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EDITORIAL

Necessity is the mother of invention. But when ideas are discussed and planned for future, it'sreal innovation. Such was the impact of the Second SIET International Conference on EducationTechnology held on January 1 st and 2 nd, 2020 at Trivandrum in Kerala. The conference was inaugurated by the well known academician and Minister for General Education of Kerala Prof. Ravindranath. Mr.Chen Der Thanq Victor, Associate Professor, National Institute of Education, Nanyang Technological University. Singapore lead the international community in the conference.

The speakers' emphasized the need for integrating education with modern Information technology solutions. The papers presented in the conference pointed at the importance of Educational Technology and these treatise are compiled and presented before the reader inthis edition of Edu-Tech, the premier educational technology journal of Government of Kerala.These treatises were put to practice innovatively by SIET when the pandemic covid-19 gripped the country. When the school education in its normal practice became impossible, SIET Kerala became the first in the country to put forth the idea of using Mass media in continuing school education. On 2020 April 17, Doordarshan the national broadcaster of India aired SIET Padashala , the television classroom. SIET Padashala was a game changer in the education field impacting the lives of students in Kerala during the pandemic era and beyond. Edu-tech second edition is being published at a time when the world is slowly grappling out from the clutches of covid-19.This edition discusses on the newer aspects of Technology based learning ranging from the role of IT Games in making the learning process more immersive, the changed role of Teachers as a techno-pedagogue facilitator, Development of Mathematical models for scientific and logical reasoning and other modern technology interventions. Core philosophy of the SIET that no technology can be the replacement for the human involvement in the teaching process has been safely guarded while evolving the above treatise.

I hope that the academic community will make the best use of the ideas presented in this edition of Edu-Tech.

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Editor

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Similar to the development of industry, education is also progressing from traditional methods, from traditional concept of apprenticeship to modern schools, then it was 1.0, that was when the schools had mainly to fight literacy rate, not many people could read and write. When once we achieved that we moved on to 2.0. Thus we moved from general education to vocational education. It was to differentiate. Different people had different needs. So it is not fighting literacy rate any more. Education at 3.0 had school subjects distinctly wide and our schools were unable to cope with the interdisciplinary problem solving. It was proposed that perhaps we should integrate more subjects. We haven't reached education at 4.0 yet. 4.0 according to some scholars it means education to use smart technology. It means promoting organic learning. Organic learning means we return to the nature of learning. We remove some of the additives in learning in the past generation. Education at 3.5 has ICT learning, computer assisted learning, intelligent CAL, ICT integration, online learning, blended learning. These are the different terms introduced in the era of educational technology. Open learning, flexible learning, mobile learning, seamless learning, Game based learning, playful learning, MOOC, flipped classroom, etc. We always see these as the solutions, then we always find problem with education. Blended learning, is it a solution to a problem? We need learning face to face but we are submitting online. Why do we need blended learning? We must be able to identify the problem first before we talk about solutions. Those additives to learning. Every time when somebody says, he uses another solution to a problem, I ask them what solution you have found out for a learning problem. These are some hypes I have observed hi-tech. Neuron science zone. Trying to understand how much on the domain, which part of the brain is activated? We can compare some of the activities. From there we can generate some conclusion about students' learning problem. Access…we must have access. Access for everyone…motivation …technology is more interesting, otherwise it is too boring. Remedial instruction, it also enhances curriculum and computer. Teacher can continue to teach. It applies to all subjects and all students. It is very easy to develop. The fact is that it is difficult to develop. Good technology. The operating systems change. It saves money and time. You can create something. It becomes stable and you can use it over and over. It can be used by many different people. You don't need so many teachers. So, it saves money. You only need to provide professional training to teachers to operate the technology, how to use the technology. Once they know the technology, they use it. We need to learn how to impart this technical skill in education. It is not easy just to train our teachers to have the technical skills. These are my reservations of the current time. Solutions without problems. Why we are using the additives? How to improve student learning? Striving for generalizability.One solution for all. In our life we face problem with technology. Technology forces to be unified to think the same way as it was designed for. You know it when once it is designed. It does not fit here. It does not fit there. If the technology changes, the IT department comes and tells you, No, that is the centre. It is not to be changed, if it is changed it is difficult to maintain. They also will say excuse about the security. The way they should not be changed. All these, are just visions or are they just myths. To me they are myths. Are they bubbles or are they substance? To me they sound more like bubbles. For example, you put the heart before the horse or you take the body with the horse. This is what I mean solution before the problem. And we over rely on KPI Key Performance Indicators. This is the problem with assessment throughout the whole world. We want to do assessment. We want to know how to assess. Then we design some performance indicators. We tend to forget that they are just indicators and they are not the real quality. Not everything important can be measured and not everything measured is important. That is the limitation of assessment or KPI. We tend to forget and our KPIs become so powerful. It inflates the quality. The very common effect is that the designer of the effect has to help learning. According to the result we can design our learning.

Assessment is not for learning. But look at the development over world. Now assessment is of learning. So you test students and they get a score. That is a life changing consequence. They are getting a pass and they get a good job. And if they don't get a pass, they don't get a degree. Now assessment is key in learning than how in learning. That is called the brainwash effect. I cite an example of a house in Taiwan. I come from Taiwan and I know more about the houses in Taiwan. The index of the value of the house is money. The price of housing in Taiwan is so high. Because people do not buy the house for the purpose of living in the house. They buy for investment. The price is over the actual value of the house. That is an inflation. If you prick the bubble the bubble will blow up. Similarly bubbles of schooling is same. We have academic degrees. It is an indicator. It is just an indicator of your ability and skills. Students are chasing certificates. Degrees are overemphasized. You can see highly educated people with low skills. It is yet another bubble. Academic degrees are inflated. How to measure or assess educational technology. These are some common ways. One is this. How much time student spends on technology.How many resources you have provided. The more access you have over the resources the more successful you will be. Is that true? These are education technology bubbles. When we want to see how successful our education technology is please try not to use these indicators. They don't indicate success. They are something else. Another one is bandwagon. Harvard is doing it. Open courses. Everyone comes in studies for free. Some of them are high quality. Performance on exam is one of the common indicators. The recent hype is big data and learning analytics. AI. Any way the things to consider is how much they have spent, how much resources they have used, who do they talked to etc. these are learning bubbles. To me it is very difficult to point to student's learning.

Then my solutions. Education we progressed from 1.0 to 2.0 to 3.0 and now its 3.5. I like to mention about the food production. In the past in the food industry we made mass food production to fight hunger. Then we used pesticides to produce more. The chemicals harm our body. The food we eat now are no longer the same. It contains chemicals. That is why the movement of going back to organic food. In learning I am observing same trial. We are thinking of more learning. Let us think of removing additives. Think from the scratch fundamentally what learning should be.

These are the theories of learning. Behaviourist theory which is based on change in behaviour, it considers brain as black box, stimulus is given and response is brought. Negative and positive reinforcements are important. Then the cognitivist theorist says brain is computer, so we have input, information can be processed in brain, patterns, rules and principles are given, the teachers teach students, just remember this, just do all these, you apply it, you get it, so when the questions are applied we are very happy.

Then we have constructivist theory. The teachers are not all knowing. No matter how experienced the teachers are, they lack some expertise, especially in terms of technology. The students are sometimes better than teachers in technology. Some of the generations of teachers are exposed to technology. The teacher is a guide, often a facilitator, the teachers are to prefer a more interacting way. The students need not memorize. They need not stuff knowledge. Making mistakes has become a part of learning. Students can easily fail in the traditional sense. Then they learn. Then they are encouraged to do more experimentation. Give them problem. Challenge them to come with a solution. The student may deviate from the so called right solution. It does not matter. The more they try the more they learn. Then the social constructivist paradigm is even more challenging. Learning is an individual affair. Social constructivist says that we cannot learn in isolation. We learn by interacting with others. With the society, the community, the culture. We don't learn by ourselves. How to negotiate with others.How to co-construct with others.

I started my Ph.D in educational technology. Learning means taking in knowledge at that time. That is the very simplest way of looking at learning. Learning involves our whole body. If you ask me to write down the score of the music I cannot do, but if you ask me to play music, I can. The memory doesn't come from the brain only. It involves the whole body. It does not involve the fingers only. It also involves the breathing. In the current

learning also this is applicable. Let the students do with their hands. Think of this kind of organic learning. We learn with our five senses. There are tools we use for learning better like the glasses I use to see the world. Different students, different learners experience the world differently. Also different mediations, not only the body, but the community, the upbringing of the family influence the way they see the world. The learning is collaborative. Our learning has a growth spurt, just as our physical body which grows. We have different experiences and it helps the learning to have a growth spurt. There is a challenge to our education policies: by grade one they should have learnt this, by grade two they should have learnt that. Why are we forcing our children to learn in a linear way? Learning is non-linear.

Our language is symbolic. Small words are interpreted with more words. . It is circular way of understanding. We often forget that our language is symbolic. We are not at the facts of the ladder. We confuse with the facts and interpretations. So we should not force the student to accept one single interpretation of the word. We train them to conform to -isms when they are young while the interpretation we give is only one of the possible interpretations. If that is the case how can we help students to have their own interpretations? We have to encourage them to form their own interpretations. Then only they can come with their own comments and interpretations.

Question : Practical application of organic learning in your nation, are the students appreciating? The challenges that are faced, whether they add some more elements to technology.

These are my visions, so far no country has accepted. I have been talking to different policy makers. New Zealand and Switzerland are the two countries where there are no exams. In New Zealand you need not pass the examination to go to college. The door is wide open. This is their constitutional right. Once a person attains 20 years he has the right to go to any university to study. The school has no right to reject them. Just imagine that without exams how much our students enjoy learning. Assessment becomes for learning and not of learning. I have been promoting this idea, but it has not been done yet.

Just because a famous university is doing, we need not do it. That is why I told we should not chase bandwagons.

Why I promote organic learning is that I do not like our students to have exams. Assessment is to help us to know how far our students have learnt. Exams is so powerful that it affects our students' learning. Some students study just for high grades and not for learning. So that it is to me an additive which should be removed if possible. It is difficult.

Most of the time our students' learning can not be represented in numbers. Moving ahead from 3.5 to 4.0 infrastructure is more important. In Singapore there is ICT masterplan in every five years. Just think about the technology twenty years back and present. There is a huge difference. Technology develops so fast. So we have to upgrade every three years and not five years. On the top of that we need capable teachers, human beings is more important. I don't say training should be given to them because teachers can think. There should be more debates and discussions.

Technologically Rich Classroom Interactive Sessions: A Platform for Effective Learning Outcomes.

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Sub Theme: Changes in Educational Technology in 21st century.

Abstract

The use of Technology in Education has changed the face of education and it has created more educational opportunities. Both teachers and students have benefited from various educational technologies, teachers have learned how to integrate technology in their classrooms and students are getting more interested in learning with technology. Technology has helped in the growth of mobile learning . The use of internet technology has enabled teachers to reach students across borders and also students from developing countries .Though our schools use the technology resources ,most of the time the classroom interaction have technological support for the sake of using it. Planning a technological rich classroom interaction with far reaching learning outcomes rather than just completing the syllabus in stipulated time is rarely done. The present paper tries to put forward some guidelines to frame a technological rich classroom interaction session that produces learning outcomes with far reaching results.

Key words: Technology, Classroom, Interaction, Session

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Introduction

As educators our common goal is to empower students to achieve success to the best of their ability and foster skills and strategies, that will enable them to continue to develop beyond secondary education in the workplace. However, so much of assessment requires students to recall information for hours on end without the aid of technology. For the most part, rarely in the working world an employer would require individuals and teams to sit down and recall as much information as they can in a few hours off the top of their head to assess progress. Instead, we are expected to go out and find solutions to the problems and scenarios we face at work using every means available to us, predominantly technology. Technology in the classroom must be meaningful so that students are using real skills and strategies they can take with them. Technology is everywhere--entwined in almost every part of our culture

Assessment must then also be meaningful so that teachers are truly preparing students for the 'real world' and it is here that there is a gap that needs to be addressed. Computers, Wifi Technology & Internet, LCD projector, Gamification, Social Networking and Blogs, Audio Files – Podcasts, Cell Phones: Smart White Boards: LCD projector is commonly used technological devices in today's classrooms. Humans are becoming more dependent on technology and spend more time on the mobile and internet (Elsobeihi&Naser, 2017). In education field, it was revealed that modern equipment technology and tools make students' learning and interactivity improves (Raja &Nagasubramani, 2018). Unlike physical classrooms, online learning is flexible and students from different geographical locations can attend the same class with no need of traveling from those locations. Advancement in virtual technology has supported face-to-face communication between students and teachers in the virtual world. according to a study by David Nagel The most common devices used in classrooms this year were laptops followed by Chromebooks. Mobile phones came next and Paper/pencil came in fourth followed by tablets and then desktop PCs . This, it's clear that use of technology is now prevelent in every aspect of education.

Background of the study

Educational technology is redefining and leveraging smart learning. Mobility in the classroom and use of mobile devices like tablets, notebooks etc are helping to provide interactive learning to students. Mobile devices in the classroom managed with a powerful Mobile Device Management (MDM) provides a manageable, controlled and secured environment for learning. Educational technology is redefining and leveraging smart learning. Mobility in the classroom and use of mobile devices like tablets, notebooks etc are helping to provide interactive learning to students. Mobile devices in the classroom managed with a powerful Mobile Device Management (MDM) provides a manageable, controlled and secured environment for learning. In this case, students can easily ask their remote based educators' questions using virtual communication tools like SKYPE. Online education is a new wave in our education environment and it has made many educational courses and material accessible to anyone in the world. Blending the educational systems with online learning tools, this helps students of these institutions learn from anywhere. Technology helps students gain access to open educational resources. These resources are kept under the public domain and are freely available to anyone over the world-Wide-Web. These educational resources include electronic books (e-books) , pod-casts, digital libraries, educational games, educational videos and instructions, tutorials and much more. Teachers have embraced video hosting platforms like YouTube, to upload recorded lectures, so that students who missed lectures can access them from anywhere. Also the use of cell phones for educational purposes, helps students and teachers access educational information using Edu tech Apps . Teachers are also using lesson videos and clips online to learn how other

educators are using technology in classroom and education, these techniques and approaches uploaded by other educators promote self training and they help many teachers when it comes to integrating technology in their own classrooms. Website like TeacherTube, YouTube, 02 Learn, are providing free online lessons and videos to students, these videos have been created and uploaded by teachers and experienced educators. Teachers publish educational instructions on classroom blogs or they assign research work via email, and this gives a student time to study on their own and have no fear of making mistakes during the process of

learning. Also the use of Gamification educational technologies has increased students interest in learning, teachers use educational puzzles and video games to teach students how to solve different academic challenges, this all process makes students love to learn. Computers have word processing applications which students use to take notes in the classroom, these word processing applications have built-in dictionaries which help students auto-correct spelling errors and also correct their grammar in a sentence.

Different types of educational software are designed to help students learn various subjects easier. Many students complain that learning Math is difficult, so some of them have decided to use educational Math software like Braining Camp. Byju's Learning app is another educational software in use. Many teachers have discovered that integrating technology in their classroom increases student's engagement in the classroom. So now they put up technological competitions where students can make small educational technologies like robots, smart-pens, mobile applications and much more. These technological competitions in schools have increased the level of creativity and innovation among students. Technology teaches students how to solve challenges and get ready for more difficult tasks in life. With easy access to all these technological advancements in education it is a easy task to plan the interactive session in class so as to align the learning in an organized way rather than just presenting the topics to be introduced in classes for the sake of using technology.

Need and Significance of the study

This is the age of digital natives with even the small children being familiar with the use of different technological advancements .Use of technology in classrooms is inevitable in today's age as there is no one who doesn't use technology nowadays. Students must be prepared to face the realities of life once they step out of the school premises. Even small kids now have access to electronic gadgets which make them much familiar to the field of technology. Technological inventions have become an essential element of human existence. If used correctly, mobile devices and the applications they support, will help prepare students for their future careers. Prudent and wise use of the technological advancements should be exercised in each classroom for training the learner for a future life.

Learners have different ways of learning. The teacher in a conventional way cannot humanly reach out to all the students in a similarly effective manner. Use of technology lessens this gap of learning between learners. Technology in the classroom is an effective way to connect with students of all learning styles and interests.

Technology helps students be more responsible. Owning your own device or borrowing the school's devices gives students the opportunity to improve their decision making skills as well as taking ownership of a valuable (and often times expensive) device. Proper digital citizenship training can bring the best out of the learner. Technology in classrooms gives students the opportunity to enhance the interaction with their classmates and instructors by encouraging collaboration and co-operation . Most students today have been using mobile devices like tablets and smartphones to play and learn since they could crawl. So it only seems logical to align today's classrooms with the way that your students want and are used to learning. It helps in keeping the child engaged in his study to a great extent. , students are able to access the most up-to-date information quicker and easier than ever before. Technology transforms the learning experience. There has always been a debate whether the incorporation of technology in the classroom will surpass the need of a teacher in class, which is a very irrelevant concern in every sense. Students as well as teachers have access to an incredible amount of new opportunities

which not only empowers students to be more creative and be more connected with real world issues but also decreases the teaching load of the teacher. Combining new tech like VR (virtual reality) with traditional classroom instruction is one example of how the introduction of new technology can enhance the learning experience and create new opportunities.

Why technology has become an integral part of Education ?

Three factors that lead to growth and learning which is based on increased human capacity have been identified.

Capital deepening - the ability of the user to use equipment that is more productive than earlier versions

Higher quality learners- a more knowledgeable learning innovators that is able to add value to economic output.

Technological innovation - the ability of the teacher and taught to create, distribute, share and use of the new knowledge.

The basic approaches taken to link technology to educational situations can be summarised as below:

Technology literacy approach -Increasing the extent to which new technology is used by students and educationalists by incorporating technology skills into the school curriculum.

Knowledge deepening approach -Increasing the ability of students, citizens and educationalists to use knowledge to add value to society and the economy by applying it to solve complex, realworld problems.

The Knowledge Creation approach -Increasing the ability of students, citizens, and the educationalists to innovate, produce new knowledge, and benefit from this new knowledge.

"Our aim was to encourage far higher levels of active student engagement, where knowledge is obtained by sharing, problem-solving and creating, rather than by passive listening. This classroom enables both active engagement and equal access" by lead researcher, Liz Burdon Britain's Durham University (2012).

Planning a Technological rich classroom interaction

Use of technology in the classroom can be so much more and so much better if planned precisely to include all the aspects that lead a student to know more about a topic with which he can relate to in real life. Planning a technological rich classroom interaction seems not an easy task but if some aspects are kept in mind while framing a session , the result will be advantageous both to the taught as well as the teacher. Use of technology for the sake of using it may not give the expected learning outcomes even after much investment of time and money. An educational session imparted to the students must keep them in touch with the real life problems or issues they are encountering or may encounter in the future. I would be like to make the concept clear by taking an issue we are encountering now. Take for instance the Energy crisis we are facing. It's a common talk about how to deal with the problem of the fastly depleting energy resources and use of alternative forms of energy like solar energy and wind energy to avoid the crisis and also address

the related issues like implementation of the same in real life. While planning a lesson based on technology, the major objective must be to make the topic as clear and touching for the students, rather that just using the

technology for the sake of using it. If a few aspects are kept in mind when exploring the use of technology for instructional or educational purposes the results will surely have a long term impact on the learners.

1)Plan activities that provides hands on experience with the learning material. Technology is interactive, and students learn by doing, researching, and receiving feedback. This helps students become passionate about what they are learning. Let's take teaching of teaching the topic Energy to the students . We tell them about the different types of energy and even show them pictures of the same. We tell them that use of renewable sources of energy is advisable. But the teaching would be more effective if we give them some hands on experience to remember like assembling a solar panel by themselves. This is where the apt use of technology comes. Instruct the learner to use net based project sites for doing the same. Now the question arises whether a primary school learner completes the work or not. It can be assigned as a home project or group project work where the learner can seek the help of parents or teachers. When a learner does something on his own with his hands by himself he is sure to be influenced by the learning to a greater level.

2)Incorporate real life issues familiar to the learner. Learning becomes more effective by the use of real-world problems in the classroom. By using the Internet, students can research real issues happening at that moment that are related to the classroom curriculum. This helps students understand that the lesson being taught refers to real problems and real people. For instance for making the learners aware of the energy crisis faced nowadays, what can be better way than familiarizing the topic with videos and documentaries about the same rather than sticking to few words given in the textbook.,

3) Encourage learning situations that requires learner to build up concepts through simulated situations. Simulation software helps to bring to the classroom real activities that would be impossible to see without technology. By using specific simulation tools, students can see pl how a wind mill works, develop specific values for length of the wind blade through appropriate calculations by varying the air density or other related factors that determine the same. Simulated learning allow students to see the dynamic characteristics of models.

4) Include Discussions and debates boards and groups online under the active guidance of the teacher. By using the Internet or software tools, students can create online groups, wtsapp groups, Web pages, and virtual communities that connect them in real time with students and teachers anywhere around the world. Sharing information within seconds about our opinions , alternative uses of energy resources and the like can be carried with ease if there are online groups for the same under the guidance of the teacher.They can receive feedback from their teachers and share questions and concerns about their lessons. By listening to and reading about others' opinions and feedback, students refine their thinking, reaching higher levels of comprehension and deeper understanding. Online communities also present the opportunity for students to interact with others around the world.

5)Divide the class into groups for working.

Incorporating technology doesn't mean alienation from the class and catering only to individual needs.Technology-focused education doesn't involve a class of students learning by themselves, staring at a book. Working groups foster group activities, discussions, and debates, and they encourage the establishment of democratic group dynamics. For teaching energy the class can be divided into groups and each group can be made to make a simple powerpoint presentation about the particular type of energy (wind energy, solar energy, biofuels, hydroelectric energy etc)

6)Active guidance of the teacher. . Teachers are guides and facilitators in modern time classroom. They aren't just instructors who deliver a lesson. Rather, they support and guide student activities as coaches do. They provide feedback and guidelines to the class so that students receive the appropriate information and academic training. Teachers guide students in developing skills in problem solving, research, and decision-making. After

dividing the class into groups for making presentation about the various aspects of use of energy , the teacher can guide the groups so as to present their finding in the most effective manner and maybe incorporate more related ideas regarding the same.

7)Provide timely feedback on the progress of the learner. Teachers ensure that students are learning not only the concepts, but also how to use the technology resources they have. Technology-focused activities mostly require critical-thinking and problem- solving skills. Teachers work as facilitators, providing constant feedback, enabling students to achieve deeper levels of understanding and enabling them to have an attitudinal change as well as behavioral

change be it the case of judicious use of energy or any other aspect of common concern of human existence.

8)Plan activities that stimulate the curiosity of the learner.

Teaching is all about introducing students to a whole world of concepts that they didn't know about yet. Technology in the classroom is like a foray into modern invention – and you get to be the expedition leader. Rather than viewing digital devices and Internet spaces as a threat to your duties, view them as unexplored areas of growth for both you and the young minds trusting you to show them what's out there.

Conclusion

The traditional mode of learning has some flaws within it preventing effective learning. Modern technologies provide numerous avenues and improvements which can help in these issues being addressed and overcome to cater for effective and learning. By harnessing technology, learners are made familiar with the technologies therefore reduction of training costs in environments such as the workplace as well as individuals learning the importance of using technology. Individuals are also able to faster develop superior cognitive capabilities earlier due to technologies having internet access to grow knowledge and have easy access to information. Students also using technology to study have also shown better results as compared to those not as well as them having a heightened interest to learn. However, technology is expensive to utilize since there are costs associated with the initial design and set up of systems used to collect information, create knowledge and support knowledge sharing and access. The technologies are also complex and therefore hard to find an appropriate vendor to construct the services. The best solution would be to implement technology since the initial cost may be high however there is a long term cost competitive advantage achieved as well as better education offering.

