modern education, the students are taught about science, engineering, language skills, and mathematics, etc. the knowledge given in the traditional training system was enough for one's own living, but it was not enough to fit the solid cosmos.

Which Single is Better than Best?

Both the types of education have their own station and importance. We cannot hold any type of education good or tough. The traditional was good in its period and the modern education is beneficial in its period. Really, it depends on the individual. It depends on what the individual desires to take. If an individual desire to find out about his customs and religion, then definitely traditional education is better for him. On the other hand, if a soul desires to get word about science or math, then modern education is right for him. Both the type of the educations is equally significant. Traditionally educated is much related with our civilization. And it is good or we can say it is important to learn about own culture. Everyone should what are their customs, cultivation and the stories and beliefs of their faith. In the same manner, it is every bit important to catch up with a world in terms of the innovative developments which are taking place today. This depicts the importance of advanced teaching. Modern teaching is needed to remain in contact with the whole world and to discover what is going on in the universe.

CONCLUSION

It is hard to infer that which education is safer. Both the characters have their own importance. Both the characters are likewise similar to each and different to each other. Modern education is inherited from the traditional training. Simply due to innovative education, traditional training is being neglected which would result in losing our civilization. The traditional education and the modern education, both should be given equal importance.

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UNLOCKING AFRICA'S AGRICULTURAL POTENTIAL: THE INCLUSIVE DEVELOPMENT OF AN INNOVATIVE FARMERS PHONE

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ABSTRACT

Africa has 600 million acres of arable land, but only 10% is cultivated, with 10 million young people entering the labor market each year. Lack of knowledge and techniques are major challenges to unlocking this potential. To succeed, the agriculture industry requires communication, and information technology, particularly e-commerce and m-commerce, can provide a pathway to success. An innovative African Farmers Phone (AFP) is proposed to disseminate real-time, on-demand voice, image, and video-based information to rural African farmers. The AFP aims to help the 84% of rural farmers who are not educated to achieve development goals. The mobile phone technologies have integrated the oral and image culture that characterize Africa, and over 600 million phones were sold in the last decade, showing the potential for illiterate and poor people to benefit from them. The AFP will play a critical role in transmitting knowledge and operational information to improve the sector growth.

Keywords: *Africa, Innovative agriculture, World Arable land, Mobile phone technology, Sustainable agricultural development, African Farmers*

INTRODUCTION

One of the 17 Sustainable Development Growth SDGs priorities is food for everyone. Therefore, zero hunger by 2035 World Bank (nd). Africa is the place of a true manifestation of an absolute poverty where people lack all the basic needs and importantly food and the funds to acquire them. People are trapped in persistent poverty tend to experience multiple 'capability deprivations' concurrently. That is, they are illiterate, have inadequate nutrition, poor human rights, and insufficient income and livelihood opportunities, which taken together drive and maintain their poverty and ensure it passes across generations (CPRC, 2004: 40) in Oversea Development Institute (2009). Hence, hunger become increasingly widespread in Africa whereas the area is full of arable grounds and manpower.

The average African farm performs at only about 40% of its potential. And on present trends the continent will only produce 13% of its food needs by 2050. Yet African agriculture also has the greatest promise: a growing population, vibrant markets and half the world's uncultivated arable land. Farming First (nd)

"We have the solutions for addressing malnutrition. Food stamps helped stamp down hunger and malnutrition in Africa. It removed the indignity of hunger in the midst of plenty. While there's been a lot of research on its costs and benefits, the best way to know is to ask the hungry children who can now learn because they have food". afdb (2018)

Thus, "The stage is set for African agriculture to begin to redress the imbalances of the past and assume its proper place as a major agricultural powerhouse for ending poverty. For this transformation to occur, however, many impediments must yet be overcome." The World Bank (nd)

In order to pave the way for a better and highly productive Agriculture, this document is proposing an ICT infrastructure delivered as a mobile phone named African Farmers Phone that should reinforce the provision of the necessary information and knowledge sharing to be used to boost the Agricultural processes. ICT use in Africa has highly increased in most of the countries and Fox K (2011) already revealed a decade ago that "In 1998, there were fewer than four million mobiles on the continent. Today, there are more than 500 million. In Uganda alone, 10 million people, or about 30% of the population, own a mobile phone, and that number is growing rapidly every year. For Ugandans, these ubiquitous devices are more than just a handy way of communicating on the fly: they are a way of life."

