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**TURNING CHALLENGES INTO OPPORTUNITIES
IN MATHEMATICS CLASSROOMS THROUGH
ACTION RESEARCH**



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**Turning Challenges into Opportunities in
Mathematics Classrooms through Action Research**

Editors

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Saroja***

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From the Editors' Desk

Any profession is distinguished in part by a body of specialized knowledge, practices, and ethical orientations that new entrants to that profession are expected to acquire. As professional educators we are having the responsibility to justify our practices in terms of improving students' learning outcomes. There is a growing body of research literature on action research in Mathematics Classrooms, which is a methodology that has been found to be valuable as a problem-solving tool that can provide opportunities for reflection, improvement, and transformation of teaching. Action research is portrayed in the literature as very beneficial, and as a useful kind of professional development because of its' direct applicability to a teacher's classroom practice. It makes teachers more actively reflective and more aware of their teaching and their students' learning. It is effective in understanding and addressing the particular needs of every student in the classroom. With these intuitions, the international webinar on "Turning Challenges into Opportunities in Mathematics Classrooms through Action Research" was organized and it focused on the benefits and the limitations of action research for the teacher and the students in Mathematics Classrooms.

1. how to make action research practical in the mathematics classroom
2. how teachers typically ensure that their action research is reliable and valid
3. Impact of action research on diverse students
4. Engaging students with actions that make sense for them from the mathematical point of view
5. fostering creative mathematical thinking among the Students
6. Ways to provoke students' curiosity as the starting point of meaning-making actions in mathematics and
7. Effective usage of challenging tasks and techniques in the classroom to enhance Mathematics Teaching and Learning.

We the editorial board is very glad to bring forth this International Webinar Proceedings and hope this will help all the readers especially the Mathematics Teachers and Educators to turn their obstacles into opportunities and problems into possibilities and obtain remarkable outcome. We are indebted to Sr.Landrada Centre for Research, St.Ignatius College of Education (Autonomous), Palayamkottai, for rendering the support to publish the proceedings of the International webinar on "Turning Challenges into Opportunities in Mathematics Classrooms through Action Research".

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ATTITUDE TOWARDS MATHEMATICS ETHICS AMONG HIGHER SECONDARY STUDENTS

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ABSTRACT

Mathematics in the real sense is a science of space and quantity that helps in solving the problems of life needing numeration and calculation. attitude as an organization of concepts, beliefs, habits and motives associated with a particular object. Ethics in mathematics is an emerging field of applied ethics, the inquiry into ethical aspects of the practice and applications of mathematics. In the present study, the investigator has employed for the Normative Survey Method. The investigator has used a Self-made tool which is constructed by the investigator and standardized by the experts. The attitude towards mathematics subject has a greater impact in affecting students' academic achievement. The Manifested results challenged the school administrator to go deeper in evaluating and improving the teaching – learning process in Mathematics.

Key words: Attitude, Mathematics Ethics, Higher Secondary Students.

INTRODUCTION

The main aim of education is to develop harmonious personality of learner. Education should make pupils fit to live with. In all modern human societies, the young are prepared for their future roles through educational process which may be in the form of examination. Schools are always transitional institutions. They prepare pupils for education or for occupation or for family life and so on. Mathematics in the real sense is a science of space and quantity that helps in solving the problems of life needing numeration and calculation. It provides opportunities for the intellectual gymnastic of the man's inherent powers. Teaching of mathematics essentially helps the students in acquiring essential mathematics knowledge,

skills, interests and attitudes. It is necessary for and helpful in the realization of the practical or utilitarian value, disciplinary value and cultural value.

DEFINITION OF KEYTERMS

Attitude

An attitude is a readiness to respond in such a way that behaviour is given a certain direction - words by transverse

McClatchy & Doyle defines an attitude as an organization of concepts, beliefs, habits and motives associated with a particular object.

Whittaker says, “An Attitude is a predisposition or readiness to respond in a predetermined manner to relevant stimuli”

Mathematics

Mathematics (“knowledge, study, and learning”) is the study of quantity, space, structure, and change. Mathematicians seek out patterns and formulate new conjectures. Mathematicians resolve the truth or falsity of conjectures by mathematical proof. Galileo Galilei (1564-1642) said, ‘The universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth’. Carl Friedrich Gauss (1777-1855) referred to mathematics as “the Queen of the Sciences”. Benjamin Peirce (1809-1880) called mathematics “the science that draws necessary conclusions”.

Albert Einstein (1879-1955) stated that “as far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.”

Ethics

Ethics in mathematics is an emerging field of applied ethics, the inquiry into ethical aspects of the practice and applications of mathematics. It deals with the professional responsibilities of mathematicians whose work influences decisions with major consequences, such as in law, finance, and the military and environmental science.