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The Challenges and Issues of ICT Integration in Rural Secondary Schools in Kerala

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Abstract

Education at schools and higher levels is undoubtedly of high standards with high literacy rates whereas the most pronounced and evident digital divide occurs in the educational sector which exacerbates the existing divides in society penetrating economic, social, geographic, gender, age and other divides. This paper is an attempt to understand the wider gap in the digital access and use of Information and Communication Technology (ICTs) in education and to assess those factors that hinders its access and use. It is expected that education, particularly with the introduction of ICTs, contributes to higher rates of technology adoption. Still there are serious issues in rural schools which prevent students from fully benefiting these technologies due to lack of access, inadequate infrastructure, poor connectivity, insufficient number of ICT skilled teachers, absence of proper technical staff for support and timely maintenance of the age- old equipments etc. In most of the schools, ICTs are ubiquitous but its real integration in the teaching-learning process and in improving the quality of education is very minimal. Since the movement from the conventional education to a new phase, urge for innovation in education through technology is a benchmark.

Key Words: ICT, Rural Education, Digital Divide, Access, Knowledge Society

Introduction

Education has become a vast and complex institution across the world stimulating social change and development. Information and Communication Technology (ICTs), offers new possibilities beyond the four walls of traditional classroom. It has the power to take education to a higher domain. The digital age has an integral role in bringing technology and education together. The use of ICT in school education in developed countries is quite different from that of developing ones. Developed economies are more advanced in integrating new technologies in its educational system. ICT in fact improves the quality of education but at the same time, it maximizes the gap between the rich and the poor. ICTs have brought about changes in schools which in turn provide wider educational opportunities. Education finds better place for integrating ICTs as it acts as a catalyst for bringing change in teaching styles, learning approaches and in access to information (Watson, 2006). The growing use of ICT improves education and offers a new academic environment for students.

Though rural education was given priority in the process of planning and policy implementations, the expected outcomes were not obtained. There is a strong relationship between education and regional differences. As the schools in urban areas are having required facilities, the rural schools struggle to achieve adequate provision of materials and facilities needed for better educational services. Rural areas have to face many gaps like physical infrastructure, institutional facilities and human capital. Besides, lack of knowledge, skills, time and equipment's, issues in maintenance, connectivity problems, insufficient funds and sustainability of ICT-enabled projects are challenges that schools in developing countries face in introducing ICTs (Ward, 2007 &Katoch, 2012).

Background of the Study

The application and use of ICTs in school education is on an increase where in the near future courses will be offered completely online. Most of the online learning platforms such as e-learning, virtual learning, m-learning, ubiquitous learning, blended learning, MOOCs etc has altered the scope of 21st century education. As these new technologies have been integrated to make education more efficient and effective. With them there are possibilities for transforming teaching-learning process substantially than ever before. Adoption of ICTs in schools is connected with several domains such as the overall institutional domain, school development, teaching - learning environments etc. Thus, the integration of ICTs in education has a varied effect at institutional, pedagogical and curricular levels. Therefore, it is essential for exposing students to acquire skills which are needed for the 21st century education.

In spite of many technological developments, the provision of quality education to remote and rural areas remains poor. Lack of proper education, health care and inadequate infrastructure are the greater barriers for the effective implementation of rural development programmes like EDUSAT, Tele-education, E-learning etc.

Draft National Education Policy, 2016 (MHRD, 2016) also stated that though there were huge developments in ICTs during the past decades, the slow progress in its use in education has resulted in serious backdrops. The potential benefits and use of ICTs in education remains limited. Therefore, efforts need to be accelerated in order to improve the quality education through the use of ICT. The benefits of ICTs are not equal everywhere, it creates disparities in developing and disadvantaged communities. “Rural schools are often poorly repaired, equipped and staffed with poorly paid teachers” (Breccia &Hermanowicz, 2006). The main reasons behind the poor quality of rural education are dismal standards of rural education, infrastructural inequities, lack of connectivity and unavailability of teachers etc.

Objectives

The study aims to identify the major impediments in ICT integration in rural secondary schools in Kerala. It also attempts to examine what are the limitations of and challenges to ICT- enabled education into rural schools.It further addresses the broader issues prevailing in education and rural areas.

Methodology

The present study is descriptive and analytical in nature. It is based on primary data which was collected using a well-structured questionnaire from the school principals, teachers and students. The field work was carried out in three districts during August to December, 2017. Samples were collected through multi-stage random sampling technique as it involved the selection of districts, type of schools, medium of instruction and standard of study etc. A total of 43 schools including both Government and Aided schools were selected as sample for the study.

Analysis and Discussion

The barriers of ICT adoption in schools were mainly grouped into three levels- the school level, teacher level and student level. The perceived barriers related to the use of ICT in rural schools are enormous mainly due to geographical difficulties, poor infrastructure build-up, absence of proper electricity, shortage of smart classrooms, poor internet connectivity etc.

Table 1.1 Major Barriers in ICT – enabled education in schools

Barriers	n	%	Rank
High cost of ICT equipment's	2	4.65	15.5
Inadequate funding	9	20.93	8
Lack of power supply	8	18.60	9.5
Delay in timely maintenance	8	18.60	9.5
High student – computer ratio	25	58.14	3
Insufficient number of computers	32	74.42	1
Insufficient number of networked computers	3	6.98	13.5
Absence of trained faculty	12	27.91	4.5
Poor connectivity	10	23.26	6.5
Lack of time	12	27.91	4.5
Difficulties in updating software's	7	16.28	11
Lack of interest of teachers	10	23.26	6.5
Constraints in ICT integration into normal school curriculum	4	9.30	12
Lack of adequate content/ material for teaching	3	6.98	13.5
Problems of accessibility to existing hardware	2	4.65	15
Any other	26	60.47	2

Source: Primary Survey

Table 1.1 shows the major constraints faced by schools in adopting ICTs. The result indicates that insufficient number of computers (74.42 percent) was the major problem for non- utilization of ICTs in schools. High student to computer ratio was shown as the significant barrier by 58.14 percent schools only 27.91 percentopinioned lack of trained faculty and lack of time as the major hindrances. Poor internet connectivity and lack of interest of teachers too were enduring issues in the adoption of ICTs. The other major reason is the lack of funds (20.93 percent), lack of power supply (18.60 percent) and delay in timely maintenance of ICT peripherals (18.60 percent). Besides, there were other challenges such as difficulties in updating software's, constraints in integrating ICTs into the normal school curriculum, insufficient number of internet connected computers, unavailability of adequate digital contents and problems in accessing ICT peripherals.

In addition, schools also faced many other challenges in their ICT adoption which are summarized as follows: -

- Worse/poor condition of classrooms (absence of electrified and networked classrooms)
- Unreliable Electric supply
- Lack of basic physical infrastructure facilities such as good building, secured classrooms (School buildings unfit for ICT usage)

- Unavailability of computer lab and absence of space, furniture's and internet connectivity.
- Large number of damaged computers (kept as E-wastes).
- Sharing of a single computer lab by U.P and High schools.
- Absence of Separate teachers for handling ICT
- Insufficient number of teachers
- Lack of ICT training for teachers
- Shortage of Smart classrooms
- Lack of maintenance staff
- Functioning of computer lab and smart class in the same room

Teachers' Obstacles for Effective ICT use

The major inhibiting factors that led to teachers' non- usage of ICTs in schools is related to insufficient, damaged and out- dated equipments followed by pedagogy related factors like teachers' poor ICT skills, insufficient technical support and content, absence of earlier models and difficulty for ICT integration in teaching, lack of clear cut ICT goals and reluctance from the part of teachers to use it (European Commission, 2013). Lack of time and confidence along with fewer number of ICT equipments, difficulties in using ICTs in classrooms, inadequate training in handling these devices and indifferent attitude are the problems encountered by teachers in utilising ICT (Bhat, 2016).

Table 1.2 Barriers in effective Utilization of ICT

Barriers	n	%
Insufficient ICT equipment (Computers, projectors, Laptop, etc.)	91	54.17
Inadequate technical and administrative support	66	39.29
Lack of time	62	36.90
Lack of ICT experience/skills	56	33.33
Any other reason (specify)	55	32.74
Lack of interest/motivation	39	23.21
Limited ICT Training	30	17.86
Poor connectivity	30	17.86
Lack of adequate content/material	21	12.50
Lack of access	20	11.90
Difficult to integrate ICT into the curriculum	17	10.12
Language barriers	3	1.79

Source: Primary survey

Table 1.2 shows teachers' perceived obstacles for the effective use of ICT in teaching which is ranked on the basis of the 'most significant' barrier to the 'least significant' one. They rated 'insufficient ICT equipments' (54.17 percent) as the most significant factor hindering the utilization of ICTs at school which is followed by inadequate technical and administrative support (39.29 percent) and teachers' lack of time to integrate ICT in teaching (36.90 percent). While, 33.33 percent of teachers rated lack of ICT experience or poor ICT skill, 23.21 percent rated indifferent attitude towards ICT as major obstacles in integrating ICTs at school.

Limited number of ICT training received, poor access to internet connectivity, inadequate digital contents, lack of access to ICT resources, difficulty in integrating ICT into the curriculum and language barriers were also considered as greater obstacles for teachers. It is understood from the in-depth interviews with teachers, that they also have other challenges such as content overload, poor infrastructure, delay in maintenance of damaged ICT equipment's, electricity problems, shortage of classrooms to conduct ICT-enabled teaching, lack of technical staff for assistance, unavailability of computer labs/smart classrooms for access, lack of technical skills to operate projectors and other multi-media devices, physical constraints like difficulty in using computers for a long time period, lack of subject-wise ICT training and lack of continuous and regular training programmes.

Problems Encountered by Students

Factors that affect students' access to and use of ICTs at school include insufficient ICT peripherals, lack of access to computers, internet and other ICT peripherals, inadequate ICT skills and knowledge and lack of necessary support and guidance from schools. Poor accessibility to ICT peripherals was the biggest problem marked by students. The non-utilization of ICTs in the teaching-learning process adversely affected students' competence and achievements.

Table 1.3 Major Barriers encountered by Students

Barriers	n	%
Lack of access to computer	240	62.34
Lack of time	215	55.84
Poor ICT skills	194	50.39
Insufficient ICT peripherals	167	43.38
Lack of access to internet	104	27.01
Teachers lack of knowledge/skills	89	23.12
Poor/slow connection	73	18.96
Lack of guidance from school	66	17.14

Others	179	46.49

Source: Primary Survey

The major problems encountered by students in their access to and use of ICTs at school includes lack of access to computers (62.34 percent), lack of time (55.84 percent), poor ICT skills (50.39 percent), insufficient ICT peripherals (43.38 percent) including projectors, interactive white boards, speakers etc. Students indicate other barriers too, such as lack of access to internet (27.01 percent), poor ICT knowledge of teachers (23.12 percent), unreliable connectivity (18.96 percent) and lack of proper guidance from school (17.14 percent). There are still other problems like, absence of electric connection, unfit school buildings, damage of ICT equipment's, language barriers, insufficiency of smart classrooms etc.

Lack of access to computers and internet is one of the major constraints faced by students in effectively utilizing ICTs as they got access to computers only at the computer lab and not in classrooms, library or other places. Moreover, students were allowed to use ICTs at school during the ICT periods and were not given any extra time for effectively using them.

Level of ICT Integration

In order to assess the level of ICT integration in schools they were categorized into three stages based on their extent of ICT utilization in education; introductory level, integration level or an advanced level of better ICT utilization in the teaching-learning process.

Table 1.4 Extent of ICT Integration

Level of ICT integration	**n**	**%**
Introductory stage	22	51.16
Integration stage	20	46.51
Effective utilization stage	1	2.33
Total	43	100.00

Source: Primary Survey

Though almost 10-12 years have passed since the implementation of ICTs in most of the schools, there is no drastic change happened in the school system. Table 1.4 shows that 51.16 percent of the schools remain in their beginning stage with absence of adequate ICT infrastructure, limited integration in the teaching-learning process, lack of time and teacher's inefficiency to use ICTs, whereas 46.51 percent showed some positive advancements towards ICT adoption. Greater efforts and active participation are still required for these schools to move towards complete ICT-enabled education.

Conclusion

Though the potential benefits of ICTs bring positive result in education, there continues to be difficulties in adopting these new technologies. It is evident from the findings that the integration of ICT in teaching-learning process is limited as lesser schools had so far embedded it into their educational system to a significant extent.

The issues and challenges of bringing ICT-enabled education especially to rural areas are massive. Lack of awareness, rural illiteracy, barriers for ICT access and utilization are the major problems faced. Ensuring its maximum utilization in the teaching-learning process could have wider impact in expanding educational opportunities.

Several new and innovative strategies were adopted for improving the quality of education which includes, Hi-Tech School Programme for equipping 45,000 classrooms into Hi-Tech by providing necessary laptops, projectors, interactive white boards, LCD TVs, speakers, high speed broadband internet connectivity etc, Online training platform for teachers (KOOL), SAMAGRA E-Resource portal for enabling adequate content for all subjects from class 1 to 12, Little KITES – student's IT Club for improving students ICT skills. Thus, thestate government has recently made substantial interventions to revamp the public education system, especially with the creation of massive infrastructure for ICT integrated teaching and learning. However, all these could bring about positive outcomes up to the intended level, only if the impediments captured in the study are successfully overcome.

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LOGICAL-MATHEMATICAL INTELLIGENCE OF HIGHER SECONDARY STUDENTS

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Abstract

(The present study is aimed to know and assessing the level of logical mathematical intelligence of higher secondary students in Tirunelveli district. The objectives of the study are; a) to find out the level of logical mathematical intelligence of higher secondary students with reference to gender. b) to find out the significant differences in higher secondary students in their mathematical intelligence with reference to gender and type of family. c) to find out the significance difference among boys, girls and co-education school higher secondary students in their logical mathematical intelligence. The investigators has used simple random sampling technique for selecting a sample by survey method. Sample consists of 300 higher secondary students from XI standard maths group in Tirunelveli district. Logical-mathematical intelligence tool (Kanmani&Annaraja, 2009) was used. Mean, standard deviation, 't' test and ANOVA were used as statistical techniques to analyses the data. The findings showed that 19.0% of the higher secondary students have higher level of logical mathematical intelligence. 13.7% of the boys have high level of logical mathematical intelligence and 23.1% of the girls have high level of logical mathematical intelligence. The findings showed that the girls are better than boys in their logical mathematical intelligence. No significance difference is found between nuclear and joint family higher secondary students in their logical mathematical intelligence. The girls' school students are better in their logical mathematical intelligence).

Key words: logical intelligence, mathematical intelligence, co- education, problem solving

Introduction Intelligence is an ability to create an effective product or offer a service that is valued in a culture. It is also a set of skills that make it possible for a person to solve problems in

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life. Intelligence as a potential to gather new knowledge for getting solutions over problem. The concept of intelligence encompasses the way many aspects of our mental processes happen, including our self-awareness, our level of understanding, our ability to think abstractly, our ability to learn new information, and our ability to interpret material that is presented to us. Intelligence involves problem solving, planning, memory, emotions, and much more. Howard Gardner (1993) defined intelligence as 'ability to solve problems or fashion products that are of consequence in a particular cultural setting or community. Logical-mathematical intelligence Logical/mathematical intelligence involves the mental capacity to understand numbers, scientific processes, logic, and reasoning. Many professions use logical intelligence to perform their daily tasks, such as accountants, engineers, computer programmers, and mathematicians. Even ordinary people use their logical intelligence to

accomplish their everyday activities, such as balancing a checkbook, solving word problems, number puzzles, and comprehending the latest scientific discovery in their monthly magazine. Students can engage in a variety of logical/mathematical intelligence activities in the classroom, including brain teasers, strategical games, logical puzzles, and any games that challenge the student to plan ahead accordingly. Students use their mathematical intelligence in a variety of scientific disciplines. The majority of students will demonstrate their mathematical intelligence in laboratories, observatories, or by crafting science fair projects. Students strong in logical intelligence can think in numerical terms, mathematical patterns, and logical sequences. Students who lack mathematical intelligence can work on developing this mental faculty through a series of exercises. Students who engage in regular logical/mathematical intelligence activities will learn how to manipulate their environment by experimenting with objects in an orderly fashion. Children can also work on brain teasers and number puzzles that challenge their logical faculties. Other children can work on becoming proficient at keyboarding and understanding computer dynamics. Other logical/mathematical intelligence activities include working with chemistry sets, solving word problems without a calculator, pretending to own a business, reading science magazines, watching scientific television shows, visiting a science museum or planetarium, playing with a rubrics cube, setting up a telescope or microscope, help with family finances, and learning to play a musical instrument. Children who immerse themselves in logical-mathematical activities will soon find themselves performing well on their mathematical and science tests. In addition, they will start solving real-life situations without asking for guidance. Significance of the study The human mind is always looking for patterns and relationships; mathematics is just one formalized way in which we do this. Even very young children can extend a pattern by making a leap of logic. The logical - mathematical intelligence is wakened when the brain or mind sees a problem it needs to solve. The first encounter with a problem that can only be solved by the logical - mathematical intelligence is probably in the nursery when a baby sees patterns in the objects around the room and decides to rearrange the objects to fit another pattern they have in mind. It is still like that in adulthood and beyond. Logical-mathematical learners have a profound knowledge in disciplines involving math and logic. Logicalmathematical intelligence is one of the many intelligence types as stated by Howard Gardner. People belonging to this intelligence type have exceptional logical skills and a great affinity towards mathematics and reasoning. According to them, the solution to every problem lies in simple logic. They believe in applying reason and detecting suitable patterns to arrive at a solution. Many of them can easily solve math problems mentally, without having to resort to pen and paper. They keep thinking about the problem continuously, compute the problem step-by-step, and arrive at a solution. In short, they have a 'computer-like' mind. Logicalmathematical learners have a profound knowledge in disciplines involving math and logic. Logical-mathematical intelligence consists of many factors related to the analytical, synthetic and integration functioning of the mind. When developed well the person becomes a divergent thinker. Reasoning, problem solving, and decision-making represent different but overlapping aspects of human intelligences. Although interrelated, research on each of these three aspects of thinking is enormous. So that the investigators wants to know and assessing the level of logical mathematical intelligence of higher secondary students in Tirunelveli district.

Definition of Key Terms Logical Mathematical Intelligence By the term logical mathematical intelligence is the capacity to reason, calculate, recognize pattern and compute logical problems. Higher Secondary Students The students who are studying XI standard mathematics in higher secondary schools of Tirunelveli Educational District, Tamilnadu. Methodology The investigators used simple random sampling technique for selecting a sample by survey method. Sample consists of 300 higher secondary students from XI standard maths group in Tirunelveli district. Logical-mathematical intelligence tool (Kanmani&Annaraja, 2009) was used. Mean, standard deviation, 't' test and ANOVA were used as statistical techniques to analyses the data. Objectives of the study 1.To find out the level of logical mathematical intelligence of higher secondary students. 2. To find out the level of logical mathematical intelligence of higher secondary students with reference to gender. 3. To find out the significant difference between nuclear and joint family higher secondary students in their mathematical intelligence. 5. To find out the significance difference in logical mathematical intelligence among those students

who follow co-education at higher secondary level. Hypotheses 1. There is no significant difference between boys and girls higher secondary students in their logical mathematical intelligence 2. There is no significant difference between nuclear and joint family higher secondary students in their logical mathematical intelligence. 3.There is no significance difference in logical mathematical intelligence among those students who follow co-education at higher secondary level.

Analysis of the Data

1. To find out the level of logical mathematical intelligence of higher secondary standard students.

Table 1 Level of logical mathematical intelligence of higher secondary standard students Variable Low Moderate High

Logical mathematical intelligence

N % N % N % 88 29.3 155 51.7 57 19.0 It is inferred from the above table that 29.3% of higher secondary students have low, 51.7% of them have moderate and 19.0% of them have high level of logical mathematical intelligence. 2. To find out the level of logical mathematical intelligence of higher secondary students with reference to gender. Table 2 Level of logical mathematical intelligence of higher secondary students with reference to gender Gender Low Moderate High N % N % N % Boys 43 32.1 71 54.2 18 13.7 Girls 46 27.2 84 49.7 39 23.1 It is inferred from the above table that among boys, 32.1% of them have low, 54.2% of them have moderate and 13.7% of them have high level of logical mathematical intelligence. Regarding girls, 27.2% of them have low, 49.7% of them have moderate and 23.1% of them have high level of logical mathematical intelligence.

Table 3 Difference between boys and girls higher secondary students in their logical mathematical intelligence Variable Gender N Mean SD Calculated 't' value Remarks at 5% level Logical mathematical intelligence Boys 131 44.70 14.72 1.98 S Girls 169 48.28 16.44 (At 5% level of significance, the table value of 't' is 1.96)

It is inferred from the above table that the calculated 't' values is greater than the table value. Hence the null hypothesis is rejected. It shows that there is significance difference between boys and girls higher secondary students in their logical mathematical intelligence. Table 4 Difference between nuclear and joint family higher secondary students in their logical mathematical intelligence Variable Type of family N Mean SD Calculated 't' value Remarks at 5% level Logical mathematical intelligence Nuclear 229 47.04 15.93 0.64 NS Joint 71 45.69 15.38 (At 5% level of significance, the table value of 't' is 1.96)

It is inferred from the above table that the calculated 't' values is less than the table value. Hence the null hypothesis is accepted. It shows that there is no significance difference between nuclear and joint family higher secondary students in their logical mathematical intelligence. Table 5 Difference among boys, girls and co-education school higher secondary students in their logical mathematical intelligence Variable Source of variation Sum of squares Mean square Calculated 'F' value Remarks at 5% level Logical mathematical intelligence Between 5737.50 2868.75 12.38 S Within 68810.97 231.68 (At 5% level of significance for (2,297) df the table value of 'F' is 3.03) It is inferred from the above table that the calculated value of 'F' is greater than the table value at 5% level of significance. Hence the hypothesis rejected. It shows that there is significant difference among boys, girls and co-education school higher secondary students in their logical mathematical intelligence. Results & Conclusion Regarding percentage analysis of the sample, 29.3% of higher secondary students have low, 51.7% of them have moderate and 19.0% of them have high level of logical mathematical intelligence. Regarding gender, among boys, 32.1% of them have low, 54.2% of them have moderate and 13.7% of them have high level of logical mathematical intelligence. Regarding girls, 27.2% of them have low, 49.7% of them have moderate and 23.1% of them have high level of logical mathematical intelligence. The findings showed that there is significance difference between boys and girls higher secondary students in their logical mathematical

intelligence. While comparing the mean scores of boys (M=44.70) and girls (48.28), the girls are better than boys in their logical mathematical intelligence. There is no significance difference between nuclear and joint family higher secondary students in their logical mathematical intelligence. There is significant difference among boys, girls and coeducation school higher secondary students in their logical mathematical intelligence. While comparing the mean scores of boys school (M=48.98), girls (M=49.89) and co-education (M=40.22) higher secondary students, the girls school students are better in their logical mathematical intelligence. References: 1. Aggarwal, J. C. (1966). Educational Research: An Introduction. New Delhi. Arya Book Depot. 2. Aggarwal, Y. P. (2005). Statistical Methods. New Delhi. Vikas Publishing house Pvt. Ltd. 3. Gardner, H. (1999). The disciplined mind: What all students should understand, New York.Simon & Schuster. 4. Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. New York. Basic books. 5. Sternberg, R. J. (1985). Beyond IQ: A triarchic theory of human intelligence. New York. U.S. A: Cambridge University Press. 6. Sharma, R. A. (2004). Essentials of Scientific and Behavioral Research. Meerut: R. Lall Book Depot.