Hence, the document is presenting the Agricultural environment in Africa with a thorough exploration of the actors of the whole chain and their needs which will literally transform the sector to a real professional business one, that is strongly supported by a useful and efficient ICT infrastructure.

METHODOLOGY

The research is built around the Farmers of Togo especially from the Plateaux and the Maritime region based on the focus group methodology. In order to deliver this report, we had to get together six (4) mixed groups including: farmers, suppliers, customers, agriculture experts from the government agencies and agriculture NGOs representatives. Each group had run three (3) sessions per week for a total of twelve (12) weeks. Observations have been also used to strengthen the research strategy. This investigation has taken into account the psychosocial, physiological, philosophical and the economic aspect of different actors of the farming activity as suggested Leikas J (2013) et al in a development of the Life Based Design, LBD methodology, a multi-dimensional approach provided for a further analysis and understanding of the stakeholders and their formal lives. Reaching the goal by implementing the Life Based Design, LBD is the main objective. "The main component of LBD is to reveal information about people's lives, in their forms and actions. The problem often rests in finding effective methods for fostering innovative thinking. This means providing tools, which guide thinking towards appropriate problems in addition to the information which enables problem-solving" said Saariluoma P et al (nd)

This methodology helps to investigate the formal live of the different stakeholders in order to find issues to be dealt with. The concerns are here: the lack of knowledge to soil and monitor the growing of the crops, the difficult management of the dynamism of the planting environment including lands and microbes and bacteria vegetal attack issues, the absence of a marketing system for an accurate products distribution and the lack of information on the daily prices on different markets. These African farmers are also very far from each other and also from the other

stakeholders such as various Agriculture experts with whom they can exchange and receive useful helps. Hence Life-Based-Design, LBD helps by responding to possible risks and ask the stakeholders whether a built ICT infrastructure is the solution to implement and therefore, start the design of the dedicated integrated and innovative ICT platform. Thus, as the computers and networks are at the heart of all activities nowadays and offer several advantages such as rapid access to information and the potential development impacts, our discussions came up with a resulting idea of building a solar powered smartphone for African Farmers named African Farmers Phone, AFP.

The main concern of this research is to know how to make these benefits available to these poor farmers. Thus, the emerging solution discussed further the accessibility of the provided benefits to the poor.

We used an inclusive focus group data collection method to gather pertinent data for our article, "Using Smartphones to Boost African Agriculture." A diverse group of small-scale farmers from various African regions comprised our target audience. Using software for video conferencing, the focus group discussions were held both in person and online to ensure maximum participation. Our objective was to investigate how smartphone technology can be used to help small-scale farmers in Africa overcome the current obstacles they face. We asked the participants a variety of questions about how they farm, how much technology they have, and how they feel about using smartphones to improve their farming methods. Many of the participants highlighted the potential advantages of using smartphones for tasks like accessing weather forecasts, tracking crop growth, and connecting with potential buyers. The responses we received were insightful. We also took note of some participants' concerns, including those regarding connectivity and affordability. Overall, the inclusive focus group data collection method provided useful feedback that we used to create our article report and offer suggestions for using technology to improve African agriculture.

POSITIVE ECONOMIC CHANGES IN AFRICA

“Africa has experienced high and continuous economic growth in the past decade, prompting analysts to argue that the continent has reached a turning point in its development history and is poised to play a more significant role in the global economy in the twenty-first century.” Unctad (2015)

And furthermore, it is said that “In terms of its economy, Jegede (2002:1) points out that about 90 per cent of Nigeria's annual revenue comes from petroleum – it exports two million barrels of oil a day – and that it ranks as the country with the seventh largest oil reserves in the world.” Olabode S et al (2005). This country is now known as the first economy of Africa ahead of South Africa that is already recognized worldwide as emerging country.