Higher Secondary Students

In Indian Educational system, a student undergoes ten years of schooling. After this, a student should undergo two years of academic program in order to join the college

program/degree. These two years of academic program is called Higher Secondary level. It includes XI and XII standards.

REVIEW OF LITERATURE

Sabita mahanta., (2015) “Study of Mathematics at secondary level is the foundation stage of Higher Education”. Every secondary school student should study mathematics as a compulsory subject so that he/she gains a basic quantum of Mathematical knowledge as a part of general education. In our society there exists a general belief that mathematics is a subject for boys. Even today a very few people encourage girl students to opt for this subject. In the present study data have been collected from secondary students through questionnaire and their attitudes have been compared. Also their attitudes and achievements have compared.

Hlanganipai Ngirande, (2014) had investigated “The exploring mathematics Anxiety: Mathematics Students, Experiences”. The purpose of this research was to explore students’ mathematics anxiety levels at a selected tertiary institution in South Africa. The results also show high levels of mathematics anxiety among female students. The t-test showed that the mean difference between mathematics anxiety and gender is significant. Based on the findings of this study, it is worth noting that mathematics anxiety is one psychological factor that affects students’ achievement and their general practices.

OBJECTIVES OF THE STUDY

1. To find out whether there is any significant difference among attitude towards mathematics ethics among the higher secondary students based on Gender.
2. To find out whether there is any significant difference among attitude towards mathematics ethics among the higher secondary students based on Location
3. To find out whether there is any significant difference among attitude towards mathematics ethics among the higher secondary students based on Medium of Instruction

HYPOTHESIS OF THE STUDY

1. There is no significant difference in attitude towards mathematics ethics among the higher secondary students based on gender.
2. There is no significant difference in attitude towards mathematics ethics among the

higher secondary students based on Location.

3. There is no significant difference in attitude towards mathematics ethics among the higher secondary students based on Medium of Instruction.

METHODOLOGY

In the present study, the investigator has employed for the **Normative Survey Method**.

TOOLS USED FOR THE STUDY

To verify the framed hypothesis the following tool were used in the present investigation.

The investigator has used a **Self-made tool** which is constructed by the investigator and standardized by the experts. Effectiveness of the study largely depends on the accuracy of measurement. Accuracy of measurement in turn depends on the precision of the instrument. The investigator has selected the questionnaire form and the tool had 45 items. The Three-point scale was used and the response is Yes, No and Some times.

POPULATION AND SAMPLE SELECTED FOR THE STUDY

Population

The Population of the study consists of higher secondary school students studying in Namakkal District

Sample

A sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure that the researcher adapts while selecting items from the population. The sample of the study consists of 300 higher secondary school students are selected from 4 schools in Namakkal District. **Purposive sampling techniques** are used in this study.

ANALYSIS AND INTREPRETATION OF DATA

To find the meaningful interpretation of the raw scores, the data analyzed using **Mean, SD, t test and F test**.

TESTING OF HYPOTHESIS

HYPOTHESIS: 1

There is no significant difference between attitudes towards mathematics ethics among higher secondary school students based on gender.

TABLE-1

The table showing mean, SD and 't' values of attitude of higher secondary school students towards Mathematics ethics based on gender.

Variable	N	Mean	Standard deviation	't' value	5 % level of significance
Male	147	59.80	2.74	4.617	Significant
Female	153	61.52	3.62		

df = 298

Interpretation of Data:

From the above table the calculated t-value (4.61) is greater than the table value (1.96) at 5% level of significance. Hence the null hypothesis is rejected.

Therefore, it is concluded that there is a significant difference between the attitudes towards Mathematics ethics among the higher secondary students with respect to gender.

Compare with male and female students, female students mean score is better than male students in their attitude of higher secondary school students towards Mathematics

HYPOTHESIS: 2

There is no significant difference between attitudes towards mathematics ethics among the higher secondary students based on Locality.

TABLE-2

The table showing mean, SD and 't' values of attitude towards Mathematics ethics among the higher secondary students based on locality

Variable	N	Mean	Standard deviation	't' value	5 % level of significance
Urban	166	61.39	3.59	4.226	Significant
Rural	134	59.80	2.74		

df = 298

Interpretation of Data:

From the above table the calculated t-value (4.22) is greater than the table value (1.96) at 5% level of significance. Hence the null hypothesis is rejected.

Therefore, it is concluded that there is a significant difference between the attitudes towards Mathematics ethics among the higher secondary school students with respect to their locality.

Compare with Urban and rural students, urban students mean score is better than rural students in their attitude towards Mathematics ethics among the higher secondary school students.

HYPOTHESIS: 3

There is no significant difference between attitude towards Mathematics ethics among the higher secondary school students based on Medium of Instruction.