Effectiveness of Web Based Learning Materials in Biology at Higher Secondary Level

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Abstract

With emerging new technologies, the teaching field is evolving from a teacher- centred, teacher based instruction to a student centred interactive learning environment. “The richness of technology permits us to provide a richer and more exciting learning environment. Our concern is the new understandings and new capabilities that are possible through the use of technology. Technology specifically, Information and Communication Technology involves in school education in two ways- as a subject to be learnt and as a tool in teaching learning process. Web based learning is a powerful instructional strategy that enhances students’ ability to remember and retain information. This is because it presents multiple representations of a single concept. Static pictures and hand layouts are insufficient in retaining the concepts for a longer period of time. In higher education web-based learning environments have been used to support student learning, to provide a platform for a dynamic engagement between students and lecturers outside the physical classroom and to enhance student autonomy. This paper attempts to find out the Effectiveness of Web Based Learning Materials in Biology at Higher Secondary Level. Experimental method was adopted in this study. Samples were divided into Control and Experimental groups. Control group was taught by Activity Oriented Method and Experimental group with Web Based Learning Method. Pre-test and post-test was administered to both the groups. The findings of the study reveal that the achievement in Biology of students exposed to Web Based Learning Method is better than those of students exposed to Activity Oriented Method

Introduction

India is a country of millions of youth minds, seeking knowledge to move ahead in contrary to their limit. This time is important for India to get prepare for the future hence requiring education in full fledge. Though, we have many schools, enough teachers and facilities for students and teachers, there is great variation in the quality of education and is due to some factors like social background of students and parents, different standards of teacher training programs and lack of adequate competencies of teachers. This fetches the need of WBL-Web Based Learning. Technological change, which not only permits new activities but makes those new activities superior in many important ways over the previous method of operation, creates long lasting innovations in society. As a result of rapid growth of Internet, Web based learning soon revolutionized the field of education. Some reasons behind this are that WBL (a) promotes growth of distance education economically as compared to computer based training, (b) live broadcasts, video tapes and so on enables learners who prefer or are required to learn outside traditional classrooms to attend classes at their homes or offices, and (c) provides delivery medium, content provider, and subject matter in one package, unlike other mediums, such as computer based training, that require a separate delivery mechanism. In the words of Barron (1998),"Web based instruction is defined as the delivery of instruction via the World Wide Web. Such instruction may be delivered as a stand-alone course that does not include any face-to-face interaction between teacher and student or may be a supplement to traditional classroom instruction". Web based learning is a powerful instructional strategy that enhances students' ability to remember and retain information. This is because it presents multiple representations of a single concept. Static pictures and hand layouts are insufficient in retaining the concepts for a longer period of time. Web based learning can improve the quality of teaching learning and management in schools and there by helps to raise standards.

2. Rationale of the Study

The knowledge of using Web Based Learning Method are essential for teacher and students. Such knowledge helps them to develop a better understanding of the Biology concept:

Understanding enables the teacher,

- To acquire necessary skills in learning
- To develop a positive attitude
- To develop interest in learning
- To guide the learner's growth and development

In the modern education technology, the Web based teaching and learning has been found to be more effective and time saving. The web resources plays vital role in making the web based teaching and learning and it is more functional and effective.

Objectives of the study

1. To prepare and validate Web Based Learning Materials in Biology for Higher Secondary Students.
2. To test the effectiveness of the Web Based Learning Materials by comparing the Achievement in Biology of the Web Based Learning Group and Activity Oriented Method Group for total sample in terms of :
    i. Pre-test Achievement
    ii. Immediate Post-test Achievement
3. To identify the practical difficulties likely to be encountered by Higher Secondary School teachers in Biology while using the Web Based Learning Materials.

Methods and Materials

Experimental method was adopted in this study. Pre-test was administered in order to find out the entry behaviour of the students towards Web Based Learning in Biology. Sample consists of 80 Biology students of which 40 of control group and another 40 for experimental group. The investigator taught the topic “Breathing and Exchange of Gases” using many related websites in Biology, to acquire information. Opportunity was given to the students to explore the websites at their own pace. Post- test was conducted in order to find out the effectiveness of Web Based Learning Materials. An achievement test was prepared by the investigator with 22 questions. Scores of the achievement test was used in the statistical analysis. A Rating Scale was prepared for technical and content validation of the Web Based Learning Material. A questionnaire was prepared to collect the practical difficulties encountered by the Higher Secondary School Biology teachers while using the Web Based Learning Material.

1.Web Based Learning Materials in Biology

The existing methods followed in the schools are without taking in to consideration of the needs and individual differences of the students. For satisfying the needs of the individual differences and to make teaching learning process effective by developing various innovative and individualized instructional strategies. These strategies ensure the active participation of the students and facilitate more learning. So, a need was felt by the investigator to develop Web Based Learning Materials in Biology named ‘www.bioetutor.in’ for class XI students.

1.1 Designing of the Web Based Learning Materials

The investigator prepared Web Based Learning Materials in Biology based on the topic 'Breathing and Exchange of Gases" of class XI [Based on NCERT Syllabus]. There are several and different methods for the developing educational websites. In the development of the material the investigator selected the steps developed by Dick and Carey (2005) and certain modifications were made based on discussions with experts. In the present study the following steps were used for preparing the Web Based Learning Materials.

1. Information gathering
2. Identify entry behaviours and learner characteristics
3. Selection of the chapters
4. Identification of instructional objectives
5. Preparation of instructional material
6. Develop learner assessment
7. Sequencing the content
8. Preparation of initial and final drafts of web based instructional package.

1.2Validation of the Web Based Learning Materials

After compilation and development of Web Based Learning Materials [www.bioetutor.in], it was analyzed. If there were any spelling mistake, lack of information, they were edited. The validation of Web Based Learning Material was done in three phases:

i. Self Evaluation
ii. Evaluation by Students
iii. Expert Evaluation

1.3 Preparation of the Final version of Web Based Learning Materials

Taking into consideration the outcomes of self evaluation, evaluation by students and evaluation by the experts, necessary modifications were made and final Web Based Learning Materials were developed and the web address is www.bioetutor.in. All the students and teachers were again requested to go through the Web Based Learning Materials and final Web Based Learning Materials were developed.

2. Comparison of Pre- test Scores in Achievement in Biology of Students in the Web Based Learning Group and Activity Oriented Method Group

The difference between the mean scores of the Web Based Learning Group and Activity Oriented Method Group were tested for significance by finding the critical ratio. The data and results of the test of significance are given in the below table:

Table 1

Data and Results of Test of Significance of Pre- test scores in Achievement in Biology in the Web Based Learning Group and Activity Oriented Method Group

Groups	No. of Students	Mean	Standard Deviation	Critical Ratio	Level of Significance
Web Based Learning Group	40	14.22	3.475	0.578	Not significant at 0.05 level
Activity Oriented Method Group	40	14.67	3.489		

The critical ratio obtained is 0.578 which is not even significant at 0.05 level. This shows that there is no significant difference between the means of the Pre- test achievement scores of students in the Web Based Learning Group and Activity Oriented Method Group. Therefore the two groups do not differ significantly in their performance. So it is inferred that before the experiment the two groups were of more or less of the same ability.

3. Control group and Experimental group higher secondary level students do not differ significantly in the post-test.

Comparison of Immediate Post- test scores in Achievement in Biology of students in the Web Based Learning Group and Activity Oriented Method Group

The difference between the mean scores of the Web Based Learning Group and Activity Oriented Method Group were tested for significance by finding the critical ratio. The data and results of the test of significance are given in the table given below:

Table 2

Data and Results of Test of Significance of Immediate Post- test scores in Achievement in Biology in the WBLG and AOMG

Groups	No. of Students	Mean	Standard Deviation	Critical Ratio	Level of Significance
Web Based Learning Group	40	34.950	3.7000	6.98	Significant at 0.01 level
Activity Oriented Method Group	40	28.775	4.1970		

The critical ratio obtained is 6.98, which is significant at 0.01 level. This shows that there is significant difference between the Web Based Learning Group and Activity Oriented Method Group in the post-test achievement. Since the mean of Web Based Learning Group (34.95) is greater than that of the Activity Oriented Method Group (28.775), it is inferred that Web Based Learning Group is better than that of the Activity Oriented Method Group.

4. Analysis of the Responses made by the Higher Secondary School Teachers in Biology regarding the Practical difficulties likely to be encountered while using Web Based Learning Materials.

Percentage analysis of the responses made by the Biology teachers at Higher Secondary Level regarding the practical difficulties likely to be encountered while using Web Based Learning Materials in teaching Biology at Higher Secondary Level was made. The details are given in Table 3

Table 3

Rank Order of Practical difficulties likely to be encountered by the Higher Secondary School teachers in Biology

Sl.No	Practical Difficulties	Rank order
1	Rigid time table	5
2	Overcrowded classroom	3
3	Lack of time	1

4	Unavailability of suitable resource materials	8
5	Over loaded syllabus	2
6	Lack of cooperation from authorities and parents	6
7	Lack of basic training in computers	7
8	Lack of sufficient number of computers	4

From the table 3 it is found that regarding the practical difficulties likely to be encountered by the Biology teachers while using the Web Based Learning Materials in Biology at Higher Secondary Level, the highest difficulty recorded was “lack of time”. It is followed by overloaded syllabus and overcrowded classroom. Fourth priority among the practical difficulty was given to lack of sufficient number of computers followed by rigid timetable and lack of co-operation from school authorities and parents. The practical difficulty which is given the seventh priority is lack of basic training in computers followed by unavailability of suitable resource materials.

The analysis revealed that there are certain difficulties encountered by teachers while using Web Based Learning Materials for teaching Biology at Higher Secondary Level and the findings highlighted the need for adopting appropriate measures to overcome the difficulties.

Conclusions

Web- Based Learning provides students with a wide variety of teaching/learning alternatives that expand the educational process beyond the traditional classroom. Web- Based Learning offers a new sensibility and a means of social interaction engineered towards learning. In web- based instruction the nature of content becomes dynamic as compared to the static texts that are published on a certain date. This method of learning does not substitute a teacher, but it complements the teacher in his /her teaching process. Web Based Learning method is one of the latest technologies integrated in education. It helps to cut across the boundaries of apace and time. It takes the specialist to the learners’ desk. Technology is never a substitute for good teaching but traditional classroom teaching may not prove worthy in the present scenario and without skilled instructors, no electronic delivery can achieve good results. The present study has been undertaken with a view to providing a status report of

the effectiveness of Web Based Learning in Biology at higher secondary level in selected schools. These findings are clear evidences that the developed Web Based Learning Materials are effective for enhancing the achievement in Biology of the Higher Secondary School Students.

The Educational Implication of Web Based Learning Materials are the following:

- This study has revealed that transaction using Web Based Learning Materials are effective in learning Biology at Higher Secondary level. Hence it is recommended that Web Based Learning Materials can be used in learning Biology at the Higher Secondary level.
- The study has provided data on the effectiveness of Web Based Learning Materials in Biology for enhancing academic achievement. Hence it is recommended that Web Based Learning Materials in Biology be used for transacting the Biology subject at Higher Secondary level.
- The potentials of the new teaching – learning strategies can be used to enhance the quality of education at the school level.
- Through Web Based Learning we have to inculcate 21st Century skills in students. In addition to the positive learning effects that happen when students work with Web Based Learning Materials, they also develop new literacies such as learning navigation, searching and retrieving skills, as well as multimedia and hypertext reading. Thus they are made to cope up with the pre requisites of development of information retrieval skills that are needed for the21st century and the teachers are to be encouraged to make maximum use of Web Based Learning Materials in their teaching.
- Education is the fundamental human right of the child. But a large number of students are excluded from this due to physical, intellectual, social, emotional, linguistic or other factors. A major task of the school is to provide educational experiences that include and accommodate these differences in order to optimize each student's education. This is possible only in a flexible education system that assimilates the needs of a diverse range of learners and adapts itself to meet these needs. It is Web Based Learning Material that can accommodate all children regardless of their physical, intellectual, social, emotional, linguistic or other conditions. So government has to come forward and encourage heads of the institutions and teachers to use this method of learning in the schools.
- Web Based Learning can go a long way in relieving the students from the stress of not understanding the concepts taught by the teacher in the class and missing the class on account of any reason because Web Based Learning Materials are readily available to

students. The students can access the learning material from anywhere at any time. The educational institution has to encourage the teachers to avail and make use of the Web Based Learning Materials in their teaching process.

- Students with high level of intelligence can get maximum benefits from Web Based Learning Materials, as e- links in the material may help them in widening and satisfying their urge of getting more knowledge. So heads of the schools should encourage the teachers to make maximum use of Web Based Learning Materials in the teaching learning process to make the best use of potential of students with high level of intelligence and enhancing the interest and learning of the students with low level of intelligence.
- Development of Web Based Learning Materials is not an expensive matter because once the package is developed; it can be used for many years with the required updates. So the educational institutions only have to make a onetime investment in the development of the material.
- Nowadays education related softwares are available on the internet and in the market. Teachers are to be guided and trained to select the appropriate software from various websites and open sources. The teachers can further help the students to select the software to assist them in effective learning. For this parents are to be made aware of the meaningful use of educational software. This will also help them in discarding their misconceptions regarding the misuse of the internet.

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TEACHER'S ATTITUDE TOWARDS EDUCATIONAL TECHNOLOGYIN SECONDARY SCHOOL BIOLOGY CURRICULUM

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Abstract

The incorporation of technology in to the secondary curriculum is part of worldwide trend in education .The aim of the present study is to determine the attitude of secondary teachers towards educational technology .The study was composed of 60 teachers .Attitude scale towards educational technology developed by investigator was used in order to investigate the attitude towards educational technology in secondary curriculum..t- test was administered in order to compare the attitude of teachers according to their gender and locale of school. It was found that the educational technology have facilitated secondary education as an interactive process and analyses were done by testing the hypothesis to find out there is no significant difference in teachers attitude of educational technology in secondary curriculum in the sub samples-male and female, rural and urban .

Introduction

The word educational technology was recognized in 1967 with the establishment of national council for educational technology in the United Kingdom. Educational technology is the effective implementation of technology across all curriculum areas in a learner centered environment to support students and teachers in the learning process .It enable the students to develop the knowledge and skills necessary to be productive ,informed citizens and self directed lifelong learners It requires teachers attitude to develop teaching strategies that lead to academic success for each students.

In today's school educational technology has helped to release the teacher from the routine role of pouring information .Now he can devote his time and effort to the more important task like planning, arranging and evaluating learning experience and outcomes and can encourage his students by giving proper guidance and counseling. In the era of technology, educational technology aids plenty of resources to enhance the teaching skills and learning ability.

Educational technology is united with the designing of a suitable curriculum for the achievement of the desired objectives. It is helpful in describing the ways and means of the suitable learning experiences ,organization of the contents in a suitable frame work I order to bring better results. It provides the scientific setting to education as well as establish theories of teaching and learning.

Need and importance

At secondary level education plays a pivotal role and is held responsible for the development of society .Therefore secondary education can be made effective with the use of educational technology .The secondary schools are using educational technology in curriculum development ,in learning process and in the evaluation of learners. If scope and needs are becoming greater day by day. The growing use of educational technology in today's secondary schools has helped to release the teacher from the routine role of information giving ,so that he can devote his time and efforts to the more important test of planning ,arranging and evaluating learning experiences and outcomes and to encourage ,enthuse ,guide and counsel pupil.

Educational technology in teaching and learning is an important and challenging aspect in secondary education .Technology for improving and facilitating learning process is everywhere .It has

been used in every classroom .as becomes a part of the courses in high schools ,middle and elementary schools all over the world .Technology application n classrooms is essential to ensuring its efficiency and effective integration. Technology has now changed how teachers and students access, gather, analyze, transmit information by giving them more process in the classrooms(Dooley,1999)

. Singh(1980)found that majority of teachers had opined that educational technology had changed classroom teaching and learning process to a great extent and had made an attitudinal change among the pupils. Katherine(2001)concluded that all the teachers of Bharathidhasan university jurisdiction are having positive attitude towards the application of educational technology aids at secondary level.Selvam(2006)reported that female primary teachers have more favourable attitude towards educational technology.

Kabadayi (2006) reported study on pre-school teachers and part time teachers examine their results of the study,75% of the teachers showed their positive attitude towards of education in classrooms. Ozadamli,Hursen,Ozacinar(2009)reported that teacher trainees believed in the positive effects of educational technology .It was found that their were no gender difference in the attitude of educational technology. Zanguyi(2011)examined that the teachers attitude towards the use of educational technology in the instruction process .the results of study reported that teachers showed positive attitude towards use of new educational technologies in teaching process.

Scope of the study

Educational technology tries to discuss the concept of teaching ,analysis of the teaching process, variables of the teaching, phase of the teaching ,levels of teaching ,principles and maxims of teaching ,concept of teaching ,relevance of theories and relationship between teaching and learning. Education is concerned with the designing of a suitable curriculum for the achievement of the stipulated objectives In any process of teaching and learning teacher is key figure. Educational technology ,therefore take care of the proper preparation of teachers for exercising their complex responsibilities .Educational technology tries to describe the ways and discovering ,selecting and developing suitable strategies and tactic of teaching.

Through proper education teacher helps a child in bringing out his hidden capacities. Various studies had revealed that the educational attainment of students depends up on the attitude of teachers in their teaching learning process .Therefore it is necessary to study the attitude of the teachers promotes learning and also creates a climate which stimulates effective learning to the

students. Teachers provide students various learning opportunities that they can meet curriculum outcomes and they can able to develop positive self concept.

The present study expected to be helpful in gaining an insight into the current status of the biology curriculum which in turn can reveal its effectiveness .A probe into the competencies attained by students would expose the inhibitions and limitations involved in the effective transaction of the curriculum. It is hoped that this would not only call attention of the authorities, but also create an awareness in them regarding the necessity of taking steps for the effective transaction of the curriculum, such as providing adequate orientation and infrastructural facilities, revision of text books and hand books and modification in the system of evaluation.

Statement of the problem

Great potential for improving instruction in biology through educational technology.Teachers have a significant impact on their students .The instructional strategies selected by the teachers influence student learning outcomes. Teachers attitude, characteristics and the classroom phenomena are determine the teacher effectiveness .Teachers are spirited, invigorated and endured to develop better curriculum text books and teaching aids. Hence the study has been entitled as "TEACHER'S ATTITUDE TOWARDS EDUCATIONAL TECHNOLOGY IN SECONDARY SCHOOL BIOLOGY CURRICULUM."

Objectives

1. To find out there is any significance difference between male and female teachers attitude of educational technology in secondary school biology curriculum .
2. To find out there is any difference between urban and rural teachers attitude of educational technology in secondary school biology curriculum.

Hypotheses

1. There is no significant difference between male and female teachers attitude of educational technology in secondary school biology curriculum.
2. There is no significant difference between urban and rural teachers attitude of educational technology in secondary school biology curriculum.

Method of the study

Survey method is adopted for the study.

Sample

The population includes 60 secondary school biology teachers selected as the sample of the study.

Tool

Teacher's attitude scale towards educational technology.

Procedure for data collection

Survey research design was adopted for this study. This was done to examine the attitude of teachers towards educational technology in secondary curriculum. The research instrument adopted for this study was self administered attitude scale titled "Attitude scale towards educational technology. The scale consist of 15 items and each statement followed by five responses representing the five levels of acceptance(strongly agreed ,agreed, undecided, disagreed and strongly disagreed- Likert rating scale). After the preparation and attitude scale the researcher personally visited the selected secondary schools .After obtaining permission ,the researcher administered the tool on the secondary biology teachers . Data were analyzed using t-test .

Statistical technique

t- test

Analysis and interpretation

Objective-1

To find out there is any significance difference between male and female teachers attitude of educational technology in secondary school biology curriculum .

Hypothesis-1

There is no significant difference between male and female teachers attitude of educational technology in secondary school biology curriculum.

Table-1

Mean ,Standard deviation and t test ratio of male and female teachers attitude of educational technology in secondary school curriculum.

SL.NO	VARIABLE	MEAN	SD	t	LEVEL OF SIGNIFICANCE
1	MALE	56.7	7.4	.882	Not significant
2	FEMALE	56.1	7.1		

The above table (1)shows that the mean score of male and female teachers attitude of educational technology in secondary curriculum. Mean and standard deviation score of male and female teachers are 56.7 an7.4,the mean and standard deviation score of female teachers are56.1and 7.1t test computed for comparison of mean score of male and female teachers value was calculated to be .882.As the calculated value of t is found to be less than at both the levels, the calculated value of t is found to be not significant, therefore the hypothesis is "there is no significant difference between male and female teachers attitude towards educational technology in secondary school curriculum is retained. Findings indicated that gender does not have impact on the attitude of educational technology in secondary school biology curriculum.

Objective-2

To find out There is any difference between urban and rural teachers attitude of educational technology in secondary school biology curriculum.

Hypothesis-2

There is no significant difference between urban and rural teachers attitude of educational technology in secondary school biology curriculum.

Table-2

Mean ,Standard deviation and t test ratio of urban and rural teachers attitude of educational technology in secondary school curriculum.

SL.NO	VARIABLE	MEAN	SD	t	LEVEL OF SIGNIFICANCE
1	URBAN	60	5.08	.670	Not significant
2	RURAL	59.4	5.02		

In order to test this hypothesis score of urban and rural teachers were obtained .The above table(2) shows that score of mean and SD of urban and rural teachers are 60 and 5.08,rural teachers are 59.4and 5.02 .The .05 and.01 level of significance calculated t value .670.Therefore it is inferred that there is no significant difference in teachers attitude towards educational technology in secondary curriculum. Hence it is concluded that urban and rural teachers do not differ significantly in their attitude towards educational technology in secondary school curriculum.

Limitations of the study

1. The present study limited to secondary biology teachers only.

2. Only very little time was made available for the conduct of the survey.

3 .The selection of the sample were confined only one district .A more representative sample from the other district of Kerala has highlighted the findings of the study to a substantial extent

4. Study limited to Kerala state syllabus.

5. The investigator could not analyze the students attitude towards educational technology in secondary school curriculum.

Educational implications

1. Competent teacher should be employed in teaching service in order to facilitate effective use of educational technology in secondary school

2. To help proper insight and knowledge on how integration of educational technology in outside classrooms.

3. Govt and stakeholders in education to provide support in the use of technology in teaching and learning in schools to enhance performance.

4. Orientation on the development of educational package may constantly be made available to the teachers at all levels.

Further research studies

1. A survey may be conducted to assess the adequacy of infrastructural facilities for the effective transaction of secondarycurriculum.

2 .A study on the competencies necessary for teachers for the effective transaction of curriculum through technology.

3. A study to identify the difficultiesencountered by educationalauthorities can be tried.

4 .To study the effectiveness of educational technology on student in terms of achievement and attitudes.

5. How do students perceive effectiveness of electronic classroom after teaching biology through electronic classroom technologies.