It is now confirmed that Africa, which was formerly considered as the poorest area of the whole world is now changing the paradigm to become an economic Eldorado of investors. In reality Africa is attracting more and more investment “Over the last

decade, Africa has emerged as a prime investment destination for global businesses seeking M&A opportunities. The value of African inward investment has tripled in the last ten years reaching more than $182bn while deal volumes have doubled now standing at a total of 2,417." **(Freshfield, 2015)**

EXTREME POVERTY AND FARMING

Hunger is tightly linked to poverty as two conditions often perpetrate a vicious circle: hunger produce poverty but also a cause of it. Humans are less likely to develop the skills they need to live healthy and productive lives as a result of hunger. In turn, low productivity perpetuates hunger and underdevelopment. This is the case of Africa where the consequences are the miserable and indecent living lives of its people from the children to the elders.

Even though Africa has the best arable land of the world and with all the potential to feed the whole world, nothing is showing this type of fulfilment in a near future. "Yet Africa is far from realizing this potential. For too long, Africa's agriculture sector was neglected. African governments failed over many decades to invest adequately in the agriculture sector and to create a policy and regulatory environment in which smallholder farmers could flourish. Compared to a sharp rise in domestic spending in Asia, public spending on agriculture in Africa stayed stagnant and low throughout the 1980s and 1990s. Meanwhile, donor assistance to agriculture was slashed 72% between 1988 and 2003" One (nd). As it is argued before, the capacity of the continent is huge, in term of producing variety of foods to feed all its people and even the whole world. Africa in general and in Togo in particular, where we are basing our research, member of least developed countries in Africa, there is no efficient plan in place that could provide with a proper organization of the sector in order to achieve the goal of not only feeding the people but also develop a powerful agricultural sector to strengthen the economy, employ the high number of those strong youngers waiting for employment opportunities, who will in turn provide well-being to their different families.

With the recent involvement of notable figures such as the U.S. President Barack Obama, the World Bank President Jim Yong Kim, and Bono, the call to eliminate extreme poverty by 2030 has gained momentum. It is heartening to note that the developing world has already made significant strides in this direction, as evidenced by the reduced number of individuals living in absolute poverty. And McArthur J (2013) confirmed that "But, as my colleague Laurence Chandy and his co-authors recently pointed out, the distance to crossing the absolute-poverty line varies tremendously by region. Most of China has already crossed the $1.25 threshold, and India has a huge share of its population poised to make the leap next. Sub-Saharan Africa has the farthest to go, despite recent progress, since a large proportion of its population still lives so far below $1.25 per day, often at half that level of income. Most of Africa's poorest people live on small farms in rural areas, so those places will likely form the final frontier of the global quest to end extreme poverty."

Hence, the key for the elimination of the extreme poverty, hunger and malnutrition is without any doubt, the investment in the agriculture economic sectors and

especially in the rural area, place where the poorest are living Prasula P (nd). This investment should include all the value chain in order to consider the land acquisition, preparation, production, transformation transport distribution and the information to help in the transformational process.

AFRICAN AGRICULTURE SECTOR

The poorest of the world estimated to almost 400 million people live in sub-Saharan: Africa with the bug part of them rely on Agriculture. In order to resolve this problem, IMF argued that the continent needs to create 18 million jobs each year until 2035 in order to give jobs to its population and to definitely deal with the employment issues. Farmaafrica (nd)

Therefore, investing to reorganize the agriculture sector is the solution. However,

"Africa's cereal crop yields today are nearly as low as they were several decades ago, and just a fraction of those in Latin America and South Asia. Today, Africa is a net food buyer, looking outside the continent to feed its growing and increasingly urban population. It faces challenges such as poor infrastructure, expensive fertilizer, poor access to extension and financial services, unreliable and unpredictable markets, low use of technology, and limited land security. Women, who constitute almost half of the agricultural labor force, have consistently lower access to the productive resources listed above, and thus cannot contribute as much as their potential. As a result, Africa's smallholder farmers, particularly women, have been left unable to produce enough food to feed their families or sell surplus to markets to generate income." One(nd)