TABLE-3

The table showing mean, SD and 't' values of attitude towards mathematics ethics among the higher secondary students based on medium of instruction

Variable	N	Mean	Standard deviation	't' value	5 % level of significance
English	99	60.08	2.94	2.224	Significant
Tamil	201	60.98	3.47		

df = 298

Interpretation of Data:

From the above table the calculated t-value (2.224) is greater than the table value (1.96) at 5% level of significance. Hence the null hypothesis is rejected.

Therefore, it is concluded that there is a significant difference between the attitudes towards Mathematics ethics among the higher secondary school students with respect to their medium of instruction.

Compare with English and Tamil medium students, Tamil medium students mean score is better than English medium students in their attitude towards Mathematics ethics among the higher secondary school students.

FINDINGS OF THE STUDY

1. There is a significant difference between attitude towards mathematics ethics among the higher secondary students based on gender.

Compare with male and female students, female students mean score is better than male students in their attitude towards mathematics ethics among the higher secondary.

2. There is a significant difference between attitudes towards mathematics ethics among the higher secondary students based on Locality.

Compare with Urban and rural students, urban students mean score is better than rural students in their attitude of higher secondary school students towards Mathematics ethics

3. There is a significant difference in attitude towards mathematics ethics among higher secondary school students based on Medium of Instruction.

Compare with English and Tamil medium students, Tamil medium students mean score is better than English medium students in their attitude of higher secondary school students towards Mathematics ethics.

CONCLUSION

The present investigation, clearly emphasis the various aspects regarding attitude towards mathematics ethics among the higher secondary students. This study showed that there is a significant relationship between students' attitudes Mathematics learning. Generally, it shows that the recipients in a high school had fairly satisfactory performance in

Mathematics, which is affected by the respondents' attitudes towards Mathematics ethics. Thus, it is concluded that the attitude towards the subject have a greater impact in affecting students' academic achievement. The Manifested results challenged the school administrator to go deeper in evaluating and improving the teaching – learning process in Mathematics.

REFERENCES

- Akey, T. M. (2006). *School context, student attitudes and behavior, and academic Achievement: An exploratory analysis*. MDRC. <http://bit.ly/2UGex9a>.
- Bramlett, D. C. (2007). *A study of African-American college students' attitude towards mathematics*. <http://bit.ly/2Gm9LE0>.
- Chang, K. E., Wu, L. J., Weng, S. E., & Sung, Y. T. (2012). Embedding game- based Problem-solving phase into problem-posing system for mathematics learning. *Computers&Education*, 58(2), 775-786. <https://doi.org/10.1016/j.compedu.2011.10.002>.
- Diaz, E. D., & Dio, R. V. (2017). Effectiveness of Tri-In-1 strategic intervention materials for Grade 9 students through Solomon Four-Group Design. *Asia Pacific Journal of Education, Arts and Sciences*, 4(1), 79-86. <http://bit.ly/2IF9jTT>.
- Farooq, M. S., & Shah, S. Z. U. (2008). Students' attitudes towards mathematics. *Pakistan Economic and Social Review*, 75-83. <http://bit.ly/2IsNeZq>.
- Ifamuyiwa, S. A., & Akinsola, M. K. (2008). Improving senior secondary school students' attitude towards mathematics through self and cooperative-instructional strategies. *International journal of mathematical education in science and technology*, 39(5), 569-585. <https://doi.org/10.1080/00207390801986874>.

ASSESSING THE VIEWS OF TEACHER EDUCATORS AND STUDENT TEACHERS IN CONNECTION WITH THE USE OF THE HISTORY OF MATHEMATICS IN THE TEACHING OF FRACTAL SUBJECT

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ABSTRACT

This study aims to figure out the views of a mathematics teacher and his students about fractal subject which is processed with the history of mathematics. It was carried out with 35 students, enrolled at the graduate level of a University in Chennai. The study was carried during the V Semester of the 2021 academic year. Research tools consisted of student's compositions and semi-structured interviews with the student - teachers and teacher educators. It is understood that the interviews with the student teachers and teacher educators, the course dedicated in the history of mathematics is surprising and useful and the materials are interesting and effective too.

Keyword: Mathematics education, History of Mathematics, fractals, student teacher and teacher educators' views.