6.To find out various effects of educational technology to enhance the teaching process in secondary level.

7. Identify the factors that support and inhibit the integration of education technology in secondary level.

Conclusion

Educational technology improves to great extent and it has now become a need for revolutionizing education for the better .Introducing the biology topics at secondary level using technology can help to alleviate anxiety and can inspire and improve retention of students. In this study there is positive attitude towards teachers in secondary school biology curriculum and there is no significant difference in gender and locale of the school.

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PERCEPTION OF HIGHER SECONDARY SCHOOL TEACHERS' TOWARDS THE USE OF TECHNOLOGY TOOLS AND THEIR INTEGRATION IN THE CLASS ROOM

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Abstract

Technology has penetrated our society to the point that our lives are now increasingly reliant upon this medium and it has become an essential part of every dynamic society in today's era (Underwood, 2009).The impact of technology in education, especially on teaching and learning is now growing rapidly. Technology integration in the classroom has become an important aspect of successful teaching and learning. Technology has been integrated into the curriculum design and its implementation provides a teaching and learning platform that functions for both educators and learners across the globe (Wardlow,2014,Zehra& Bilwani,2016).In the present research, investigators made an attempt to study the perception of Higher secondary school teachers regarding the usage of technology tools in the classrooms. Sample of the study constitute 60 higher secondary school teachers from Thiruvananthapuram district of Kerala. The sampling technique used for the study is cluster sampling. Findings of the study revealed that teachers integrate various technology tools in their classroom activities.

Key words: Technology integration, teachers' perception, technology tools

Introduction

Technology is becoming increasingly interactive and distributed at rapidly declining cost and one can easy to participate in the incredibly complex information, resources and learning. With the dramatic growth in both the means and impact of technology, there is a heightened need for teachers to know the theoretical and implementation of technological tools in classrooms. The lack of pedagogical knowledge of teachers about integrating technological tools in educational setting leaves a mounting dilemmas and confusion. Technology has penetrated our society to the point that our lives are now increasingly reliant upon this medium and it has become an essential part of every dynamic society in today's era (Underwood, 2009). The impact of technology in education, especially on teaching and learning is now growing rapidly. Over the last two decades, evolution and exponential advancement of technology has made traditional teaching methods fairly outdated and obsolete and technology integration has become an important facet of successful teaching (Negi, Negi&Pandey, 2011). Technology has a great potential as a teaching tool, due to which educational technology has become the bedrock to enhance student's performance at school (Lei, 2010, Zehra, 2016).Technology integration in the classroom has become an important aspect of successful teaching and learning. A number of researchers have explored technology integration projects worldwide and reported positive impact on teaching and learning for teachers using technology (e.g., Holinga, 1999; Guha, 2000; Sandholtz, 2001; Manzo, 2001; Sherry et al., 2001; Hong and Koh, 2002; Zorfass and Rivero, 2005, &Almekhlafi, 2006a, 2006b, Almekhlafi and Almeqdadi).Technology has been integrated into the curriculum design and its implementation provides a teaching and learning platform that functions for both educators and learners across the globe (Wardlow, 2014,Zehra& Bilwani,2016).Technology use in education is becoming an increasingly important part of higher and professional education (Wernet, Olliges, &Delicath, 2000; &Almekhlafi, 2006a, 2006b). Technology not only gives learners the opportunity to control their own learning process, but also provides them with ready access to a vast amount of information over which the teacher has no control (Lam & Lawrence, 2002).

- **Need and significance of the study**

The impact of technology, especially on teaching and learning is now emerging rapidly. Research evidence suggests that technology is effective in improving teaching and learning (Negi, Negi&Pandey 2011; Higgins, Xiao &Katsipataki, 2012,Zehra &Bilwani 2016).Various research findings highlight the importance of teacher beliefs (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur&Sendurur, 2012; Kim, Kim, Lee, Spector &DeMeester, 2013), perceptions (Kopcha, 2012; Georgina &Hosford, 2009), attitudes (Buabeng-Andoh, 2012; Alharbi, 2013) and lived experiences (Tuttle, 2012) for successful integration of ICT in the classrooms. This study was driven by the realization that the domain of technology integration in teaching learning, especially with respect to the perceptions of teachers has not been explored to date. The current research is an attempt to fill this gap. The purpose of this study was to gain an insight and understanding of the experiences of teachers, identify the extent of use of technology, analyze teachers' perceptions regarding the integration of technology tools in teaching learning process, and the factors affecting effective technology integration in the classrooms.

- **Research questions**

The research question developed for the study was:

1. What are the perceptions of higher secondary school teachers regarding the use of technology tools in classrooms?
2. To what extent do teachers perceive their classroom use of technology tools?

- **Objectives of the study**

1. To find out the perception of teachers regarding the use of technology tools and their integration in the class room.

2. To identify the responses of teachers regarding the extent of use of technology tools in the class room.

- **Methodology**

Method

The research design adopted for this study is descriptive in nature. Survey method was used to collect perception of higher secondary school teachers regarding technology integration in classrooms.

Sample

The sample for this study was selected using probability sampling method. The sample consisted of 60 higher secondary school teachers from Thiruvananthapuram district. Respondents were selected using cluster sampling method.

Tools used

The tools used for the study were **perception scale** for analyzing the teachers' perception towards technology integration in class room and a **check list** for measuring the extent of use of technology tools in classroom practices. Perception scale consists of two parts. The first part contains personal data sheet regarding age, sex, subject handled etc. Second part consisted of item relevant to the teachers' perception regarding technology integration in the teaching learning process. These items are belongs to different dimensions like technology in teaching –learning process, factors affecting technology integration, teacher readiness etc.

- **Data Analysis**

Data were analyzed using Percentage analysis.

Results and Discussions

1. **Perceptions of teachers regarding the use of technology tools and their integration in the classroom**

Table: 1

SL No.	Statements regarding the use of technology tools and their integration in the classroom	Strongly Agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
1.	Technology is an integral part of the 21st century learning.	35 (58.33%)	24 (40%)	1 (1.66%)	0 (0%)	0 (0%)
2.	Integrating technology in teaching learning process increases the students' engagement in learning.	26 (43.33%)	33 (55%)	1 (1.66%)	0 (0%)	0 (0%)
3.	Technology integration in classroom results more independent learners.	18 (30%)	22 (13.2%)	9 (1.5%)	5 (3%)	6 (10%)
4.	Integrating technology tools in classrooms minimizes teachers' efforts.	23 (38.33%)	26 (43.33%)	5 (8.33%)	4 (6.66%)	2 (3.33%)
5.	Use of technology tools in classroom deepens students understanding on academic subjects.	27 (45%)	25 (41.66%)	6 (10%)	2 (3.33%)	0 (0%)
6.	Integrating technology tools in teaching learning process makes curriculum more functional.	32 (53.33%)	26 (43.33%)	2 (3.33%)	0 (0%)	0 (0%)
7.	Personal experience regarding technology use influence the effective integration of technology tools in classroom.	37 (61.66%)	20 (33.33%)	3 (5%)	0 (0%)	0 (0%)
8.	The success of	39	17	2	2	0

	technology integration in classroom depends on the selection of appropriate technology tools.	(65%)	(28.33%)	(3.33%)	(3.33%)	(0%)
9.	Availability of various technology resources is crucial for successful technology integration in the classrooms.	32 (53.33%)	25 (41.66%)	2 (3.33%)	1 (1.66%)	0 (0%)
10.	Use of technology tools in classroom increases productivity, promote creativity, and facilitate academic learning	29 (48.33%)	26 (43.33%)	1 (1.66%)	4 (6.66%)	0 (0%)
11.	Lack of training on how to integrate technology in teaching learning process affects the effective technology integration in classroom	30 (50%)	27 (45%)	3 (5%)	0 (0%)	0 (0%)
12.	Rigid time schedule affects the creative integration of technology tools in the classrooms.	26 (43.33%)	28 (46.66%)	2 (3.33%)	4 (6.66%)	0 (0%)
13.	Well-equipped technology labs are not available in the schools.	29 (48.33%)	21 (35%)	5 (8.33%)	4 (6.66%)	1 (1.66%)
14.	Internet connectivity and other technical problems during technological integration	33 (55%)	26 (43.33%)	1 (1.66%)	0 (0%)	0 (0%)
15.	Technology tools make administrative tasks easier	24 (40%)	19 (31.66%)	6 (10%)	5 (8.33%)	6 (10%)
16.	Administrative support affects technology integration in the classrooms	18 (30%)	26 (43.33%)	4 (6.66%)	7(11.66%)	5 (8.33%)
17.	Support from other teachers helps to share new ideas regarding technology integration	27 (45%)	24 (40%)	5 (8.33%)	4 (6.66%)	0 (0%)
18.	Designing instruction with technology tools must cater the needs of the learner	31 (51.66%)	27 (45%)	2 (3.33%)	0 (0)	0 (0)

19.	Use of technology tools in teaching learning process makes curriculum transaction more flexible.	26 (43.33%)	29 (48.33%)	2 (3.33%)	0 (0)	3 (5%)
20.	Strong understanding of the nature and operation of technology systems helps to design versatile learning environment	33 (55%)	19 (31.66%)	5 (8.33%)	3 (5%)	0 (0)

From table: 1 it can be interpreted that majority (58.33%) of teachers strongly agrees and teaches about 40% agrees to the statement that 'technology is an integral part of the 21st century learning'. It can be inferred that most of the teachers have strong understanding about the importance of technology tools in the teaching –learning process. The response towards the statement 'Integrating technology in teaching learning process increases the students' engagement in learning' revealed that 43.33% of teachers strongly agree and 55% of teachers agrees to the statement. The statement regarding the 'use of technology tools in classroom deepens students understanding on academic subjects' shows that majority (45%) of the teachers strongly agree and 41.66% agree to the statement. It can be interpreted that teachers have high stance towards integrating technology tools in classroom. These results are supported by findings of Tuttle (2012) and he found that most of the teachers adopted technology because they were either prompted by the administration or because they believed technology would enhance the learning experience of students.

The perception of teachers towards the factors related to successful technology integration reveals that 'lack of training on how to integrate technology in teaching learning process', 'rigid time schedule, un availability of well- equipped technology labs', 'availability of resources', 'internet connectivity and other technical problems' are the major factors leads to the effective technology integration in the classrooms. Roberts and Ferris (1994),Flores (2002),Kopcha(2012) were supported by these findings. Flores(2002) highlighted that teachers face many barriers in their quest to incorporate technology such as time scheduling for technology use and administrative support, equity, and the lack of resources. According to Ertmer (1999), as cited in Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur (2012), the use of technology by teachers is influenced by two orders of barriers: (a) training, financial resources, hardware and software resources, and administrative support; (b) confidence of teachers, their beliefs and perceptions. Other than these factors, Earle (2002) pointed out some barriers to the integration of technology in the classroom including both restraining forces that are extrinsic to teachers such as access, time, support, resources, and training and forces that are intrinsic such as attitudes, beliefs, practices, and resistance.

2. Perceptions of teachers regarding the extent of use of various technology tools in class rooms

Table :2

SL No	Various technology tools in class room	Responses in	percentage
		Yes (%)	No (%)
1.	PowerPoint presentation	60(100%)	0(0%)
2	Smart board	39(65%)	21(35%)
3	Computer	60(100%)	0(0%)
4	overhead projector	55(91.66%)	5(8.33%)
5	virtual reality	21(35.00%)	39(65.00%)
6	Animation	42(70.00%)	18(30.00%)
7	Different computer software	38(63.33%)	22(36.66%)
8	Graphics	36(60%)	24(40.00%)
9	Geographic maps	24(40%)	36(60%)
10	Drawing tools	38(63.33%)	22(36.66%)
11	CD	52(86.66%)	8(13.33%)
12	Internet	60(100%)	0(0%)
13	Simulation	27(45%)	33(55%)
14	Transparencies	39(65%)	21(35%)

From table 2, it can be interpreted that teachers use number of technology tools in their classrooms include computer, power point presentation, internet, projector, CD, animation, smart board, virtual reality , drawing tools, graphics, transparencies. These results are supported by Yildirim(2007),who found that teachers use ICT more frequently for the preparation of handouts and tests than to promote critical thinking. Moreover, Chai, Koh and Tsai (2010) found that ICT courses with direct instruction on the use of technological tools through the technology enhanced lesson (TEL) approach helped teachers learn how to use technologies as supporting tools in order to enhance their teaching and student learning.

- **Conclusion**

Results of the study shows that majority of the teachers have high acuity regarding the importance of technology integration in teaching learning process. There are many factors hinders the technology integration in classrooms include lack of training on how to integrate technology in teaching learning process, rigid time schedule, un availability of well- equipped technology labs, un availability of resources, internet connectivity and other technical problems. In spite of these obstacles most of the teachers use number of technology tools such as computer, PowerPoint presentation, internet, projector, CD, Animation, smart board, virtual reality , drawing tools, graphics, transparencies. Based on the above findings researchers made following suggestions for the effective technology integration in classroom:

1. It is necessary to conduct regular professional development workshop for teachers.
2. In the information age, skills in the use of technology are invaluable, so technology enhanced curriculum is essential for the overall development.
3. Information communication technology ought to be employed to make the transaction of curriculum effective.
4. Teachers must be careful in the selection of appropriate technological tools in the teaching-learning and should encourage using these and allow the students for doing their work efficiently.

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FOSTERING SCIENTIFIC REASONING SKILLS IN TECHNOLOGY ENRICHED CLASSROOM ENVIRONMENT – ROLE OF TEACHERS AS A TECHNO - PEDAGOGUE

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Abstract

The paper discuss the role of teachers as a techno – pedagogue in fostering scientific reasoning skills in technology enriched classroom environment. As students' lives become increasingly multimodal, diverse, and globalized, the traditional notions of literacy must be revisited (New London Group 1996).Technology enriched classroom is one of the most important elements in creating an enriched interactive physical space convenient for applying cooperative, active and engaged learning which strengthensscientific reasoning skills like classifying ,ordering ,conceptualizing ,etcwhich in turn have a long term impact on students' achievement. Classroom activities should be enriched with multiliteracies ,scientific practices and evidence- based reasoning for decision making , so that students can be engaged in developing both inductive and deductive skills and knowledge central to being scientifically literate. Flourishing in today's global society requires citizens that are both intelligent consumers and producers of scientific understanding. So classroom instruction should stress the need for a prepared 21 st century workforce, where students can acquire advanced transferable scientific reasoning skills which will better enable them to handle open ended novel situations and design their own investigations to solve problems in real world situations. In order to assist the students and provide a platform to foster scientific reasoning skills, teachers should be professionally competent as a techno pedagogue who can think how technology fits into their philosophy of teaching and learning.

Keywords

Scientific Reasoning Skills ,Technology Enriched Classroom , Techno – Pedagogue
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Introduction

The usage of technology has challenged conventional teaching methods, transformed instructional practices and contributed to emerging new instructional methods which gives much importance to life long learning skills like reasoning , problem solving ,decision making , understanding , making solutions ,estimating ,etc. . With its prospects, technology usage has become an important component of educational reform and an integral part of the school curriculum (Papanastasiou&Angeli, 2008). The educational prospects of technology usage include enriched learning environments, permitting learners to embrace several perspectives on complex phenomenon, encouraging flexible knowledge construction in complex learning domains and catering for individual differences (Sang et al., 2010).So ,the professional digital competenceof teachers is of growing importance in classrooms, now that digital resources and digital media are becoming important parts of teachers' everyday practice. The integration of technology into teaching and learning is seen as a priority by many governments and educational institutions worldwide.Many governments have developed a number of Master Plans dealing with technology in education (Pelgrum& Anderson, 1999) as well as spent crores on educational infrastructure and professional development of teachers and other categories of staff. Teachers are considered as agents of change in schools and are drivers who play important roles in implementation of technology in education.Effective integration of technology requires educators and teachers who possess the skills to harness the capabilities of technology into their teaching and learning environments. Technology offers innovative tools for restructuring teaching and learning processes in preparing students for thelife long learning process which includes acquisition of various skills like Higher Order Thinking- Problem solving, Critical Thinking , Scientific reasoning ,etc.So teachers as a techno pedagogue in the digital world , without being a slave of the technology, should be able to nurture students' diverse needs to make the individual prepare for the need of time. In the classroom, teachers should encourage students to interact meaningfully to one another, to propose ideas, to justify them and to challenge others in reasonable manner in order to inculcate scientific reasoning skills which are one of the essential skills of 21^{st} century.

21 st Century Teacher – A techno pedagogue

The use of 21st century technology in education is imperative as educators attempt to prepare 21st century students for future jobs in a globally competitive and interactive digital workplace.Various research provide insight into how a 21st century literacy perspective can support inclusive literacy practices that create a community of learners, use digital tools to make the curriculum accessibleand link academic goals with real-world platforms.Technology, as the newest instructional media developed in this globalization era, presents situation which helps the students to have new authentic and meaningful learning experiences; engaging their effort and behavior by providing more fun and effective learning atmosphere. In addition, it provides the opportunity for the students to work collaboratively and easily access the information that can supplement their learning experience. Those benefits become the central part of 21st century education which should be optimized in order to create sophisticated learning immersion and maximize the quality of students in the future.

The future trends needs to take into account the increasing globalization which would require newer skills to be imparted through the school system. With such many more socio-economic changes, the role of technology in the lives of the people would also increase. The era of artificial intelligence would arrive with the 'invisible networks' located in our clothes and skins as well. In the domain of education, this proliferation of technology would mean the increase in range of educational courses, "well equipped centers for vocational and educational training", "invasive and non invasive interfaces between the brain and the machines" and thereby, the change from networked to ubiquitous computing. This would weaken theboundaries between the aspects of contemporary living and the definition of work, leisure, employment and education would change considerably. Though different theorists predict these changes with variations, the role of technology would invariably increase in and accepted through the disciplines as technology would become "smaller, cheaper and faster" and they engages with questions whether technological future is inevitable or desirable and then,

pinpoints the importance of values underpinning the society which will decide the role technology would play in the society and the education system.

Technology in education has a multiplier effect throughout the school system, by;

- enhancing learning and providing students with new sets of life long skills which are in the domains of cognitive , affective and psycho – motor
- facilitating and improving the training of teachers (KERIS, 2011)
- increasing the possibilities of communication and reinforcement of the development of skills of coordination and collaboration between peers (Dede, 2009)
- minimizing costs associated with the delivery of traditional instruction(Gulati, 2008; KERIS, 2012).

Research studies have also found that positive perceptions of teachers on Technology integration into schools and it's usage in their teaching are essential to successful implementation of Technology in education (Almekhlafi and Almeqdadi, 2010; Aydin, 2013; Sipilä, 2014; Choy and Ng, 2015). Teachers' attitudes towards the use of Technology impact on their Technology integration in the classroom, decisions they make and actions they take in classrooms (Shaibou, 2015). So ,this paper addresses one of the essential life long skills ie , Scientific reasoning skills and discuss the role of teacher as a techno – pedagogue in fostering scientific reasoning skills in technology enriched classroom environment.

Current educational system demands the transformation or hike in the role of teachers as techno pedagogue in order to create an enriched interactive physical space convenient for applying cooperative, active and engaged learning which strengthens scientific reasoning skills like classifying ,ordering ,conceptualizing ,etcwhich in turn have a long term impact on students' achievement. Classroom activities should be enriched with multiliteracies ,scientific practices and evidence- based reasoning for decision making , so that students can be engaged in developing both inductive and deductive skills and knowledge central to being scientifically literate. Flourishing in today's global society requires citizens that are both intelligent consumers and producers of scientific understanding. So classroom instruction should stress the need for a prepared 21st century workforce , where students can acquire advanced transferable scientific reasoning skills which will better enable them to handle open ended novel situations and design their own investigations to solve problems in real world situations. In order to assist the students and provide a platform to foster scientific reasoning skills, teachers should be professionally competent as a techno pedagogue who can think how technology fits into their philosophy of teaching and learning and should be aware that scientific thinking requires a complex set of cognitive skills, the development of which requires much practices and patience.

Moreover, teacher should know a variety of task formats that can be used to explore:

- scientific reasoning competencies
- hands-on physical activities,
- tasks using story problems ,
- contextual support (abstract vs. concrete),
- task complexity (single-variable vs. multivariable),
- plausibility of factors,
- response format (choice vs. production),
- strength of prior belief or prior content knowledge in scientific domains (e.g., Physics, Chemistry and Biology)

All the above mentioned have been shown to influence performance on scientific reasoning tasks (Lazonder& Kamp, 2012; Adey&Csapó, 2012). Predict-Observe-Explain (POE) items ask children to make informed predictions about a presented situation (Fu, Raizen, &Shavelson, 2009), and following an observation or summary of what happens and ask students to provide explanations.

So, as a techno – pedagogue ,teacher should be aware that technology integrated classroom reduces the digital divide between the good old traditional system of teaching and learning and digitally enhanced instructional process which gives much importance to essential 21st century skills ,which is considered as an inevitable aspect of the century. Teacher should understand the potential benefits and the best outcome of learning experiences which are the ultimate result of technology enriched classroom. Various research studies have proved that technology enriched classroom not only assist the techno – pedagogue in the instructional process but offers unlimited access to treasures of knowledge and information that is readily available at the finger tip , various course content ,opportunities to examine various view points(Koç, 2005;

Tam, 2000) of a particular content for effective instructional process in an inclusive classroom.Look (2005) cited that a review of 219 studies on the use of technology in education consistently found that students in technology rich environments experienced positive effects on achievement in all subject areas.So , teachers need to plan their instruction according to curriculum requirements, students' learning needs, available technologies'

affordances and constraints, and the realities of school and classroom contexts which fosters the core skills of the students. In toto , teachers should be digitally literate in the digital era.

Technology Enriched classroom – A platform to foster Scientific reasoning skills

"Digital Natives" and "Digital Immigrants" are two terms introduced by Prensky (2001) and he expounds that these people, are 'native speakers' of the language of the internet and the digital world. It is only natural for them to utilize it to solvetheir immediate problems. These range from exchange of interesting information, notes, exam schedules, important notifications to seeking doubt-solving for an assignment. As educators, it is necessary to recognize that digital natives do not necessarily learn in a linear manner but by processing random, hyperlinked resources available. It is also prudent to remind ourselves that their learning is neither confined to classroom nor to textbook. So in the current digital era , teaching has become a complex process which involves independent variablessuch as teacher -efficiency, student competency , various methodologies and resources used in the classroom . Different types of learning experiences should be provided tosatisfy the needs of each and every learner as notable ' differences'exist between individuals.The learning situations should provide freedom to make creativecontributions as the learner is an active, behaving, exploringindividual.

In the educational context, technologies imply a paradigm shift in learning-teaching processes both in the renewal of knowledge and practices and in evaluating knowledge appropriation. It is evident that Technology plays a crucial role in the attainment of knowledge and information by :

1)increasing economic productivity through digital economies

2) enhancing the delivery of public and private services

3) achieving broad socio-economic goals in education, health care, employment and social development.

Technology in education can help individuals to compete and adapt to the knowledge and information of the society by achieving the 21stcentury skills which can enhance skilled workforce ,social mobilityand focus on mastery of students in four main domains, namely ,

- digital age literacy
- inventive thinking (reasoning)
- effective communication

- high productivity .