Africa is very rich and has the natural gifts for the development of its Agriculture sector. "The region has the fertile land and water resources available to invest in agriculture; however, it also faces important threats like soil erosion, deforestation and destruction of grazing lands. Boosting agriculture in a sustainable way, while ensuring good access to markets for farmers, are key aspects to reducing poverty in Africa. These are some facts and figures behind. Farmafrica (nd)

"Sub-Saharan African agriculture could, and should, be thriving. According to the World Bank, the region has the right conditions to feed itself: enough fertile farmland, enough water and enough favorable climates. According to the International Fund for Agricultural Development (IFAD), the Africa Progress Panel and others, Africa has the potential not only to feed itself, but also to become a major food supplier for the rest of the world." One (nd)

In spite of prevalent thinking, horticultural creation in Africa has expanded consistently: Its value has nearly tripled (+160%), is nearly the same as that of South America, and is growing at a slower but still comparable rate to that of Asia

And "Global agricultural expansion and food security will increasingly be focused on Africa. There is such opportunity for governments, farmers, businesses, academics, and civil society organizations to develop and implement innovative and sustainable food and agricultural systems," says Tatjana von Bormann, senior manager of the policy and future unit at conservation organization, WWF-SA."

"Nedbank Business Banking head of agriculture John Hudson says climate change and over-consumption are tipping points for the planet. Africa's population is growing and global population is estimated to reach 9-billion by 2050, a huge incentive for farming." Dugmore H (2018)

INFORMATION TECHNOLOGY IN THE AGRICULTURE SECTOR IN AFRICA

The agricultural sector in Africa has the potential to undergo a revolution, thanks to information Communication technology (ICT). With the utilization of ICTs (data and correspondence advancements), farmers can further develop their gamble the board procedures, target explicit projects, and perform spatial investigation to upgrade their harvest yields. Additionally, farmers can benefit from e-education and financial services that can assist them in making informed decisions regarding their operations.

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While a large number of people now are hooked to the internet, fixed telephone, and mobile phones in most developed countries compared to a couple of decades ago, the use of digital technologies, however, is relatively less pronounced in Africa, particularly in agriculture [1]. Estimates by Kuduma et al. [1], for example, indicate that only 13% of smallholder farmers in sub-Saharan Africa have access to various digital technologies. Indeed, internet penetration rate in sub-Saharan African countries has remained low. In sub-Saharan Africa, the internet penetration (individuals using the internet) was 16% in 2015 and rose to 29% of the population as of 2020 [2].

There is an uneven adoption of information and communication technologies by scale and geography within Africa. For instance, mobile money services dominate (85%) in Kenya, with presence among more than half (55%) of the population in Ghana, less than half (45%) in Tanzania, and relatively low (8%) in South Africa and Nigeria (4%) [1]. As of 2021, there were 515 million mobile services subscribers in sub-Saharan Africa, representing about 46 percent of the population [3]. Recent estimates show that 40% of the adult population is connected to mobile internet, whereas 44% of individuals live in areas with mobile network coverage, but they do not use mobile internet services [3]. Notwithstanding the uneven coverage, a positive effect has been established between mobile money services and financial inclusion, welfare, and other development outcomes in sub-Saharan Africa (SSA) Ugochukwu R et al (2023).

Therefore, incorporating precision technology as well into its global agriculture projects is a proactive move by the World Bank. This includes making smart irrigation devices that can increase crop yields and save water by combining cloud-

based data analytics with Internet of Things (IoT) devices like smartphones. Agro-weather analytics, which can assist smallholder farmers in applying inputs for optimal results, are also being supported by big data and GIS-enabled technologies in Kenya. Ehui S (2018)

New companies like Welcome Farm vehicle are additionally having a beneficial outcome in the horticulture area by permitting ranchers in Nigeria and Kenya to enlist reasonable farm haulers to work their property through their cell phones. Customers' sales have increased by 200 percent as a result. Additionally, solar refrigerators are assisting Kenyan dairy farmers in cooling their milk products and minimizing spoilage.

"The agriculture industry's growing acknowledgement of the positive impact of digital tools and technologies is evident. In 2020 the GSMA reported that there are around 400 digital agricultural solutions in use across sub-Saharan Africa. The use of these digital farming services is growing at about 45% each year" Farmers Review Africa (2023)

Another area of potential expansion in the agricultural industry is the application of blockchain technology. By making financial transactions easier and less expensive for farmers, this technology could help expand rural finance by allowing farmers to manage their supply chains more effectively.

Generally speaking, the combination of IT into the horticulture area in Africa can possibly significantly work on rural efficiency and versatility in a supportable manner, and assist ranchers with defeating the difficulties they face in the locale. Ehui S (2018)

OVERVIEW OF THE AGRICULTURE SECTOR IN TOGO

Togo, is country classified as a least developed country with a national GDP per capita of $555. United Nation (2018). Agriculture plays a leading economic and social role and ranks among the country's leading sources of growth. It occupies more than seventy percent of the active population fao (nd) However, this sector is one of the most neglected in the country, the situation of Togolese agriculture can only be understood by studying it in the overall economic and social context of Togo. Togo; this small country in West Africa is today ranked among the least developed and one of the poorest countries on the planet.
At present, where the world developed economies like the United States and France and the emerging world, have the basis of their economic performances built mainly on agricultural transformations and industries, Togo, for its part, still believes in a purely rudimentary agricultural economy; and nothing is done for bringing in innovation as it is happening elsewhere in Africa.
Indeed, Togo has an economy based on agriculture, agriculture that is not immune to climatic hazards, and cruelly lack of modernization despite the green revolution that occurred in the 70s.

OVERALL FINDINGS

The focus group revealed below the challenges that small-scale farmers in Africa especially in Togo face to increase their agricultural productivity. These challenges include a lack of market access, unpredictable weather patterns, and insufficient access to information on modern farming practices, various information on land planning and enough farming control and protection, the real time fertilizers and nutriments supply chain access...

The participants identified the insufficient access to information on modern farming practices as the most significant obstacle. They typically rely on traditional practices that may not be effective in today's agricultural landscape. Additionally, they lack access to training on modern agricultural practices, which limits their ability to innovate and adopt new techniques.

Farmers also highlighted that unpredictable weather patterns, such as droughts and floods, pose a significant challenge. The lack of early warning systems for extreme weather events and limited access to irrigation systems hindered their ability to plan and prepare for such events.

Moreover, farmers expressed concerns about limited market accessibility, especially in rural areas. This limitation affects their capacity to sell their products at competitive prices and generate a decent profit. Access to credit to invest in their farms and

In some of African countries other than Togo, Artificial Intelligence and technology-led support and transformation of the agriculture sector is already happening, from farm to fork. The Focus group discussions propose the conception, design, implementation and the integration of information technology or its increasing improvement and its wider availability in the African agriculture. As mobile phone is nowadays, widely used in Africa, it must be worthwhile according to the focus group exchange to provide better services on smartphones. They've recognized that the use of WhatsApp applications especially has exploded and represent already a great success even in rural areas of the continent. And the suggestions are that this proposed ICT system, the AFP uses and utilisability carcteristics should not be far from the one or WhatsApp or be very user friendly as the WhatsApp application which has a great success within the African Farmers even in rural areas.

AUTOMATING THE FARMING PROCESSES WITH MOBILE COMMUNICATION

The agriculture sector can attain growth and development by utilizing Information Communication Technology (ICT) effectively. The deployment of ICT has proven to be a significant contributor to the growth and socio-economic development in countries where it has been utilized effectively. Developed countries have achieved tremendous improvements in agriculture value chain efficiency and productivity through the effective integration of ICT in the agriculture sector. However, in sub-Saharan Africa, the uptake of ICT in agriculture has been slow, and a major transformation of the sector is yet to be realized. Ayim C et al (2022)