Development of these skills will enable individuals to design their own investigations to solve scientific, engineering, and social problems in real world (Bao et al., 2009).In their report, (OECD, 2013) affirm that many of the challenges of the 21st century will require innovative solutions that have a basis in scientific thinking and scientific discovery. It is found that in the K-12 education in the United States of America (USA), China and in most Organization for Economic Co operation and Development (OECD) countries, the development of scientific reasoning skills has been shown to have a long-term impact on students' academic achievement and is increasingly relevant for making informed decisions in everyday lives.

Indeed, the modern world is facing ever-more complex problems that require innovative ways of thinking about, around, and within all field of studies.As numerous educational stakeholders have suggested, specific skills and abilities are not innate and must, therefore, be taught (McNeill &Krajcik, 2008). National Research Council(2013)says that such instruction requires a fundamental shift in pedagogy so as to foster knowledge and practices like deep, conceptual understanding, model-based reasoning, and oral and written argumentation where scientific evidence is evaluated.So in order to encourage student learning in the digital world, it is necessary that a teacher learns to identify their students' conceptual schemes and establish connections between these schemes and new content to be learned in a technology-enriched classroom environment and thereby definitely have had a positive effect on student acquisition of higher-order thinking skills which include various scientific reasoning skills that are necessary and inevitable aspect of the individual to survive in the highly competitive world.

Scientific reasoning is an important component under the cognitive strand of the 21st century skills and is highly emphasized in the education standards.Development of scientific reasoning, as with the development of any reasoning, must necessarily be slow and organic process in which the students construct the reasoning for themselves (Adey&Csapo, 2012).

Morris, et al. (2015) concurred with them that effective scientific reasoning requires both deductive and inductive skills. Individuals must understand how to assess what is currently known or believed,develop testable questions, test hypotheses, and draw appropriate conclusions by coordinating empirical eevidence and theory.

If a task is one that a child can do with a more knowledgeable kknower's help, then the child will eventually learn to perform this task on their own by modelling the more knowledgeable example. The idea that children build on existing knowledge is also reflected in Piaget's (1959) work with formal reasoning development. The model articulates clearly the levels through which children develop from birth (sensorimotor stage) to adulthood (formal operational stage). By engaging in these activities, children can start to develop proficiency in the scientific reasoning skills as well as scientific literacy.Many studies have indicated that scientific reasoning skills is critical in enabling the successful management of real-world situations in professions beyond the classroom.It is understood that a stimulating classroom environment is characterized by high quality dialogue, modelled and organised by the teacher.

So, as the definition of modern literacy goes beyond print texts to include digital texts, media objects, images, sounds and social practices, what it means to be a teacher in is shifting and growing in complexity, teachers should be professional and competent enough to share the platform of technology enriched classroom in order to foster the scientific reasoning skills which pave the way to life long learning.

Conclusion

Technology whether as an end in the pursuit of human happiness or a tool to achieve a human purpose has come to play a seminal role in the field of education. Just as the modern world today is unthinkable bereft of technology ,education too would fall short of an " enlightening experience" without the use of technology. Digital technology is now defining the contours of technological interventions in the field of education so it is natural to utilize it to solve the immediate problems .The digital tools incorporated in the learning process provide opportunities to view the learning in a different lens.Teachers should keep in mind that the students need to operate in an information age that requires them to be: information literate, inventive thinkers, and skilled communicators. So 21st century teachers should improve 21st century skills as a key to effective 21st century learners should determine how these skills can be best fostered and which teaching strategies contribute most to learning, retention, and transfer of these skills with the assistance of technology.

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IT Integrated Learning Package for the Enhancement of Mathematical Problem Solving Skills among Students at Secondary Level

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Abstract

Mathematics Education plays an important role in school learning and assumes a prominent position in modern education and curriculum. The main objective of teaching Mathematics is to train the students in the art of problem solving. Problem solving is a skill that everyone uses throughout life. A mathematics teacher is a person who inspires their students to look beyond the pages of the textbook to become problem solvers and critical thinkers. Learning becomes easy and interesting with the use of technology. InformationTecsshnology (IT) is an indispensable part of education. IT integration in teaching mathematical problem solving can be very useful and interesting for the students. The present study intends to find whether IT integrated learning package will help to develop mathematical problem solving skills.

An IT integrated learning package is used for the enhancement of mathematical problem solving skills. The study reveals that the prepared package is effective in enhancing mathematical problem solving skills of students at secondary level. The study implied the scope of developing mathematical problem solving skills of students using various enhancement programs. This necessitates the integration of Information Technology in teaching mathematical problem solving skills.

Key Words: *IT Integration, Learning Package, Mathematical Problem Solving Skills*

Introduction

Background of the Study

Education is the process of human enlightenment and empowerment for the achievement of a better and higher quality of life. A sound and effective system of education results in the unfoldment of learners' potentialities, enlargement of competencies and transformation of their attitudes and values.

Recognizing such an enormous potential of education, all progressive societies have committed themselves to the universalization of education with an explicit aim of providing 'Quality Education for All'. They have recognized the importance of expansion of secondary education, gradually reaching to a near universalization level and simultaneously improve its quality for effective empowerment of as many learners as possible in order to achieve advancements in socio-economic and other domains of life.

Mathematics is the mainstay in today's systematic life. Without numerical and mathematical evidence one cannot decide many issues in day to day life. Mathematics Education plays an important role in school learning and assumes a prominent position in modern education and curriculum. In the past, aim of mathematics in the school curriculum was to prepare children for the life to enable them to use mathematics in the everyday world around them. But in this century, there are several factors of life that requires us to examine a new role that mathematics

Problem solving is a skill everyone uses throughout life. Good problem solvers know the anatomy of a problem. They know that a problem contains facts, a question and a setting. Problem solvers are extremely perseverant when solving problems. They will ask themselves many, what if …" questions, changing conditions within the problem as they proceed. Good problem solvers are students who hold conversations with themselves. They know what questions to be asked by themselves, and what to do with the answers they receive as they think through the problem.

Need and Significance of the Study

Mathematics is a fundamental part of human thought and logic, and integral to attempts at understanding the world and ourselves. Mathematics provides an effective way of building mental discipline and encourages logical reasoning and mental rigor. In addition mathematical knowledge plays a crucial role in understanding the contents of other school subjects. Mathematics literacy is a crucial attribute of individuals living more effective lives as constructive, concerned and reflective

citizens. Mathematics literacy is taken to include basic computational skills, quantitative reasoning, spatial ability etc. Mathematics is applied in various fields and disciplines, ie, mathematical concepts and procedures are used to solve problems in science, engineering, economics etc.

Mathematics is an important subject in school curriculum like other subjects. As far as the practical value of the subject mathematics is concerned no other subject of the school curriculum can surpass it. Not a single aspect of our life is free from its use. The pass percentage of high school examination in mathematics is very low in comparison to other subjects of the school curriculum. It is because the study of mathematics requires specific ability and intelligence.

In mathematics, problem solving is more important. This is the main area students needs to concentrate. It is highlighted in reforms documents as a key factor of change in mathematics education(NCTM 2000). In NCTM (2000) stated that instructional programmes should enable all students to build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts ;apply and adapt a variety of appropriate strategies to solve problems; and monitor and reflect on the process of mathematical problem solving. Studies in almost every domain of mathematics have demonstrated that problem solving provides an important context in which students can learn about number and other mathematical topics. Problem solving ability is enhanced when students have opportunities to solve problems themselves and to see problems being solved. Further problem solving can provide the sight for learning new concepts and for practicing learning skills. Thus, problem solving is important as a way of doing, learning and teaching mathematics. However, whether or how such ways of viewing problem solving get implemented in the classroom will depend on the teacher. Most of them fail in this particular section.

In mathematics teaching priority should be given to solving problems. Teacher should be competent enough in finding out interesting and simple methods to teach problem solving.

The pace of change brought about by new technologies has had a significant effect on the way people live, work and play worldwide. New and emerging technologies challenge the traditional process of teaching and learning, and the way education is managed.

The effectiveness of educational technology depends on the degree to which pedagogical results about student's learning and conceptual difficulties are used to guide the development and implementation of instructional packages. It is necessary to investigate and study student's previous ideas and conceptions in order to proceed to the design and development of appropriate computer packages.By reviewing the literature the investigator found that there are ample studies related to interpretation of Information Technology for making the teaching learning process in the school more

effective (Ezziane, Z. 2007; Huzzaine, I. &Zafdar, M.2008; Tearle, P. 2003) Zakaria and Khalid (2016). It is proved by many studies that by integrating the principles of Information Technology one can make the teaching-learning process more ease, time saving and also effective.The investigator integrated Information technology to prepare learning package to enhance Mathematical problem solving skills.

Objectives

1. To find out the effect of IT Integrated Learning Package on Mathematical Problem solving skills of students at secondary level.

2. To find out the effect of IT Integrated Learning Package on Mathematical Problem solving skills of students at secondary level with respect to gender.

3. To find out the interest in Mathematical Problem solving of secondary school students after the implementation of IT integrated Learning Package.

Hypotheses

1. The mathematical problem solving skills of students at secondary level after the implementation of IT Integrated Learning Package will be significantly enhanced than that of before.
2. There is significant difference in the effectiveness of IT Integrated Learning Package in mathematical problem solving skills with respect to gender.
3. There is significant difference in the interest of secondary school students in mathematical problem solving after the implementation of IT Integrated Learning Package.m

Methodology

Experimental method was utilized for testing the effectiveness of the IT Integrated Learning Package (ITILP). Experimental design is the blue print of the procedures that enable the researcher to test the hypotheses by reaching valid conclusions about relationships between independent and dependent variables. Selection of a particular design is based on the purposes of the experiment, the type of variables to be manipulated, and the conditions or limiting factors under which it is conducted. The design deals with such practical problems as how subjects are to be assigned to experimental and control groups, the way variables are to be manipulated and controlled, how observations are to be made, and the type of statistical analysis to be employed in interpreting data relationships. Of the different experimental designs, 'The Pretest- PosttestNonEquivalent - Groups Design was adopted for the present study. In this design Experimental and Control groups were there.Thepretest is given to both the groups then the treatment (X) to the experimental group, then post test to both the groups.

The Pretest - Posttest Non Equivalent- Groups Design

$R \quad O_1 \quad X \quad O_2 \quad O_1 O_3$= *Pre tests*

$R \quad O_3 \quad C \quad O_4 \quad O_2 O_4$= *Post tests*

The investigator tested the effectiveness of ITILP with respect to mathematical problem solving skills and interest of students. For experimentation, investigator selected a random sample of 130 students at secondary level from Kottayam District. The tools and materials used for the experimental part were IT Integrated Learning Package -ITILP, Test to measure problem solving skills and Interest Inventory.

Tools and Materials Used

The following tools and materials were used for collecting the required data for the present study.

- ✧ IT Integrated Learning Package developed by the investigator
- ✧ Test to measure problem solving skills developed by the investigator
- ✧ Interest Inventory developed by the investigator

IT Integrated Learning Package

The investigator integrated information technology in the learning package to improve the quality of teaching learning process. After thorough review of related literature the investigator followed ADDIE model proposed by Lockard (1992) in developing the IT integrated package. The components of mathematical problem solving skills from different sections such as Arithmetic, Algebra, Geometry and Trignometry were carefully embedded in the package.

Test to measure Problem Solving Skills

In order to measure the problem solving skills of students, a test was used. The test consists of 50 items.The reliability of the test was found to be 0.81 and has a satisfactory content validity. The maximum score of the test is 50 and that of minimum is 0.

Interest Inventory

In order to know the students interest in mathematical problem solving skills an interest inventory developed by the investigator was used. The inventory consists of 30 items. Each statement has three alternative options to select. The maximum score of the inventory is 90 and the minimum score is 30. The reliability of the inventory was found to be 0.79 and has a satisfactory content validity.

Statistical Techniques Used

Statistical techniques such as Arithmetic Mean, Standard Deviation and 't' value were used for the study.

Analysis and Interpretation

The mean,standard deviation and 't' value of pre test scores on mathematical problem solving skills of secondary school studentswere found out. The details are given below

Table 1

Mean, Standard Deviation and 't'*value of Pre test scores of Mathematical Problem Solving Skills and Interest in Problem Solving*

Group	Experimental Group			Control Group			*t*	*Level of Significance*
	M_1	SD_1	N_1	M_2	SD_2	N_2		
Problem Solving Skill	32.79	7.24	65	32.34	6.91	65	0.36	P > 0.05
Interest	60.81	4.81	65	61.37	6.80	65	0.54	P > 0.05

The arithmetic mean and standard deviation of two groups were found out and it is clear that the arithmetic mean of the two groups were not having much difference. The mean scores of the groups were low. This means that the problem solving skills of students before implementing the package were low.

The obtained 't' value is less than the table value when compared Experimental and Control Groups before experimentation at 0.05 level and hence there is no significant difference in the pre test scores of mathematical problem solving skills in the experimental and control groups. This shows that the experimental and control groups are equated groups with respect to their problem solving skills.

The obtained 't' value is less than the table value when compared Experimental and Control Groups before experimentation at 0.05 level with respect to interest and hence there is no significant difference in the pre test scores of interest in mathematical problem solving in the experimental and control groups. This shows that there is no diffence in students interest in mathematical problem solving in the experimental and control groups.

Table 2

Mean, Standard Deviation and 't' value of Pre test and Post test scores of Mathematical Problem Solving Skills

Group	Pre test			Post test			*t*	*Level of Significance*
	M_1	SD_1	N_1	M_2	SD_2	N_2		
Experimental Group	32.79	7.24	65	41.25	6.93	65	6.82	P < 0.01
Control Group	32.34	6.91	65	33.60	7.81	65	0.98	P > 0.01

The arithmetic mean and standard deviation of Experimental and Control groups were found out. The arithmetic meanof pre test and post test in the Experimental groupwere having difference and that of the Control Group were having not much differnce. The mean scores of post test in the experimental group was higher than pre test scores and that of conrol group was almost same. This means that the problem solving skills of students after implementing the package was high in the experimental group and having no difference in the control group.

The obtained 't' value is greater than the table value at 0.01 level of the Experimental group and hence there is significant difference in the pre test and post test scores of mathematical problem solving skills in the experimental group. The obtained 't' value is less than the table value at 0.01 level of the Control group. Hence there is no significant difference in the pre test and post test scores of mathematical problem solving skills in the control group.

This means the Mathematical Problem Solving Skills of Students increased after the experimentation in the Experimental Group.

Table 3

Mean, Standard Deviation and 't' *value of Post test scores of Mathematical Problem Solving Skills*

Group	Experimental Group			Control Group			*t*	*Level of Significance*
	M_1	SD_1	N_1	M_2	SD_2	N_2		
Total	41.25	6.93	65	33.60	7.81	65	5.88	P < 0.01
Boys	43.41	5.16	34	35.90	7.81	35	4.72	P < 0.01
Girls	44.78	6.96	31	36.19	6.30	30	2.98	P < 0.01

The obtained 't' value is greater than the table value for the Total sample when compared the Experimental and Control groups after experimentation. This implies there is significant difference between Experimental and Control groups in the mathematical problem solving skills after experimentation .

The obtained 't' value is greater than the table value for Boys when compared the Experimental and Control groups after experimentation. This implies there is significant difference in scores of Boys between Experimental and Control groups in the mathematical problem solving skills after experimentation .

The obtained 't' value is less than the table value for Girls when compared the Experimental and Control group after experimentation. This implies there is no significant difference in scores of Girls between Experimental and Control groups in the mathematical problem solving skills after experimentation.

Table 4

Mean, Standard Deviation and 't' *value of Post test scores of Mathematical Problem Solving Skills with respect to Gender*

Group	Boys			Girls			*t*	*Level of Significance*
	M_1	SD_1	N_1	M_2	SD_2	N_2		
Experimental Group	43.41	5.16	34	44.78	6.96	31	0.90	P > 0.05
Control Group	35.90	7.81	35	36.19	6.30	30	0.17	P > 0.05

The obtained 't' value is less than the table value for the Experimental and Control groups when compared with respect to gender after experimentation. This implies there is no significant difference between Boys and Girls in the Experimental group and that in the Control group in the mathematical problem solving skills after experimentation at 0.05 level .

Table 5

Mean, Standard Deviation and 't' *value of Post test scores of Interest in Mathematical Problem Solving*

Group	Experimental Group			Control Group			*t*	*Level of Significance*
	M_1	SD_1	N_1	M_2	SD_2	N_2		
Total	75.63	5.64	65	63.08	4.87	65	12.55	P < 0.01
Boys	75.28	6.12	34	66.48	7.19	35	5.47	P < 0.01
Girls	74.19	5.70	31	64.16	9.01	30	5.17	P < 0.01

The obtained 't' value is greater than the table value for the total sample when compared the Experimental and Control groups after experimentation. This implies there is significant

difference between Experimental and Control groups of Students Interest in mathematical problem solving after experimentation .

The obtained 't' value is greater than the table value for Boys when compared the Experimental and Control group after experimentation. This implies there is significant difference in scores of Boys between Experimental and Control groups of Students Interest in mathematical problem solving after experimentation.

The obtained 't' value is greater than the table value for Girls when compared the Experimental and Control groups after experimentation. This implies there is significant difference in scores of Girls between Experimental and Control groups of Students Interest in mathematical problem solving after experimentation.

Table 6

Mean, Standard Deviation and 't' *value of Post test scores of Interest in Mathematical Problem Solving with respect to Gender*

Group	Boys			Girls			*t*	*Level of Significance*
	M_1	SD_1	N_1	M_2	SD_2	N_2		
Experimental Group	75.28	6.12	34	74.19	5.70	31	0.74	P > 0.05
Control Group	66.48	7.19	35	64.16	9.01	30	1.13	P > 0.05

The obtained 't' value is less than the table value for the Experimental and Control groups when compared with respect to gender after experimentation. This implies there is no significant difference between Boys and Girls in the Experimental group and that in the Control group of students interest in mathematical problem solving after experimentation at 0.05 level.

Findings and Discussions

1. The IT integrated learning package is effective in enhacing mathematical problem solving skills of students at secondary level

2. The IT integrated learning package is effective in enhacing mathematical problem solving skills of students at secondary level with respect to gender

3. The interest of students in Mathematical problem solving skills is increased through the usage of IT integrated learning package

The above findings substantiate all the the three hypotheses formulated. Therefore all the hypotheses can be accepted. The study revealed that the prepared learning package is effective in enhancing mathematical problem solving skill. This supports the findings of Rathnabai (2014) andDendane (2009).The package was also effective in enhancing Interest in Mathematical problem solving . This finding is in tune with the study conducted by Alex (2014).

Conclusion

The primary goal of this study was to find out the effectiveness of IT integrated learning package in mathematical problem solving skills of students at secondary level. The findings of the present study revealed that the package is effective in enhancing the mathematical problem solving skills of students at secondary level. Package also helped to increase the interest of students in mathematical problem solving.

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EFFECTIVENESS OF ICT SUPPORTED INSTRUCTIONAL MODULEIN ENHANCING PRONUNCIATION SKILLS INENGLISHAMONG SECONDARY SCHOOL STUDENTS

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Abstract

The purpose of the present study was to assess the effectiveness of ICT supported instructional module in enhancing pronunciation skills in English. Experimental method was adopted for the study. Pre-test, post-test non- equivalent control group design was used for the present study. Multi- stage random sampling technique used and the sample was 172 secondary school students from 2 higher secondary schools were selected from Thiruvananthapuram district in Kerala. The findings of the study revealed that ICT supported instructional module is more effective than activity oriented teaching method in enhancing pronunciation skills in English among secondary school students and ICT supported instructional module is more effective than activity oriented teaching method in enhancing pronunciation skills in English on the basis of component skills among secondary school students.

Keywords: pronunciation skills, pronunciation, accuracy, fluency, stress, English, secondary school students.

INTRODUCTION

Communication is a dynamic interactive process that involves the effective transmission of facts, ideas, thoughts, feelings and values. In today's highly competitive professional world we need to engage a lot in English communication in our day to day life. So we need to develop and hone the skills of pronunciation. One should spark in a pleasant voice in which proper modulation is highly essential. We live in the world of information technology. Communication is the nerve centre of information technology and IT enabled services.

Higher education sector of Kerala is mainly based on English as the medium of instruction. Most of the students lack of proper language and pronunciation skills even though they have been educated in English for years. It is found that students who excel in their language and pronunciation skills have greater confidence in learning are better achievers. It is the responsibility of committed teachers to develop that could enhance the English language and pronunciation skills of her students.

Phonetics refers to the study of speech sounds. It is the study of articulation of sounds in English language. Phonetics is the branch of linguistics that deals with the sounds of speech and their production, combination, description and representation of written symbols.

Pronunciation is the foundation of speaking. English, both written and spoken, has been accepted as the dominant means of communication for most of the world but some misunderstandings have been caused by inappropriate pronunciation (Yong, 2004). Poor pronunciation can condemn learners to less social, academic and work advancement than they deserved (Fraser, 1999, 2000). Good pronunciation may make the communication easier and more relaxed and thus more successful (Dan, 2006).

Pronunciation of the words should be clear and audible. A basic understanding of the sound system of the English language is very important in effective pronunciation. Pronunciation plays an important role in helping the learner become an intelligible speaker. The idea of pronunciation training to improve communication skills and confidence of non-native speakers was clearly identified from the experience in pronunciation teaching.

ICT supported instructional module, ICT stands for information and communication technologies are defined, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create spread, store and manage information". ICT supported instructional module offers explicit guidance on how to better help to the students lean and develop.

An audio and video based instructions or guidelines for developing students' pronunciation skills in Phonetics with the help of technology. The present study focuses on the development of a module that includes International Phonetic Alphabet and English Phonetic Alphabet, Different Branches of Phonetics and Air Stream Mechanism, The Organs of Speech and their Functions, Classification of Speech Sounds, Homophones, Phonemes, Allophones, Minimal Pair, Strong and Weak forms, Syllables, Stress, Intonation and also integrates audio visual clippings of pronunciation in the proposed ICT supported instructional module.

The present study is an attempt at developing ICT supported instructional module in enhancing pronunciation skills in English among secondary school students. The investigator will also integrates audio visual clippings in the proposed ICT supported instructional module.

The study would attempt to prepare a module on values for secondary school students. The main issue which emerged at the beginning of this study is presented below in the form of research questions.

1. Is a specially designed ICT supported instructional module effective in enhancing Pronunciation skills in English among secondary school students?
2. What is the level of pronunciation skills in English among secondary school students?
3. What are the important strategies for the development of pronunciation skills in English?

When we deal with any language we have to master all the four major communicative aspects of that language. They are listening, speaking, reading and writing. We get enough exposure for reading, writing and listening but for speaking we don't get enough opportunity. Hence we are unable to speak correctly properly confidently and with proper pronunciation. Pronunciation is the manner of speaking and good pronunciation is the way of speaking that ordinary people find easy to understand. By applying the techniques of phonetics the language skill of the student can be improve to good extent.

This study focuses to identify the components of pronunciation skills such as pronunciation, accuracy, fluency and stress in students developed by the present pattern of school curriculum. The researcher also attempt to introduce a new method of teaching (ICT supported instructional Module) and tries to find out its effectiveness on enhancing certain pronunciation skills among secondary school students.

OBJECTIVES OF THE STUDY

1. To develop ICT supported instructional module in phonetics for enhancing pronunciation skills in English among secondary school students.

2. To assess the effectiveness of ICT supported instructional module in phonetics over activity oriented teaching method in enhancing pronunciation skills in English among secondary school students.