There are several processes in the farming life cycle, which ICT should take in account in order to help the agriculture development in Africa. Hence, a solution named African Farmers Phone is proposed to help African farmers to identify the best land to be selected for a typical crop to grow, be given an automated and real time knowledge for growing some crops like be provided an automated system of planning, implementation and control of the entire cultivation processes of a given crop; it could be how to grow maize, cassava directed by the mobile phone. During the cultivation part of an agricultural project, a sensor-based information collection is provided and proposed advices and actions could be implemented with the use of the Africa Farmers Phone, AFP in order to control the lands such as the temperature of the land, thus, either humidity or hotness surveillances, prevent and/or report on any microbial attacks or vegetal diseases. This AFP mobile phone will also create environment that help send and receive various agricultural information ranging from weather alert to educational videos and market information.

THE AFRICAN FARMERS PHONE, AFP

Like said above this Africa Farmers Phone, AFP is considering the whole Agricultural environment and processes and deliver the necessary information that led to a smooth and a harmonious operation of the agriculture activity in Africa, especially in the sub-Saharan African where the use of the mobile phone and the smartphone and especially the WhatsApp mobile application is nowadays common in either rural or urban area. Mobile Phones should therefore help boost the agriculture activities of the impoverished farmers on the continent and especially in Togo where the integration of the Information and Communication Technology applied to the agricultural sector is very low or does not even exist. Hence The AFP is equipped with functionalities grouped in three (3) main modules that are

- Land and Fields planning
- Crops growing module
- The Land and plants control module
- Farming General Information (market prices, weather, loans and banking, transport, various online assistance…) module

The inclusive farming application development and usability fostering

The integrative Software Development processes

As the world becomes increasingly digital, it is essential to provide farmers with tools that can help them increase their productivity and profitability. One way to accomplish this is by developing a mobile application that African farmers can use to obtain crucial information about their crops, markets, and weather conditions and others like showed by the diagramme of the African Farmers Phone system down.

To ensure that this app is effective and user-friendly, an integrative software design strategy that combines the best practices of software engineering, user experience design, and agricultural knowledge is necessary. An integrative approach will be

used in this subchapter to frame a few important considerations for the design of an African farmer's telephone application.

Client driven plan

Identifying the requirements and preferences of the intended customers is the most crucial step in developing a compelling rancher's telephone application. The unique difficulties and constraints African farmers face must be taken into consideration in the app's design. For instance, many Farmers may not have access to electricity or the internet, have low-tech gadgets, or have limited educational abilities. The application ought to be planned in view of these imperatives, with UIs that are straightforward and improved for low-transmission capacity associations.

Information on horticulture

In order to provide farmers with useful information, the app ought to be designed to incorporate pertinent agricultural knowledge, such as crop calendars, the best practices for soil management, pest control, and irrigation techniques. The application should in like manner outfit clients with current market costs, weather patterns guess, and alerts for environment related risks like dry season or flooding.

Executive information deliverance

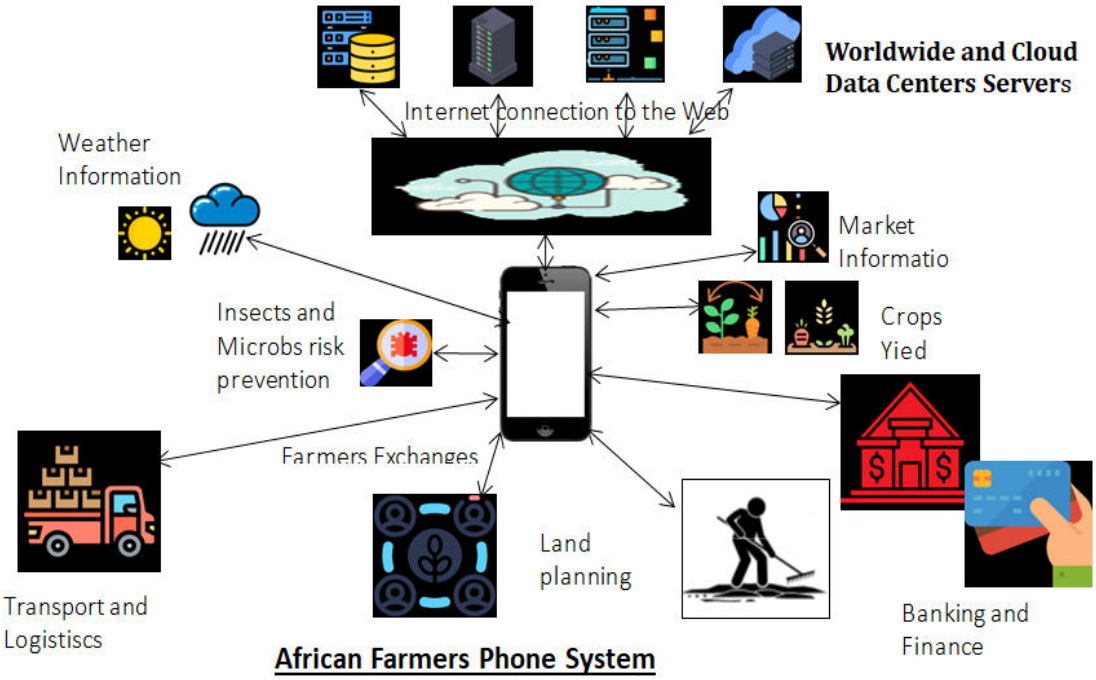
Effective data management is required for an African farmers phone, AFP application. Farmers should be able to easily enter and track information about their crops, such as planting dates, fertilization schedules, and harvest times, using the app. Data analysis tools like graphs and charts should also be included in the app to help farmers make informed decisions about their crops and markets.

Collaboration and social networking

The application should be designed to facilitate coordinated effort and individual-to-person communication because ranchers frequently work in networks and organizations. This could include features like chat rooms or forums where farmers can share information and advice as well as tools for coordinating activities like buying inputs in bulk or jointly marketing crops.

Protection and safety

To protect Farmers information and prevent unapproved access, the application should be designed with safety and security in mind. Examples of this include mechanisms for encryption and authentication as well as giving farmers control over their own data and the ability to export or delete it if they so choose.



The Human design approach of the AFP

An African Farmer's telephone application can provide Farmers with important data and devices that can assist them in working on their efficiency and benefit by adopting an integrative strategy to the programming plan. By incorporating user-centered design, agricultural knowledge, data management, local languages and cultures, collaboration and social networking, security and privacy, and other elements, the app can be tailored to meet the needs of African farmers and help them overcome the obstacles they face.

Cultures and languages of the region

A few neighborhood dialects and societies should be considered while planning the application in many pieces of Africa. The AFP ought to be developed in a way that it can be used in a variety of languages and dialects and that is culturally relevant to the setting in which it is used. This could mean utilizing proper pictures and symbols that Farmerss are as of now acquainted with and staying away from content that could annoy or be socially obtuse.

Hence, as it was suggested by the stakeholders of this project, the AFP should be inclusive in every single part of its development. African farmers are characterized by various particularities that are illiteracy, culture of images and voices that need to be critically emphasized in the building of the application included in the mobile phone. Languages too are issues in Africa as the majority does not speak the foreign languages like French or English. It is important to design therefore, a very inclusive and specific HCI that is really focused on the habit of the Africans. The research is therefore proposing to construct a highly national interactive application based on:

- African Culture of the typical country and its adapted icons and button to build a user-friendly interface.

- Use of image and videos as much as possible as contents
- Use local language for the interface and the content

Norman A (2002) emphasizes the importance of considering diversity and cultural and social factors when designing products versus an hogenisation of culture design that is more service centered than Human-centered. "Globalization and commercial production has led to a shift in focus in the approach of product design. Commercial production aims at a global market that comprises many cultures and subcultures. In light of this new development, product design has shifted from one which is human based to activity based. This is a situation where products are designed to be able to be used to perform a specific activity wherever in the world by anyone who can access it and is able to interact with its technology. For example, the mobile phone industry uses a technology/activity based approach for design. There are no distinct phones designed for any cultural segment but rather economic segments of the world. The main activity here is communication, and the phone design uses a technology that just enables the activity to take place. This homogenization of culture in product design is extending to entire disciplines like architecture, furniture and industrial goods." Daevas design (nd).