3. To assess the effectiveness of ICT supported instructional module in phonetics over activity oriented teaching method in enhancing pronunciation skills in English among secondary school students on the basis of component skills such as

i. pronunciation

ii. Accuracy

iii. Fluency

iv. Stress

HYPOTHESES OF THE STUDY

1.There is significant difference between pronunciation skills in English among secondary school students subjected to ICT supported instructional module in phonetics over activity oriented teaching method.

2.There is significant difference between pronunciation skills in English among secondary school students subjected to ICT supported instructional module in phonetics over activity oriented teaching method on the basis of component skills such as

i. pronunciation

ii. Accuracy

iii. Fluency

iv. Stress

METHODOLOGY

Method Adopted

The method adopted for the present study was Experimental Method. In this study the investigator has adopted Pre – test Post – test non-equivalent control group design.

Population

All the secondary school students in Thiruvananthapuram District, Kerala constitute the population.

Sample of the study

In this present study Multi Stage Random Sampling Technique was used. Two schools were selected. From the selected schools Total 172 students of IX thstandard were taken for the Experimental and Control group.

Tools of the study

The selection of suitable and appropriate tools are important for successful research. The tools adopted for the present study were;

1) Validated ICT supported instructional Module in pronunciation skills in English based on Phonetics.

2) Pronunciation based validated written and oral test.

Procedure of the study

Experimental method with Pre-test, post-test non- equivalent control group design. From the selected schools the investigator randomly selected IX thstandard. ICT supported instructional module will be prepare for improving the pronunciation skills in English using phonetics. The module will be validated by the subject experts and English teachers. Using the validated tool for identifying the pronunciation skills, the students of experimental and control groups were compared.

Statistical Techniques

For the present study, the investigator used the following suitable statistical techniques for the study

i. Descriptive statistics
ii. Test of significance of difference between mean (t)
iii. ANCOVA

RESULTS AND DISCUSSION

Result of the existing study are discussed along with its objectives

Objective: To assess the effectiveness of ICT supported instructional module in phonetics over activity oriented teaching method in enhancing pronunciation skills in English among secondary school students. Before proceeding to ANCOVA, ANOVA was carried out pre -test and post -test separately. Total sum of squares, mean square variance and F ratio of the pre-test and post test scores of the experimental and control group were computed. The data and results of ANOVA are presented in table is given as following

Table 1: **COMPARISON OF PRE TEST AND POST TEST SCORES (ANOVA TABLE)**

Source of variation	df	SSx	SSy	MSx	Msy	Fx	Fy
Among means	1	22243.8	412972.0	22243.8	412972.0	1.97	8.51**
Within groups	170	1924088.9	8254506.3	11318.2	48555.9		
Total	171	1946332.7	8667478.3				

***: - Significant at 0.01 level x :Pre test y : Post test

The obtained value of Fx is 1. 97. It is much less than the table value of 3.91 at 0.05 levels. Therefore it can be tentatively concluded that there is no significant difference between the pre- test scores of the experimental group and that of the control group. The obtained value of Fy is 8.51. It is much greater than the table value of 6.74 at 0.01 levels.

The table value of F is the obtained value for pre –test is1.97 and post-test is 8.51 which is significant at 0.0l level.

The summary of ANCOVA of pre -test and post test scores of pupils in experimental and control group table is given below

Table 2: **COMPARISON OF POST TEST SCORES AFTER CORRECTING FOR DIFFERENCE IN PRE TEST SCORES (ANCOVA**

Source of variation	df	SSx	SSy	SSy.x	MSy.x		Fy.x
Among	1	22243.8	412972.0	172878.7	172878.7	151.85	7.5*
Within	169	1924088.9	8254506.3	3896997.9	23059.2		
Total	170	1946332.7	8667478.3	4069876.6			

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

The table value of F (df=1/169) are 3.92 and 6.74 at 0.05level and 0.01 level respectively. The calculated value of Fy.x is 7.5, since it is much greater than the table value it is significant at 0.01 level.

Table 3:**UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE AND POST TEST LEVEL**

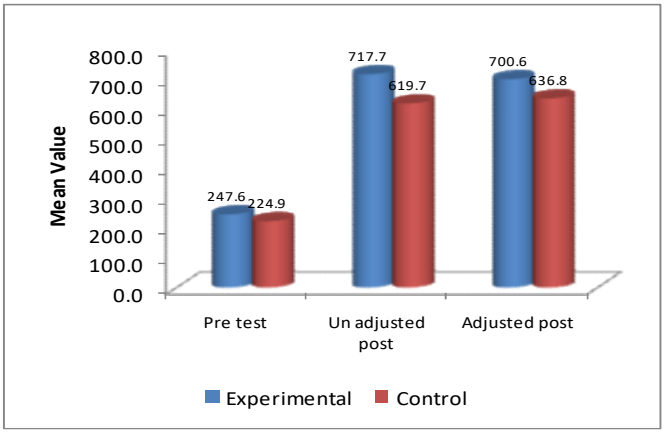
Group	N	Mx	My	My.x	T
Experimental	86	247.6	717.7	700.6	2.75**
Control	86	224.9	619.7	636.8	
Total	172	236.2	668.7	668.7	

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

The calculated t value is 1.93 at 0.05 level and 2.56 at 0.01 level. Since the calculated value of 't' exceeds the table value, it is significant at 0.01 level.

From the above analysis it is seen that the hypothesis formulated in this context "there is significant difference between in the level of pronunciation skills among secondary school students when taught through ICT supported instructional module in phonetics is effective than the activity oriented teaching method" is accepted.

Figure 1: **UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE AND POST TEST LEVEL**



Objective: To assess the effectiveness of ICT supported instructional module in phonetics over activity oriented teaching method in enhancing English pronunciation skills among secondary school students for the experimental and control group on the basis of component skills such as

i. Pronunciation
ii. Accuracy
iii. Fluency
iv. Stress

Pre – test and Post – test (component skills of pronunciation)

Before proceeding to ANCOVA, ANOVA was carried out pre -test and post -test separately. Total sum of squares, mean square variance and F ratio of the pre - test and post - test scores of the

experimental and control group were computed. The data and results of ANOVA are presented in the table is given below

Table 4: **COMPARISON OF PRE TEST AND POST TEST SCORES (ANOVA TABLE) FOR COMPONENT SKILLS OF PRONUNCIATION – PRONUNCIATION**

Source of variation	df	SSx	SSy	MSx	Msy	Fx	Fy
Among means	1	1506.3	26875.0	1506.3	26875.0	2.09	8.89**
Within groups	170	122657.0	513970.3	721.5	3023.4		
Total	171	124163.3	540845.3				

**: - Significant at 0.01 level x :Pre test y : Post test

Analysis of variance (ANOVA) is carried out to test the effectiveness of two treatment groups under study. The obtained value of Fx is 2.09. It is much less than the table value of 3.91 at 0.01 levels. The obtained value of Fy is 8.89. It is much greater than the table value of 3.91 at 0.05level and 6. 74 level at 0.01 level. The table value of F is the obtained value for pre –test is 2.09 and post - test is 8.89 which is significant at 0.01evel.

Table 5: **COMPARISON OF POST TEST SCORES AFTER CORRECTING FOR DIFFERENCE IN PRE - TEST SCORES (ANCOVA)**

Source of variation	df	SSx	SSy	SSy.x	MSy.x	SDy.x	Fy.x
Among	1	1506.3	26875.0	11411.3	11411.3	38.799	7.58**
Within	169	122657.0	513970.3	254409.5	1505.4		

Total	170	124163.3	540845.3	265820.8			

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

The calculated Fy.x ratio was tested for significance. The table value of F (df=1/169) are 3.92 and 6.74 at 0.05 level and 0.01 level respectively. The calculated value of Fy.x is 7.58, since it is much greater than the table value it is significant at 0.01 levels.

Table 6 **: UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE AND POST TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION – PRONUNCIATION**

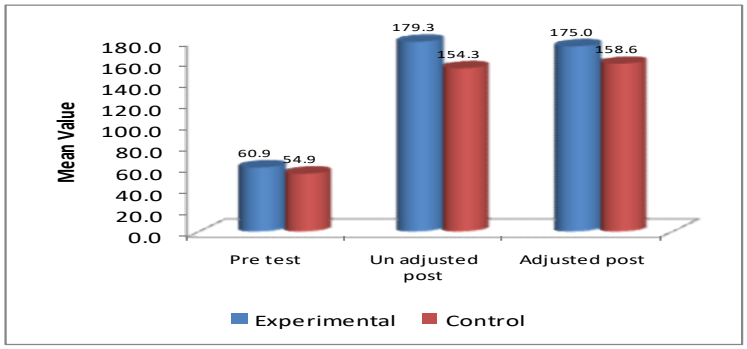
Group	N	Mx	My	My.x	t
Experimental	86	60.9	179.3	175.0	2.77**
Control	86	54.9	154.3	158.6	
Total	172	57.9	166.8	166.8	

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

Adjusted Y means of post test scores were tested for significance. The calculated t value is 2.77. Since the calculated value of 't' exceeds the table value, it is significant at 0.01 level. From the above analysis it is seen that the hypothesis formulated in this context "there is significant difference between the 'English pronunciation skills' among secondary schoolstudents when taught through ICT supported instructional module in phonetics is effective than the activity oriented teaching method" is accepted.

The graphical representation of the result figure is given as follows.

Figure 2: **UNADJUSTED AND ADJUSTED MEANS SCORES AT PRE AND POST TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION – PRONUNCIATION**



Pre – test and Post – test (component skills of pronunciation – Accuracy)

The pre-test and post - test scores of component skills of pronunciation - accuracy skill test for the experimental and control groups were subjected to analysis of variance (ANOVA) to determine the effectiveness of ICT supported instructional module in phonetics over activity oriented teaching method in enhancing English pronunciation skills among secondary school students.

Before proceeding to ANCOVA, ANOVA was carried out pre -test and post -test separately. Total sum of squares, mean square variance and F ratio of the pre- test and post test scores of the experimental and control group were computed.

The data and results of ANOVA are presented in the table is given below

Table 7: **COMPARISON OF PRE - TEST AND POST - TEST SCORES (ANOVA TABLE) FOR COMPONENT SKILLS OF PRONUNCIATION –ACCURACY**

Source of variation	df	SSx	SSy	MSx	Msy	Fx	Fy
Among means	1	2649.0	28139.5	2649.0	28139.5	3.97*	9.31**
Within groups	170	113374.9	513745.1	666.9	3022.0		
Total	171	116023.9	541884.6				

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

The table value of F is the obtained value for pre - test 3.97 and post - test is 9.31 which is significant at 0.01 level. The obtained value of Fx is 3.91. It is much less than the table value of 6.74 at

0.01 levels. Therefore it can be tentatively concluded that there is no significant difference between the pre- test scores of the experimental group and that of the control group. The obtained value of FY is 9.31. It is much greater than the table value of 6.74 at 0.01 levels.

Table 8: **COMPARISON OF POST - TEST SCORES AFTER CORRECTING FOR DIFFERENCE IN PRE - TEST SCORES (ANCOVA) TABLE FOR COMPONENT SKILLS OF PRONUNCIATION – ACCURACY**

Source of variation	Df	SSx	SSy	SSy.x	MSy.x	SDy.x	Fy.x
Among	1	2649.0	28139.5	8197.7	8197.7	39.638	5.22*
Within	169	113374.9	513745.1	265521.3	1571.1		
Total	170	116023.9	541884.6	273719.0			

*: - Significant at 0.05 level x :Pre test y : Post testy.x : Adjusted post

The calculated Fy.x ratio was tested for significance. The table value of F (df=1/169) are 3.870 and 6.71 at 0.05 level and 0.01 level respectively. The calculated value of Fy.x is 5.2, since it is much greater than the table value; it is significant at 0.01 levels.

The data for adjusted means of post - test scores of pupils in experimental and control groups table is given below.

Table 9: **UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE – TEST AND POST - TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION - ACCURACY**

Group	N	Mx	My	My.x	T
Experimental	86	59.6	176.2	170.4	2.31*
Control	86	51.7	150.7	156.5	

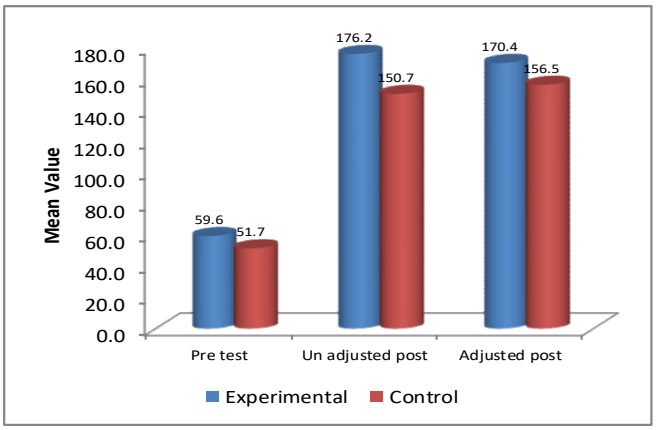
Total	172	55.6	163.5	163.5	

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

Adjusted Y means of post- test scores were tested for significance. The calculated t value is 2.31. Since the calculated value of 't' exceeds the table value, it is significant at 0.01 level. From the above analysis it is seen that the hypothesis formulated in this context "there is significant difference between the level of 'English accuracy skill' among secondary school students when taught through ICT supported instructional module is effective than the activity oriented teaching method" is accepted.

The graphical representation of the result in the figure is given as follows.

Figure 3: **UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE AND POST -TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION – ACCURACY**



Pre – test and Post – test (component skills of pronunciation – Fluency)

Table 10: **COMPARISON OF PRE - TEST AND POST - TEST SCORES (ANOVA TABLE) FOR COMPONENT SKILLS OF PRONUNCIATION - FLUENCY**

Source of variation	Df	SSx	SSy	MSx	Msy	Fx	Fy

	Among means	1	2234.9	26377.3	2234.9	26377.3	3.12	8.7**
	Within groups	170	121641.6	515703.4	715.5	3033.5		
**:-	Total	171	123876.5	542080.7				

Significant at 0.01 level x :Pre test y : Post test

Analysis of variance (ANOVA) is carried out to test the effectiveness of two treatment groups under study. The table value of F is the obtained value for pre - test 3.12 and post - test is 8.7 which is significant at 0.01 level. The obtained value of Fx is 3.12. It is much less than the table value of 3.92 at 0.05 level and 6.74 at 0.01 levels. Therefore it can be tentatively concluded that there is no significant difference between the pre- test scores of the experimental group and that of the control group. The obtained value of FY is 8.7. It is much greater than the table value of 6.74at 0.01 levels.

Therefore it can be tentatively concluded that there is significant difference between the post-test scores of the experimental group and that of the control group. The table value of F is the obtained value for pre –test is 3.12 and post - test is 8.7 which is significant at 0.0l level.

Table 11: **COMPARISON OF POST - TEST SCORES AFTER CORRECTING FOR DIFFERENCE IN PRE - TEST SCORES (ANCOVA) TABLE FOR FLUENCY**

Source of variation	df	SSx	SSy	SSy.x	MSy.x	SDy.x	Fy.x
Among	1	2234.9	26377.3	8841.5	8841.5	39.789	5.58*
Within	169	121641.6	515703.4	267553.0	1583.2		
Total	170	123876.5	542080.7	276394.5			

*: - Significant at 0.05 level x :Pre test y : Post testy.x : Adjusted post

The calculated Fy.x ratio was tested for significance. The table value of F (df=1/169 are 3.87 and 6.7 at 0.05 level and 0.01 level respectively. The calculated value of Fy.x is 5. 58, since it is much greater than the table value; it is significant at 0.05 levels. Thus it is clear from the Fy.x ratio that the

post - test scores of the experimental group and control group differ significantly, after they have been adjusted for initial differences.

Table 12: **UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE – TEST AND POST - TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION - FLUENCY**

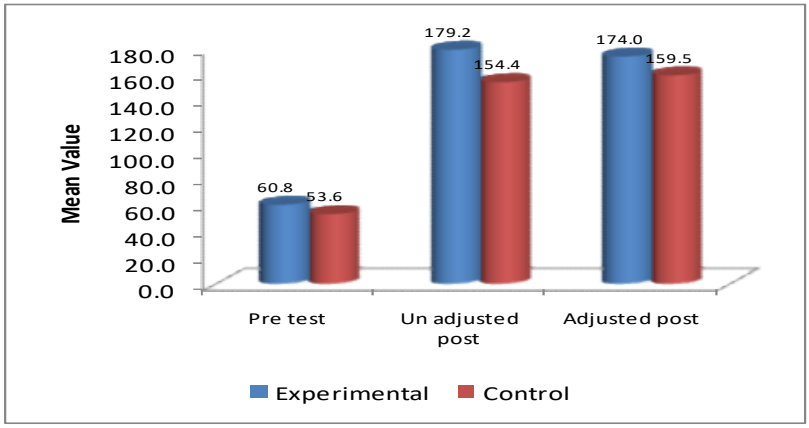
Group	N	Mx	My	My.x	t
Experimental	86	60.8	179.2	174.0	2.38*
Control	86	53.6	154.4	159.5	
Total	172	57.2	166.8	166.8	

*: - Significant at 0.05 level x :Pre test y : Post testy.x : Adjusted post

Adjusted Y means of post- test scores were tested for significance. The calculated t value is 2.38. Since the calculated value of 't' exceeds the table value, it is significant at 0.05 level. From the above analysis it is seen that the hypothesis formulated in this context "there is significant difference between in the level of 'English fluency skill 'among secondary level students when taught through ICT supported instructional module is effective than the activity oriented teaching method" is accepted.

The graphical representation of the result in the figure is given as follows.

Figure 4 :**UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE AND POST TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION - FLUENCY**



Pre – test and Post – test (component skills of pronunciation – Stress)

The pre-test and post - test scores for component skills of pronunciation - stress skill test for the experimental and control groups were subjected to analysis of variance (ANOVA) to determine the effectiveness of ICT supported instructional module in phonetics over activity oriented teaching method in enhancing English pronunciation skills among secondary school students.

Before proceeding to ANCOVA, ANOVA was carried out pre -test and post -test separately. Total sum of squares, mean square variance and F ratio of the pre- test and post test scores of the experimental and control group were computed. The data and results of ANOVA are presented in table is given below.

Table 13: **COMPARISON OF PRE - TEST AND POST - TEST SCORES (ANOVA TABLE) FOR COMPONENT SKILLS OF PRONUNCIATION– STRESS**

Source of variation	df	SSx	SSy	MSx	Msy	Fx	Fy
Among means	1	134.3	22062.2	134.3	22062.2	0.15	6.96**
Within groups	170	155662.7	538935.5	915.7	3170.2		
Total	171	155797.0	560997.8				

**: - Significant at 0.01 level x :Pre test y : Post test

The obtained value of Fy is 6.96. It is much greater than the table value of 6.74 at 0.01 levels. The table value of F is the obtained value for pre –test is 0.15 and post - test is 6.96 which is significant at 0.0l level.

Table 14: **COMPARISON OF POST - TEST SCORES AFTER CORRECTING FOR DIFFERENCE IN PRE - TEST SCORES (ANCOVA) TABLE FOR COMPONENT SKILLS OF PRONUNCIATION - STRESS**

Source of variation	Df	SSx	SSy	SSy.x	MSy.x	SDy.x	Fy.x
Among	1	134.3	22062.2	17757.9	17757.9	40.014	11.09**
Within	169	155662.7	538935.5	270586.4	1601.1		
Total	170	155797.0	560997.8	288344.3			

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

The calculated Fy.x ratio was tested for significance. The table value of F (df=1/169)are 3.92 and 6.74 at 0.05 level and 0.01 level respectively. The calculated value of Fy.x is 5.22, since it is much greater than the table value; it is significant at 0.01 levels.

Table 15:**UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE – TEST AND POST - TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION –STRESS**

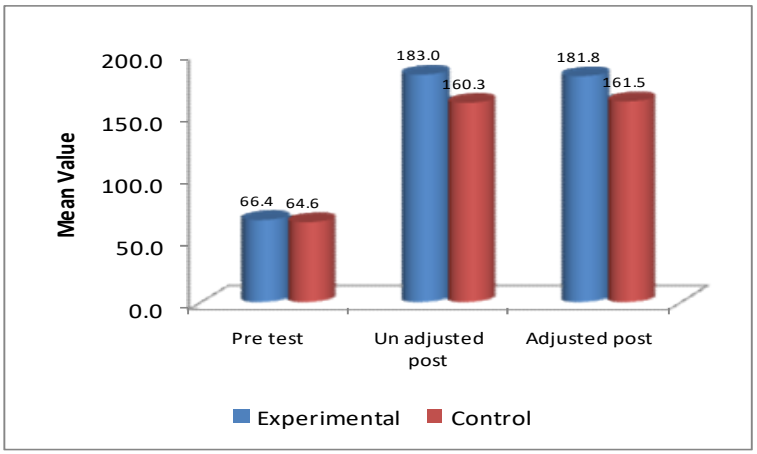
Group	N	Mx	My	My.x	t
Experimental	86	66.4	183.0	181.8	3.33**
Control	86	64.6	160.3	161.5	
Total	172	65.5	171.7	171.7	

**: - Significant at 0.01 level x :Pre test y : Post testy.x : Adjusted post

Adjusted Y means of post - test scores were tested for significance. The calculated t value is 3.33. Since the calculated value of 't' exceeds the table value, it is significant at 0.01 level. From the above analysis it is seen that the hypothesis formulated in this context "there is significant difference between in the level of ' English stress skill' among secondary school students when taught through ICT supported instructional module is effective than the activity oriented teaching method" is accepted.

The graphical representation of the result is given as follow

Figure 5: **UNADJUSTED AND ADJUSTED MEAN SCORES AT PRE AND POST TEST LEVEL FOR COMPONENT SKILLS OF PRONUNCIATION – STRESS**



MAJOR FINDINGS

1. ICT supported instructional module is more effective than activity oriented teaching method in enhancing pronunciation skills in English among secondary school students.

2. ICT supported instructional module is more effective than activity oriented teaching method in enhancing pronunciation skills in English on the basis of component skills among secondary school students.

EDUCATIONAL IMPLICATIONS, RECOMMENDATIONS AND SUGGESTIONS

Speech, anchoring, reading and communication can be conducted in educational institutions for enhancing pronunciation skills in English among secondary school students.English language is necessary on pronunciation skills can be provided to the teachers through the video and audio recordings in the language labs.

A study can be focused in adults who have not learned to speak fluency in English.A hand book prepared for the students based on ICT supported instructional module.

The findings of this study suggest that the usage of ICT supported instructional module is effective to enhance pronunciation skills in English among secondary school students.

From these findings, this study proposes the following recommendations.

Teachers should be encouraged to the students to speak in English with confidently. The researcher strongly recommended to the curriculum development committee to foster more importance to give 'phonetics' based curriculum rather than activity oriented technique to enhancing pronunciation skills in English.

In- service training for teachers should be provided for the preparation and implementation of the ICT supported instructional module in phonetics in enhancing pronunciation skills in English such as pronunciation, accuracy, fluency and stress.Students of unprivileged area like coastal and tribal areas can be taught using this ICT supported instructional module. Studies can be conducted to find out the attitude of secondary school teachers towards implementation of ICT supported instructional module in phonetics based teaching in the curriculum.