Norman (2002) argues that good design must take into account the needs and expectations of the people who will use the product, and these needs and expectations are shaped by cultural and social factorsa and specificaly of he's environment.

One way that cultural and social factors impact design is through the way people perceive and interpret information. Different cultures may have different expectations about the way information is presented, such as the use of colors, symbols, or text. For example, in some cultures, the color red is associated with danger, while in others it may represent good fortune. If a product is designed with the wrong cultural assumptions in mind, it may be confusing or even dangerous for users.

Another way cultural and social factors impact design is through the way people interact with technology.

Norman A (2002) points out that the way people use products is often influenced by their prior experiences and expectations, which in turn are shaped by cultural and social factors. For example, a product that requires users to read a lot of text may be difficult for people who come from cultures that do not emphasize reading as much as others.

Norman A (2002) also highlights the importance of understanding the social context in which a product will be used. For example, a product that is designed for individual use may not work well in a social setting where people are expected to share resources or collaborate. Understanding the social dynamics of a situation can help designers create products that work well in the specific context in which they will be used.

To finish, cultural and social factors have a significant impact on design. By taking these factors into account, designers of the African Farmers Phone, AFP products will more intuitive, easier to use, and better suited to the needs and expectations of their African users.

However, the need of training the African Farmers in the use of those ICT equipment must also be essential in order to help them achieve their goals of boosting the agricultural activities and enhance the participation of the sector to the GDP per capita. Thus, contribute further in reducing poverty throughout African continent.

CONCLUSION

Africa has an enormous potential for agricultural development, with 600 million acres of arable land available for cultivation. However, this potential is largely untapped, with just 10% of the land being cultivated, and many farmers lacking the knowledge and techniques needed to maximize productivity. The rise of mobile phone use throughout the continent provides a unique opportunity to address this challenge, by using information technology to disseminate knowledge and operational information to farmers.

The proposed African Farmers Phone (AFP) offers a promising solution to this challenge, by providing rural African farmers with real-time and on-demand voice, image, and video-based information. This inclusive development initiative takes into account the fact that many rural farmers are illiterate and poor, but have benefited from the integration of oral and image-based culture into mobile phone technologies.

With the use of the AFP, farmers will have access to critical information such as crop calendars, best practices for soil management, pest control, and irrigation techniques, as well as up-to-date market prices and weather forecasts. This information can help farmers make informed decisions, improve productivity, and increase profitability.

By leveraging the power of e-commerce and m-commerce, the AFP can help to transform the agricultural sector in Africa and contribute to the growth of the new farming-based economy. With 84% of African farmers living in rural areas, this innovative mobile phone technology has the potential to reach a large and underserved population, and create a more inclusive and sustainable future for African agriculture.

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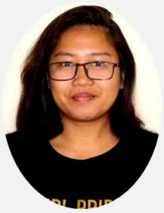

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In today's increasingly complex world, it is more important than ever to be able to think and solve problems from a multidisciplinary perspective. This book provides a comprehensive overview of the benefits of multidisciplinary studies and how to apply them in your own work and life. "**Bridging the Gaps through Multidisciplinary Studies**" is an insightful book that advocates for the integration of multiple disciplines to address complex global challenges. In today's fast-paced world, the boundaries between academic fields are becoming increasingly blurred, and this book explores the immense potential of combining ideas, theories, and methodologies from different disciplines to foster innovation and find solutions to pressing issues.

Through a comprehensive exploration, the book highlights the power of multidisciplinary approaches in tackling intricate problems that traditional single-discipline approaches often struggle to address. It encourages researchers, academics, and policymakers to embrace the idea of collaboration and synergy among diverse fields such as science, technology, social sciences, arts, and humanities, to name a few. This book is essential reading for anyone who wants to learn more about multidisciplinary studies and how to apply it in their own work and life.

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