A study of practical difficulties encouraged in Phonemic instructions can be conducted. A comparative study can be conducted among the students of rural and urban areas on the effectiveness of module based teaching. Learning package for pronunciation skills in English can be prepared for students of all grades. A study can be conducted to develop a new strategy which takes into account of all the sub skills of English pronunciation

CONCLUSION

The study almost covers a wide field and fulfils major functions in pronunciation skills. The study would be also useful and fruitful to the teachers in providing idealized individual attention to the students and help them to modify their pronunciation skills can be get much farther and further result. It is an effective teaching method to expedite their pronunciation skills among the students ICT supported instructional module is more effective than activity oriented teaching method in enhancing pronunciation skills in English among secondary school students. It helps to develop different component skills such as pronunciation, accuracy, fluency and stress which are the essential attributes of pronunciation skills in English.

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INTEGRATION OF ICT IN EDUCATION FOR DEVELOPING CREATIVITY

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Abstract

It is a fact that, children belong to marginalized societies are facing some severe problems in their educational achievement and confidence. There is also a trend of deceasing expression of creativity.Enhancing creativity and developing technology skills in the classroom are the future of education and can turn out to be powerful tools to smooth out inequalities in class. On the basis of case study on Koragas children, in this paper an attempt is made to discuss problems related to developing creativity and suggest ways to foster creativity among school children in general and Koraga children in particular. Today's world need creative personalities.21st Century Learning places emphasis on creativity and innovation.Recent research in education highlights the social and collaborative dimension of creativity. Studies have shown that, there are forms of technology and technological features which support and organize the creative processes,technology can play different roles in promoting social creativity, need of supportive environment to perform collective creativity processes. Paper discuss the importance of Information Communication Technology in learning and how it works among each educational agents both teacher and student and their role in transforming the teaching-learning process and influence creativity.The paper also discuss the nature of creativity in the context of computer based learning environment and how creativity can be improved with modes of activity — problem solving, creative cognition, and social interaction.

Introduction

Human beings are born creative and then taught to be uncreative as they grow older. Its true when we were young child or a kid, there is an emphasis on drawing class, dance or music or other instruments or playing and "reaching for the stars," stories about moon. But when we reached higher classes, what happened? We're told to think practically, take the straight and narrow path, marry by calculating dowry, and pay your taxes. These all happening in everyday life without thinking out of the box. Creative thinking is one of the most important abilities that children may develop during preschool age (Wheeler, Waiter & Bromfield, 2002). In addition according to Horakova (2004) children (3-6) years old are in the ideal age to develop self-efficacy which affects creativity.

To a certain extent, it can be stated that these tribes in Kerala are less progressive compared to other mainstream population. The creativity and knowledge of these communities should be properly directed through inclusive education.

Objectives

1. To identify the factors affecting creativity of marginalized children especially Tribal children of Kerala

2. To discuss the integration of ICT in education to foster creativity

3. To suggest measures to improve creativity among children belong to marginalized community in public sector education

Hypotheses

- Tribes like Koragas possess distinct position in the Socio-economic milieu of Kerala and some critical factors affecting creativity of these children
- Integration of educational technology and ICT , new creative pedagogical approaches to change the mind set of children will develop creativity of children
- Imparting of education in a right way and developing creativity serves as a prominent instrument for the social change and development to a considerable extent

Methodology.

A combined methodology of historical research and anthropological field-study are used.The study is analytical, descriptive and objective, in nature.Primary sources including survey, observation, interview is followed. Secondary sources are extensively used.

Introduction

The ideas of teaching construction and the way one can build and consolidate meaningful learning based on technology are now being discussed, in strictly pedagogical terms. The combination of technology and creativity is the key to provide the immersive experience students need.

Today's world need creative personalities to lead. Resnick[1] reflected on how rapidly the world is changing, faster than ever before, and on how concepts that were important to teach today may well be obsolete tomorrow. He emphasized the need to develop the ability to come up with creative solutions to a rapidly changing world.[2] EU reports endorse education's innovative capacity and encourage the development of twenty-first century skills or 4C's competencies namely Creativity, Collaboration, Criticality, and Caring.

National Educational Technology Plan mentions fostering creativity, collaboration, leadership, and critical thinking while engaging learners in complex, real-world challenges through a project-based learning approach. Anderson and Krathwohl's (2001) revision of Bloom's taxonomy places creativity at the top of the cognitive processing hierarchy, above evaluating, analyzing, applying, understanding, and remembering. Other sources can be found in other countries placing emphasis on creativity as an important goal of learning and instruction. Given such emphasis, it seems appropriate to inquire about the nature of creativity and what might be reasonably done to foster creativity in learners.

"Creativity is a central source of meaning in our lives … most of the things that is interesting, important, and human are the results of creativity…and when we are involved in it, we feel that we are living more fully than during the rest of life."[3]Creative power increases a young child's desire to learn and supports intellectual development. Divergent thinking help to maintain children's motivation and passion for in-depth learning and generate new ideas fosters their creative-thinking abilities

By seeing the words of creative personalities we could understand the relevance of creativity. Albert Einstein said, supreme art of teaching is to awaken joy in creative expression of knowledge. Galieleo said you cannot teach a man anything you can only help him to find it himself. In this context, Creativity should be defined in a qualitative manner as an essential key factor in National Educational Policy statements, because it has greater implication on curriculum and pedagogy.[4]We can foster creativity both Individual and collective creativity through parternship activity bringing together arts. technology, science and social sciences. Development of creative skill is essential socio economic development.[5]Peter Woods, famous educationist identified four characteristics of creativity, relevance, ownership, control and innovation which are recognized by NACCE, 1999[6]-, for examination of creative approach in education.Lot of research is going on the influence of creativity in education and vice versa. North America came forward in conducting research on aspects of pedagogical approaches which foster creativity.There are also research studies about the distinction between teaching creativity and teaching for creativity.

Teaching creativity and Teaching for creativity

Teaching creativity using imaginative approaches to make learning more effective and interesting. It's concerned with effective teaching.Teaching for creativity refers to forms of teaching that are intended to develop creative thinking or behavior. It is interpreted as learner empowerment as the main objective. It

[1]Professor Mitch Resnick from MIT, the father of constructionism and the Godfather of ICT integration in education
[2]Tim Kitchen, The Importance Of Creativity In Education Technology, 2015
[3]MihalyCsikszentmihalyi, "Creativity: The Psychology of Discovery and Invention,"
[4]Henriksen.D, et.al, Creativity and Teaching in Education, 2018, pp409-424
[5]Jeffereyand Craft, 2001
[6]National Advisory Committee on Creative and Cultural Education, 1999

is also interpreted that 'Young people 's creative abilities are most likely to be developed in an atmosphere in which teacher 's creative abilities are properly engaged'.

Teaching for creativity is based on certain principles such as encouraging and develop confidence,identifying creative abilities, developing curiosity, becoming more knowledgeable about creative processes, providing opportunities.This can be made done by making teaching and learning relevant and encouraging ownership of learning and then passing back control to the learner.[7]Control is a valuable experience can be gained outside class room or without the presence of teachers, through computer programme. Here child can use imagination, creativity, ownership, innovation in learning as he or she can make things on them and play around it. Children are controlling computer programmes like they would control a robot and it leads to innovation. There are also possibilities for surprising innovation in computer painting, design and animation and also programmes related to art, such as music and film etc.

Children collaborate to gain a fuller understanding of the subject and aspects of wider disciplines through collaborative teaching and learning, brain storming, possibility thinking, asking questions, identifying problems, with opportunity to discuss their ideas.[8]. They can use their imagination and can confront each other's contribution. They can do independently as there develops a strong sense of achievement in the minds of learner which leads to diverse and critical thinking.

Teaching for creativity could involve generating a learner inclusive pedagogy, where learner is engaged to engage in identifying and exploring knowledge.Teaching for creativity encourages a sense of responsibility for learning. It involves goal setting, planning capacity for self-monitoring, self-assessment and self-management. Self-directed learning is internalized better and this will lead to development of life long personal creativity. These aims can be better achieved through creative teaching of teacher and creative learning of learner.

Let's understand the realities and analyse the factors that prevent development of creativity among low privileged children like tribals.There are many reasons for the low level of educational achievement and creativity among Tribal children like Koragas

It is true that children from marginalized communities and from poor socio-economic background suffer from some problems which negatively affect their academic achievement. From the field study, it isunderstood that Koraga students facing several problems and hence forced to discontinuefrom schools resulting in increasing dropout rates which is serious issue in every school.

Problems of children at home.

Majority of tribal parents are not aware of the importance of education. Since most of Koraga parents are illiterate not able to motivate and encourage their children by creating conducive atmosphere at homes. Most of them addicted to alcohol.

[7]Jefferey and Craft , The Creative School : a framework for success, quality and effectiveness, Routledge Publication, London 2003)
[8] Jeffrey &Woods, 2003, p.73

It was understood that breakfast is not being prepared in most of the Koraga houses and the hungry students find hard to attend classes seriously.[9] Compulsion to go for seasonal works due to poverty, attitude of parents, influence of their friends and relatives, are also the reasons of drop out. It is also felt to the researcher that Koragas are facing psychological hindrances including inferiority complexes. Students facing the problem of lack of confidence and socialization skills will not able to perform well academically. Elder children especially girls are forced to discontinue their studies to look after their younger ones. Their life is very much linked with their cultural fabric.

Problems at School

There are many factors which hinder the natural development of creativity of children. Attitude of teachers and other students, lack of achievement motivation, lack of conducive environment, lack of a space to do think and share ideas and practice these ideas in to action, lack of support from school. Language problem of Koraga students is a major issue. Lack of opportunities and scope for divergent thinking are common factor in most of the school environment. Research proves that non-creative behavior is learned overtime. According to George Land's Creativity Test, young children are creative geniuses, and become less creative as they age. Studies from West say, divergent thinking declines tremendously over the course of development. The reason creativity diminishes as children grow may vary with each stage. For young adolescents, the intense pressure to conform, fit in, and not stand out is one key factor for the loss of creativity. While teens are known for being impulsive risk-takers, within academic circles they tend to be the opposite. They conform to expectations; often work to prepare for the test. Koraga students are having intelligence and brilliance as it is evident in their skill and knowledge to do multiple tasks at a time. They are able to do basketry in a limited time with fast and ease. They can do swimming, excel in sports, crafts making, work experience tasks, mathematical skills, scientific talents.[10]They can enter forests and can collect honey and other forest products and identification of plants and collection of raw materials are routine works.. For making baskets and mats, even though it was their traditional occupation, needs intelligence and hand eye brain coordination..Koragas are brilliant and fast learners. Koraga students who are talented in extra-curricular activities often do not get encouragement and training.

Tribal children find difficult to follow the higher level of learning without getting the basics are affecting their studies. For example without getting the basic knowledge in alpha-numerics from primary classes, they would not learn with interest in their higher classes and eventually they opt to discontinue their studies. Most of the Koraga students had no proper motivation and guidance. Tribal children find difficulty to cope up with the present curriculum. It is noted that opportunities to participate in arts and sports competitions and other public events are not properly utilizsed.[11]

It is in these circumstances, teachers should help them to explore imaginary worlds, or provide spark they need to invest in more creative endeavors. By teaching creative skills such as how to use

[9] Data collecte from field study conducted during 2014 April to May 2017

[10]Based on field study conducted at Koraga Settlements during 2014-2017 by researcher

[11] Based on field study conducted at Koraga Settlements during 2014-2017 by researcher

imagination, how to collaborate with peers, and how to be self-motivated, all of these skills are a pathway to making good ideas happen.

Information and Communication Technology and Education

Nowadays "information" available can be cataloged and accessed on an unlimited and immediate basis, and transmission thereof occurs across all areas of an individual's life, including politics, economy, education, and leisure.[12] The vast amount of information being now generated in our society has prompted its designation as the knowledge-based society. Some scholars go further and call it the digital society. It is true that a difference exists between what is known as the knowledge-based society and the information society. He views the latter as a media-based digital revolution being disseminated through Information and Communication Technologies (ICT), whilst knowledge-based society bases its conception on conveying and stimulating its resources through the use of technological tools, generating faster and more effective products. [13]

Integrating ICT in education once the educational system is in a position to design meaningful learning generated through experiences and a reflective content, capable of having both students and teachers generate knowledge. The above is focused not only on the classroom. Every space and moment where learning occurs must conceive of the idea of becoming this signal achievement. ICTs, as technological tools, have increased the degree of significance and educational conception, establishing new models of communication, besides generating spaces for training, information, debate, reflection, among others, as well as breaking up the barriers of traditionalism in the classroom. The teaching-learning process in the classroom, using ICT, requires a set of skills to be developed by the teacher with a view to internalizing a methodology to make the most of technological tools, in which teacher training shall be deemed among the first options prior to facing new educational challenges. In the context of ideas above, the transition from traditional education to a knowledge acquisition-based society has been no easy task. The functional role of teachers within this approach not only requires a change in their methodological practices, but a change of mind involving their beliefs in the different environments where learning can be achieved. The contribution of ICTs to education and society as such is undoubtedly flexibility and adaptability to an increasingly changing environment. ICTs, in their role as tools added to pedagogical models, can become valuable resources for learning and for equipping students with appropriate personal and professional skills for a country's development.[14]

A variety of Information and Communication Technology (ICT) applications can support the creative process, by strengthening various well known techniques (e.g. brainstorming) and introducing new ones. Young children are in ideal and critical age of develop their creative potential. Information technology plays a critical role in using technology to communicate. Information and communication technology (ICT) is universally acknowledged as an important catalyst for social transformation and national progress. The impact of ICT on the knowledge-based society has brought about major changes. In terms of form and content, it has had a massive and multiplying effect, to such an extent that the purpose of knowledge has come to permeate the wider society.[15]The widespread use of digital

[12] Ronald M. Hernandez,Impact of ICT on Education: Challenges and Perspectives, p.339
[13]V. Rajaraman, Introduction to Information Technology, PHI learning Put Ltd, New Delhi, 2010,p.339
[14]Prieto, Quiñones, Ramírez, Fuentes, Labrada, Pérez & Montero, 2011). 346 Impact of ICT on Education: Challenges and Perspectives Propósitos y RepresentacionesEne. - Jun. 2017, Vol. 5, Nº 1: pp. 325 - 347
[15] Ronald M. Hernandez, p.341

computers in education has made even the study of numerical methods through computer orientation is significant. Computers are used when developing computational algorithms for solving problems in algebra and calculus. Here approach should ensure conceptual understanding of numerical methods by relying on students' geometric intuition. The methods developed would provide a basis for evolving algorithms for implementation on a digital computer.[16]

Conclusion

Successfully integrating ICT into education depends to a large extent on the teacher's ability to structure the learning environment[17]. There is much talk about giving the "leap" forward and "breaking up" traditional formulas with cooperation and teamwork-based learning. However, the use and involvement of ICTs in education has not yet been understood as a tool through which meaningful learning can be generated.India has not been able to introduce computer aided instruction on a substantial scale due to lack of infrastructure, lack of suitable environment, overcrowded class, less funding on public education, financial constraints, lapses in effective monitoring and management of ICT enabled education, lack of basic knowledge of computers, computer illiteracy especially among poor marginalized sections of society. A comprehensive plan is needed and also government should allocate more funding on public education and ICT enabled education.

Encouraging students to enhance their creative and critical thinking skills as well as their collaboration skills needs to be a vital part of the education process. Developing a Creative Learning approach, educators can use technology to activate, blend and strengthen multiple inner skills in their classrooms. Technology can be a strong vehicle to help teachers bringing out creative values from students. The true potential of computers in imparting education has not yet been fully exploited even though many developments have brought changes in quality education. Interaction is the greatest advantage of computers as compared to TV based lessons which are one way.[18] When teachers use technological devices to integrate their traditional lessons with sounds, projected images or lights, the positive reaction is guaranteed: students become more engaged, the understanding process in their minds is boosted and they begin making links and connections among concepts they're receiving in a more tangible

form. The best way to create value in the 21st century is to connect creativity with technology".

[16]V. Rajaraman, Computer oriented Numerical methods, Prentice hall publication, 1993.New Delhi, p. ix
[17]UNESCO, 2008
[18] V. Rajaraman, Introduction to Information Technology, PHI learning Put Ltd, New Delhi, 2010, p. 351

LOGICAL-MATHEMATICAL INTELLIGENCE OF HIGHER SECONDARY STUDENTS

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Abstract

(The present study is aimed to know and assessing the level of logical mathematical intelligence of higher secondary students in Tirunelveli district. The objectives of the study are; a) to find out the level of logical mathematical intelligence of higher secondary students with reference to gender. b) to find out the significant differences in higher secondary students in their mathematical intelligence with reference to gender and type of family. c) to find out the significance difference among boys, girls and co-education school higher secondary students in their logical mathematical intelligence. The investigators has used simple random sampling technique for selecting a sample by survey method. Sample consists of 300 higher secondary students from XI standard maths group in Tirunelveli district. Logical-mathematical intelligence tool (Kanmani & Annaraja, 2009) was used. Mean, standard deviation, 't' test and ANOVA were used as statistical techniques to analyses the data. The findings showed that 19.0% of the higher secondary students have higher level of logical mathematical intelligence. 13.7% of the boys have high level of logical mathematical intelligence and 23.1% of the girls have high level of logical mathematical intelligence. The findings showed that the girls are better than boys in their logical mathematical intelligence. No significance difference is found between nuclear and joint family higher secondary students in their logical mathematical intelligence. The girls' school students are better in their logical mathematical intelligence).

Key words: logical intelligence, mathematical intelligence, co- education, problem solving

Introduction

Intelligence is an ability to create an effective product or offer a service that is valued in a culture. It is also a set of skills that make it possible for a person to solve problems in

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life. Intelligence as a potential to gather new knowledge for getting solutions over problem. The concept of intelligence encompasses the way many aspects of our mental processes happen, including our self-awareness, our level of understanding, our ability to think abstractly, our ability to learn new information, and our ability to interpret material that is presented to us. Intelligence involves problem solving, planning, memory, emotions, and much more. Howard Gardner (1993) defined intelligence as 'ability to solve problems or fashion products that are of consequence in a particular cultural setting or community.

Logical-mathematical intelligence

Logical/mathematical intelligence involves the mental capacity to understand numbers, scientific processes, logic, and reasoning. Many professions use logical intelligence to perform their daily tasks, such as accountants, engineers, computer programmers, and mathematicians. Even ordinary people use their logical intelligence to accomplish their everyday activities, such as balancing a checkbook, solving word problems, number puzzles, and comprehending the latest scientific discovery in their monthly magazine. Students can engage in a variety of logical/mathematical intelligence activities in the classroom, including brain teasers, strategical games, logical puzzles, and any games that challenge the student to plan ahead accordingly. Students use their mathematical intelligence in a variety of scientific disciplines. The majority of students will demonstrate their mathematical intelligence in laboratories, observatories, or by crafting science fair projects.

Students strong in logical intelligence can think in numerical terms, mathematical patterns, and logical sequences. Students who lack mathematical intelligence can work on developing this mental faculty through a series of exercises. Students who engage in regular logical/mathematical intelligence activities will learn how to manipulate their environment by experimenting with objects in an orderly fashion.

Children can also work on brain teasers and number puzzles that challenge their logical faculties. Other children can work on becoming proficient at keyboarding and understanding computer dynamics. Other logical/mathematical intelligence activities include working with chemistry sets, solving word problems without a calculator, pretending to own a business, reading science magazines, watching scientific television shows, visiting a science museum or planetarium, playing with a rubrics cube, setting up a telescope or microscope,

help with family finances, and learning to play a musical instrument. Children who immerse themselves in logical-mathematical activities will soon find themselves performing well on their mathematical and science tests. In addition, they will start solving real-life situations without asking for guidance.

Significance of the study

The human mind is always looking for patterns and relationships; mathematics is just one formalized way in which we do this. Even very young children can extend a pattern by making a leap of logic. The logical - mathematical intelligence is wakened when the brain or mind sees a problem it needs to solve. The first encounter with a problem that can only be solved by the logical - mathematical intelligence is probably in the nursery when a baby sees patterns in the objects around the room and decides to rearrange the objects to fit another pattern they have in mind. It is still like that in adulthood and beyond. Logical-mathematical learners have a profound knowledge in disciplines involving math and logic. Logical-mathematical intelligence is one of the many intelligence types as stated by Howard Gardner. People belonging to this intelligence type have exceptional logical skills and a great affinity towards mathematics and reasoning. According to them, the solution to every problem lies in simple logic. They believe in applying reason and detecting suitable patterns to arrive at a solution.

Many of them can easily solve math problems mentally, without having to resort to pen and paper. They keep thinking about the problem continuously, compute the problem step-by-step, and arrive at a solution. In short, they have a 'computer-like' mind. Logical-mathematical learners have a profound knowledge in disciplines involving math and logic. Logical-mathematical intelligence consists of many factors related to the analytical, synthetic and integration functioning of the mind. When developed well the person becomes a divergent thinker. Reasoning, problem solving, and decision-making represent different but overlapping aspects of human intelligences. Although interrelated, research on each of these three aspects of thinking is enormous. So that the investigators wants to know and assessing the level of logical mathematical intelligence of higher secondary students in Tirunelveli district.

Definition of Key Terms

Logical Mathematical Intelligence

By the term logical mathematical intelligence is the capacity to reason, calculate, recognize pattern and compute logical problems.

Higher Secondary Students

The students who are studying XI standard mathematics in higher secondary schools of Tirunelveli Educational District, Tamilnadu.

Methodology

The investigators used simple random sampling technique for selecting a sample by survey method. Sample consists of 300 higher secondary students from XI standard maths group in Tirunelveli district. Logical-mathematical intelligence tool (Kanmani & Annaraja, 2009) was used. Mean, standard deviation, 't' test and ANOVA were used as statistical techniques to analyses the data.

Objectives of the study

1. To find out the level of logical mathematical intelligence of higher secondary students.

2. To find out the level of logical mathematical intelligence of higher secondary students with reference to gender.

3. To find out the significant difference between nuclear and joint family higher secondary students in their mathematical intelligence.

5. To find out the significance difference in logical mathematical intelligence among those students who follow co-education at higher secondary level.

Hypotheses

1. There is no significant difference between boys and girls higher secondary students in their logical mathematical intelligence

2. There is no significant difference between nuclear and joint family higher secondary students in their logical mathematical intelligence.

3.There is no significance difference in logical mathematical intelligence among those students who follow co-education at higher secondary level.

Analysis of the Data

1. To find out the level of logical mathematical intelligence of higher secondary standard students.

Table 1
Level of logical mathematical intelligence of higher secondary standard students

Variable	Low		Moderate		High	
Logical mathematical intelligence	N	%	N	%	N	%
	88	29.3	155	51.7	57	19.0

It is inferred from the above table that 29.3% of higher secondary students have low, 51.7% of them have moderate and 19.0% of them have high level of logical mathematical intelligence.

2. To find out the level of logical mathematical intelligence of higher secondary students with reference to gender.

Table 2
Level of logical mathematical intelligence of higher secondary students with reference to gender

Gender	Low		Moderate		High	
	N	%	N	%	N	%
Boys	43	32.1	71	54.2	18	13.7
Girls	46	27.2	84	49.7	39	23.1

It is inferred from the above table that among boys, 32.1% of them have low, 54.2% of them have moderate and 13.7% of them have high level of logical mathematical intelligence. Regarding girls, 27.2% of them have low, 49.7% of them have moderate and 23.1% of them have high level of logical mathematical intelligence.

Table 3
Difference between boys and girls higher secondary students in their logical mathematical intelligence

Variable	Gender	N	Mean	SD	Calculated 't' value	Remarks at 5% level
Logical mathematical intelligence	Boys	131	44.70	14.72	1.98	S
	Girls	169	48.28	16.44		

(At 5% level of significance, the table value of 't' is 1.96)

It is inferred from the above table that the calculated 't' values is greater than the table value. Hence the null hypothesis is rejected. It shows that there is significance difference between boys and girls higher secondary students in their logical mathematical intelligence.

Table 4
Difference between nuclear and joint family higher secondary students in their logical mathematical intelligence

Variable	Type of family	N	Mean	SD	Calculated 't' value	Remarks at 5% level
Logical mathematical intelligence	Nuclear	229	47.04	15.93	0.64	NS
	Joint	71	45.69	15.38		

(At 5% level of significance, the table value of 't' is 1.96)

It is inferred from the above table that the calculated 't' values is less than the table value. Hence the null hypothesis is accepted. It shows that there is no significance difference between nuclear and joint family higher secondary students in their logical mathematical intelligence.

Table 5
Difference among boys, girls and co-education school higher secondary students in their logical mathematical intelligence

Variable	Source of variation	Sum of squares	Mean square	Calculated 'F' value	Remarks at 5% level
Logical mathematical intelligence	Between	5737.50	2868.75	12.38	S
	Within	68810.97	231.68		

(At 5% level of significance for (2,297) df the table value of 'F' is 3.03)

It is inferred from the above table that the calculated value of 'F' is greater than the table value at 5% level of significance. Hence the hypothesis rejected. It shows that there is significant difference among boys, girls and co-education school higher secondary students in their logical mathematical intelligence.

Results & Conclusion

Regarding percentage analysis of the sample, 29.3% of higher secondary students have low, 51.7% of them have moderate and 19.0% of them have high level of logical mathematical intelligence. Regarding gender, among boys, 32.1% of them have low, 54.2% of them have moderate and 13.7% of them have high level of logical mathematical intelligence. Regarding girls, 27.2% of them have low, 49.7% of them have moderate and 23.1% of them have high level of logical mathematical intelligence. The findings showed that

there is significance difference between boys and girls higher secondary students in their logical mathematical intelligence. While comparing the mean scores of boys (M=44.70) and girls (48.28), the girls are better than boys in their logical mathematical intelligence. There is no significance difference between nuclear and joint family higher secondary students in their logical mathematical intelligence. There is significant difference among boys, girls and co-education school higher secondary students in their logical mathematical intelligence. While comparing the mean scores of boys school (M=48.98), girls (M=49.89) and co-education (M=40.22) higher secondary students, the girls school students are better in their logical mathematical intelligence.

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Analysis of Student Perception towards Gamification of Learning

Dr. Syamlal G.S[1]. and Dr Deepa B[2]

Abstract

Effective way of teaching-learning process is to match the teaching styles with the learning behavior of the student. It is generally believed that the Millennial doesn't prefer a particular medium for learning rather they like wide and varied experiences. Moreover, the content should be presented to the millennial in the form of a 'snack' – quick to consume, easy to digest and really satisfying without imposing on their body.To make the learning platform more motivating and engaging, there is a general trend towards adoption of gaming components in learning platforms. 'Gamification' is the process of applying mechanisms incorporated in games to the environments that are alien to game components. Though it is generally believed that undergraduates will be easily influenced by gaming platforms, yet the creeping of boredom in the learning process encouraged even post graduate students to look for viable relaxing alternatives.When we analyzed the type of games preferred by each student it can be observed that they prefer light hearted one than serious puzzles. They opined that such a module will popularize the learning module among the students irrespective of the group which they belong. High mean and median values are a real testimony to the efficacy of the concept incorporated into the system.

Keywords: Learning Management Systems (LMS), Blended Learning, Pedagogical Models, Academic Results, Higher Education Student perceptions, Computer assisted education, Student expectations.

Introduction

Research study undertaken by Felder and Henriques (1995) opined that the effective way of teaching-learning process is to match the teaching styles with the learning behavior of the student. Millennial's learning behavior is an area that is attracting much attention from the

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researchers all over the world. It is generally believed that the Millenials doesn't prefer a particular medium for learning rather they prefer wide and varied experiences. If any new avenues are provided to them, they without any hesitancy will be more than willing to explore it. The forms of learning process generally adopted by them varied from individual to cooperative learning, traditional classroom based lecture to modern information technology based one. Studies had also opined that content should be presented to the millennial in the form of a 'snack' – quick to consume, easy to digest and really satisfying without imposing on your body. Hence, 'snackable' content is the catchy phrase that is getting much attention among them. Like any other content, they too prefer content in small bites along with some bits and pieces of long items. The bite size content also makes content consumption a less daunting task. So the content developers and faculty members are faced with the task of making learning and 'interesting experience'. First bite should be a gratification experience like a 'potato chip' which will encourage him to move on to the next one till he completes the module. The process should be so smooth and quick that moving to the next will also be an inviting experience. The best part of this generation is also that each one is interlinked with the other through various media like blogs, twitter, podcasts, wikis, and social networks sites which also directly influence their learning habits (Munoz & Towner, 2012).Hence the online learning modules should be presented in a format which is not only short, but also sweet as well.

To make the learning platform more motivating and engaging, there is a general trend towards adoption of gaming components in learning platforms. Innumerable number of sectors comprising of multi-national corporations, professionals associated with medical and other allied health services, planning and policy sectors all had incorporated these modules in one

form or another. Researchers (Deterding et.al, 2011)[3] opined that 'Gamification' is the process of applying mechanisms incorporated in games to the environments that are alien to game components. Another study (Gartner.com)[4]was of the view that the pull factor of gamification can be attributed to its effectiveness in sustained engagement and it ability to influence the behavior of a person. Along with positive behavioural outcomes, gamification had also resulted in enhanced learning outcomes (Kapp, 2012). Hence, slowly and surely, gamification of learning has become a 'hot' topic of discussion in academic circles.

Review of Literature

Based on the positive influence it had on the new generation, gamification us getting more attention among researchers(Hamari, Koivisto, & Sarsa, 2014). A closer perusal of literature conveys that many researchers had analysed the effect of gamification in the teaching-learning process. Research study undertaken by Koivisto (Koivisto & Hamari, 2014)[5] opined that through the introduction of gaming modules along with the learning modules will provide an enriching experience to the learner. Gartner.Inc[6], the world's leading research and advisory opined that by the end of this decade half of the multinational corporation will have gamified their activities. Education sector also gives due importance to gamification as it motivates. Studies also pointed out that this concept is widely used in pure science subjects (Rouse, 2013[7]; Goehle, 2013[8], Gabarron et.al , 2012[9]) and other related disciplines like cultural heritage (Gordillo et.al, 2013[10]) business and logistics (Reiners, et al., 2012)[11] etc.

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[3]Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamif ication. Proceedings of the 15th international Academic MindTrek Conference: Envisioning Future Media Environm ents (pp. 9-15). ACM.

[4] http://www.gartner.com/newsroom/id/1629214

[5]Koivisto, J., & Hamari, J. (2014). Demographic differences in perceived benefits from gamification. *Computers in Human Behavior, 35*, pp. 179-188.

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[11]Reiners, T., Wood, L. C., Chang, V., Gütl, C. H., Teräs, H., & Gregory, S. (2012). Operationalising gamification in an educational authentic environment. *IADIS Internet Technologies and Society*, (pp. 93-100). Perth, Australia.

Objectives of the Study

The objectives framed for the study are as follows

- To analyze student response towards offline and online learning process.
- To assess the time and duration during which they use the online platforms for learning purpose.
- To find out the effect of gamification of learning on learning outcomes of students

Methodology

The present research study analyses the effect of LMS activities like Chat, Discussion Forum, Assignment, Glossary, Quiz and Gamification on Engagement, Motivation and Performance of students. The study is being undertaken among Post-graduate students of two colleges in Thiruvananthapuram District. The number of students selected from each college is 25 and no specific consideration is adopted in the selection of the sample.

Discussion and Findings

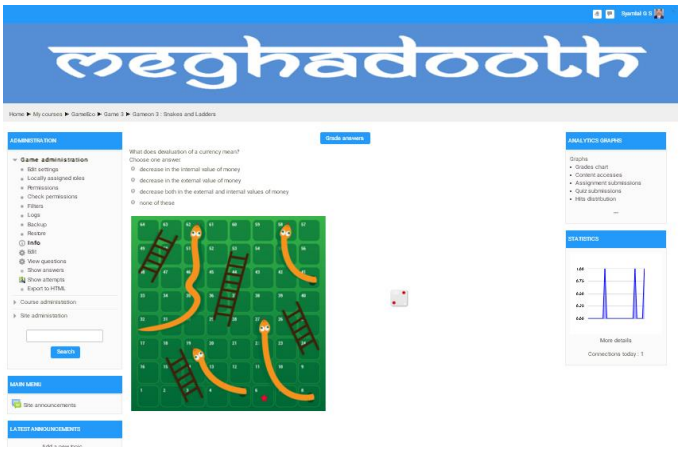
Stakeholder interaction in a traditional classroom is a teaching-learning process in the physical world where both the entities interact with one another. The benefit of such a system is that the time and pace is determined by the system rather than the learner. As a result of which many of the students are made to attend these sessions on compulsion rather than a desire to learn. But the new innovation being incorporated into the pedagogy is the Learning Management System (LMS). The incorporation of this system resulted in the transition of the teaching learning process from a traditional classroom mode to a blended one. According to Boelens, Van Laer, De Wever, and Elen (2015), B-learning is "learning that happens in an instructional context which is characterized by a deliberate combination of online and classroom-based interventions to instigate and support learning" (p.5).[12] Researchers also opined that B-learning warrants an

[12] Boelens, R., Van Laer, S., De Wever, B., & Elen, J. (2015). Blended learning in adult education: towards a definition of blended learning. Retrieved from https://biblio.ugent.be/publication/6905076

effective integration of both virtual and face-to-face methods (Garrison & Kanuka, 2004)[13]. In short the off-line classroom sessions were supplemented by the online platform. Supplementation is achieved through the adoption of texts, videos, slides, audio tracks etc. Hence the Blended Learning Platform ensures that there is wide and variety in the learning methodology adopted and it meets the desired pace of each learner.

Parametric Comparison of the Colleges

Based on this study, it can be observed that LMS enhanced the participation levels in the learning process (Stockwell et.al; 2015)[14] that finally resulted in enhanced academic performance. LMS was also effective in identify slow-learners and had enhanced the coursework submission rate of students (Hughes; 2007)[15].



Collected data from the two academic institutions were analyzed with Mean, Standard Deviation and Analysis of variance i.e ANOVA (F-ratio). Collected data was analyzed with SPSS-package v 16, to maintain the accuracy of the calculations.

[13] Garrison, D. R., & Kanuka, H. (2004). Blended learning: uncovering its transformative potential in higher education. The Internet and Higher Education, 7(2), 95–105. Available online from doi.org/10.1016/j.iheduc.2004.02.001

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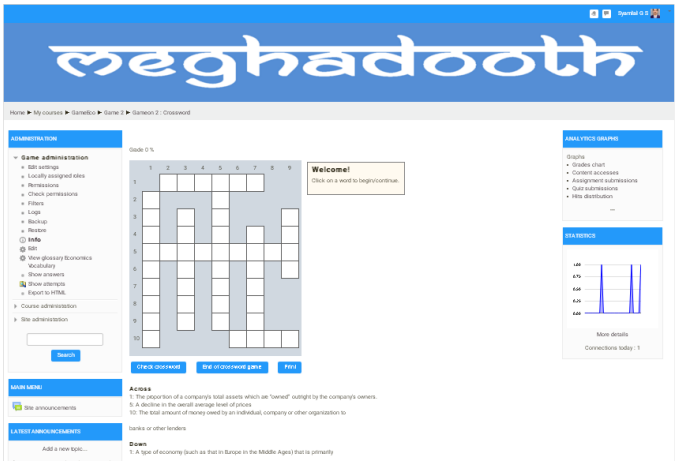
Table - 1

Parametric Comparison of the Colleges

Parameters	College A		College B		t value	Level of Significance
	Mean	SD	Mean	SD		(df = 24)
Engagement	43.15	8.46	34.69	9.98	8.07*	0.029
Motivation	91.5	13.59	76.46	12.25	2.97**	0.007
Participation	85.5	12.45	65.32	11.01	2.22**	0.05
Academic Performance	18.8	3.69	7.84	3.21	2.33***	0.012

* Significant at 0.05 level

** Significant at 0.01 level

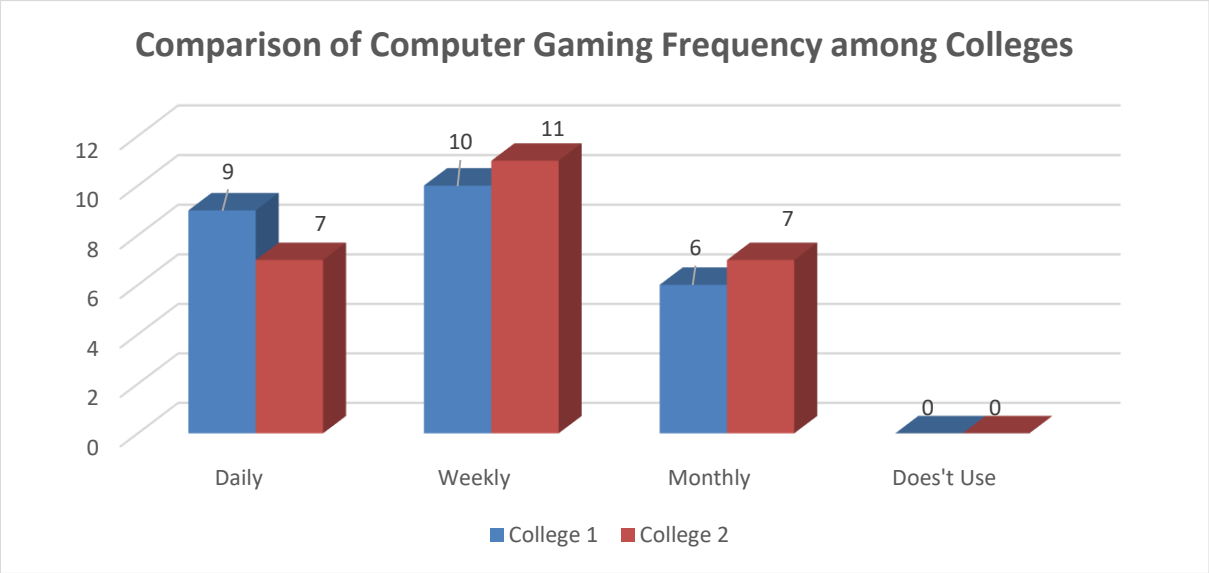


The above analysis shows that there is a significant difference between the engagement, motivation and academic performance scores between the two colleges. Based on this observation it can be concluded that the LMS-Moodle Module initiated in both the colleges had significantly influenced components like engagement, motivation, participation and higher academic performance.Thus the analysis conveyed that LMS-Moodle Module resulted in enhancing the engagement, motivation and academic performance of students in both the colleges – A & B.

Gamification and Learning Outcomes

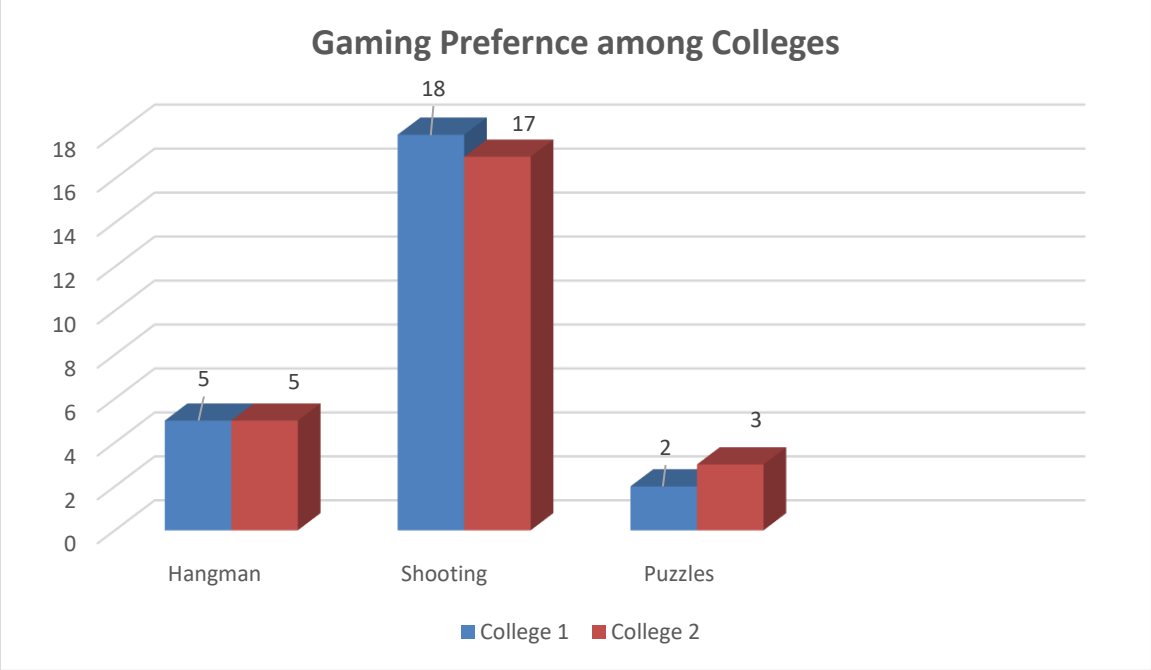
Many websites like *LinkedIn* is using progress bars to encourage the users to complete the profile. Such type of stimulants should be incorporated into the learning platforms so that each learner will be aware of where he is positioned vis-à-vis with his colleagues or batch mates. Though it is generally believed that undergraduates will be easily influenced by gaming platforms, yet the creeping of boredom in the learning process encouraged them to look for viable relaxing alternatives. Though the study observed that the respondents surfed the module on their curiosity, yet slowly adopted it into the learning process as a practice module.

Figure - 1



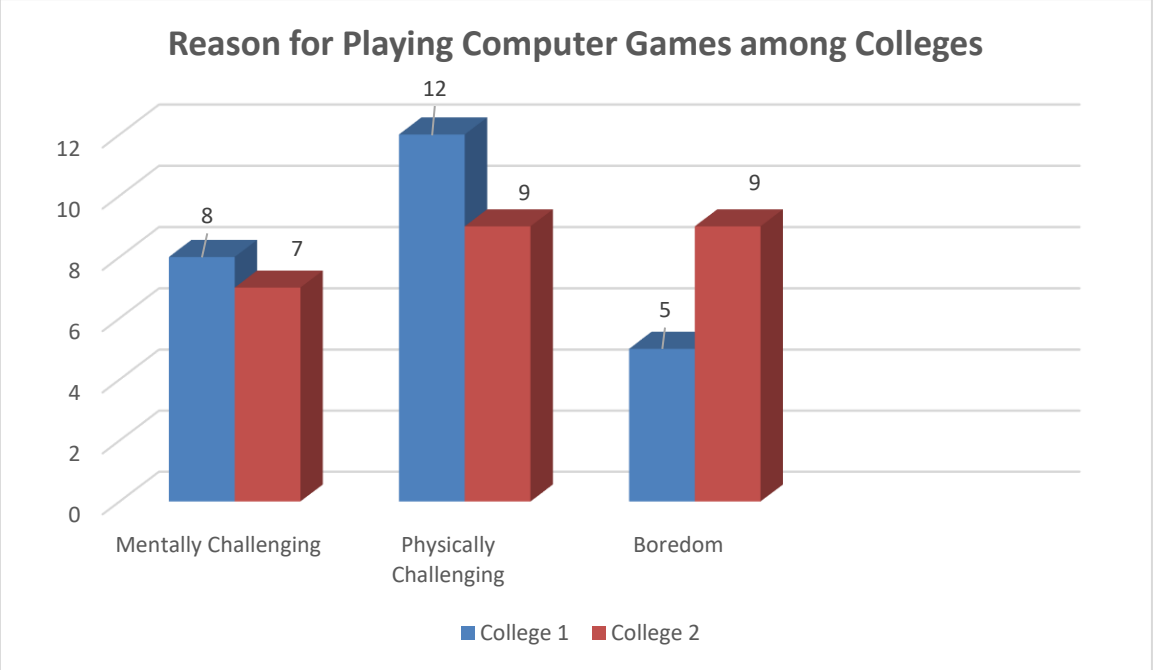
From the diagram, it can be observed that irrespective of the academic institution under consideration, majority of the students had shown a positive inclination towards the gaming module. When we analyzed the type of games preferred by each student it can be observed that they prefer light hearted one than serious puzzles. This is clearly depicted in the diagram given below

Figure - 2



The research study also tried to analyzed the reason for playing computer games as majority of them observed that it is the boredom that took them into the gaming module. While a sizeable number of students also expected the gaming module to be physically challenging which ultimately result in reaching them in the learning process. The details are shown in the diagram given below.

Figure - 3



Out of the total students surveyed, a significant number of students are in favour of incorporating computer aided games into the teaching learning process. Out the total sample selected, 73.78% supported the move while 26.22% didn't felt that it make a positive impact. None of the student expressed their displeasure towards such an experiment.

Descriptive Analysis of Game Elements

The research study also tried to analysis the general though about the gamification modules that are incorporated in the system. The detailed analysis is given in the table given below. .

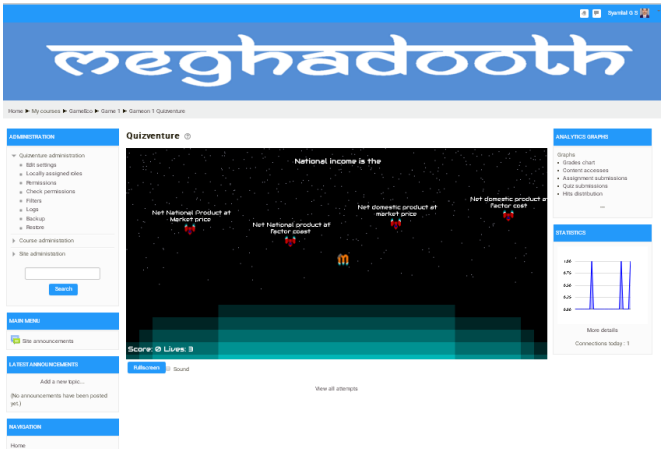
Table 2.

Descriptive statistics of game element usefulness

Game Element	Minimum	Mean	Median	Mode	Maximum	Standard Deviation
Arcade Game	1	8.23	9	10	10	2.13
Sudoku	1	7.89	8	10	10	2.28
Hangman	1	8.11	8	10	10	2.13
Snake and Ladders	1	8.63	9	10	10	1.78

This analysis is based on the general thoughts of the students who responded to the queries without any pre-conceived notions. They opined that such a module will popularize the learning module among the students irrespective of the group which they belong. High mean and median values are a real testimony to the efficacy of the concept incorporated into the system.

Conclusion



Based on the analysis undertaken, it can be believed that this experiment of gamification will enhance the teaching learning process and will encourage students to be an active participant. The point system or scores accrued to each learner conveys to the person some relevant information regarding his performance and his present position in the system. He will have a clear idea regarding the additional efforts he need to incorporate to make further progress in the system he now have a clear idea regarding who actually is his ‘competitor’.

Suggestions

Respondents opined that game systems should be incorporated which will provide them with actual feedback along with the deficiencies of a person. They prefer to hear comments and criticism from a computer system rather than from a human as it will not end is a ‘bruised ego’.

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