INTRODUCTION

Shai Reshef aptly said that a person's life is changed when he is educated. Similarly, the world could be changed when many are educated. Many changes had been seen in the effect of education. The implementation of constructivist approach was adopted in our education sphere. The mathematics program of study has been revitalized gradually. A curriculum that was adopted by the constructivist approach has been executed for nearly five years. Mathematics curriculum and syllabus propagate students to learn mathematics through learning by doing as it basically promotes student-centered education (Baki & Cabakcor 2010). There are many factors that students feel difficult to learn mathematics. To highlight few, they don't trust themselves and most of the students think that they don't have stuff enough to learn mathematics. The consequences of these factors find difficult to emphasize student-centered education. To resolve these issues to some

extent, the use of history of mathematics can encourage students and also make easy of their understanding of mathematics. In addition, teaching of the history of mathematics can afford many gains for students. They are as follows:

1. The history of mathematics is an outstanding source which includes many attractive problems to develop students' problem-solving skills.
2. It ensures that students learn more mathematical concepts meaningfully.
3. It supports students to connect mathematics, mathematics applications and topics related to mathematics with other disciplines.
4. The history of mathematics allows students to relate mathematics with their daily life scenario (Wilson & Chauvot 2000).

From the words of Hickman and Kapaida (1983) it is to be accepted that history of mathematics should be included and applied in mathematics course as it is seen as a science which is continuously developing. It is evident from the studies of Idikut (2007) that mathematics courses that includes history of mathematics as a part of the curriculum were resulted successful than other courses which includes teacher guidebooks. Several studies show that the history of mathematics should be incorporated while teaching mathematics.

Only man-made objects can be described in Euclidean geometry. However, unlike Euclidean Geometry, many structures in nature have an irregular in shape and uneven look such as orbits of the planets, heart, bronchi of lungs, blood vessels, skin, beach strips etc., are all composed of fractal structures. The fractal subjects are included in the new mathematics curriculum.

This study aimed to investigate the fractal subject. Due to the inclusion of fractal in textbooks and the lack of history of fractals. The recent studies made the researchers to incorporate the history of mathematics with fractals. In this study, the perceptions of the teacher educators and the student-teachers were selected for the study. They were asked to give their views on the history of mathematics in the teaching of fractal subject. Further, the reflections in the classroom environment were given by using the history of mathematics as a tool.

Fractals is the never-ending pattern and that is the common name of geometric shapes which often resemble themselves or recurring shapes forever intertwined. Consequently, the problem "What is

the historical development of fractals and what are the views of the teacher educators and the student teachers using the history of mathematics in the teaching of fractal subject?” arises. In this context, the opinions of the teacher educators and the student teachers were asked about fractal subject regarding the lectures using the history of mathematics.

METHODOLOGY

The research was carried out by using “Case study” method. Since the case study is appropriate for the researchers conducted individually due to the creation of a possibility to make research within short amount of time, as it name indicates, allows the researcher to focus on a special case.

Participants:

The research was conducted with 25 female and 10 male students at the graduate level Student - teachers in Chennai during the academic year 2021.

Research tools:

The data for this study was collected through student compositions and interviews conducted with teacher educators and the student teachers. The researcher prepared 2 work sheets to execute pilot study. The views of teacher - educators and the experts were extracted and 2 worksheets were finalized. A semi-structured interview was made with 5 students to determine their opinions. As a matter of ethics, these students were encoded in the form of “S1, S2, S3, S4 and S5”. In addition, after the implementation, the student- teachers were asked to write their views about the course in the form of composition. At the end of the study, an interview was conducted with the teacher - educators to evaluate the course.

In this practice, a video about fractals was watched by the student- teachers. Then, examples of fractals were shown and the historical development of fractals was explained. In addition, the life of Karlweierstrass and Benoit Mandelbort, the founders of fractal geometry, were presented. At the end of the course, the worksheets decorated with pictures and information’s about fractals were applied in pairs.

Data analysis: The interviews were recorded and the copies of the interviews were printed. During the analysis of the interviews, instead of using the participants' thoughts verbatim, irrelevant responses of the participants and the expressions and interpretations of researchers were removed, the rest of the information was analyzed according to their self-similarity. Then, codes and themes were established and the findings were presented in tables. In addition, compositions written by the student - teachers, as well as the interviews with the teacher-educators and student- teachers were used in direct quotations.

Results: This section of research consists of the findings of semi-structured interviews with student teachers and the finding of the student compositions. The findings obtained from the semi structured interviews with student teachers

Table 1 shows the students' response to "*what are the surprising aspects of mathematics course in relation to the history of mathematics?*"

Theme	Codes	Participants	Supporting Sentences
Recognizing the aim of the History of Mathematics	The relations of Mathematics and nature	S2,S3	S3: We learnt nature has mathematics and also fractals are nature of mathematics. We saw that nature has so many fractal examples in plants such as filix mas
	Learning that mathematics has a history	S3,S4,S5	S5: The biggest difference between this course and other courses is learning the history of mathematics
	Recognized that mathematics is a living science	S1,S2,S5	S5: after this course, I learnt that mathematics has a history of development and change

Table 1, indicates students believe that mathematics has examples in nature, and it is an interesting living science. Students' answers were supported in their composition. One student wrote a composition as follows: "We were taking mathematics courses as theoretical issue and their examples. We didn't know the answers to some questions such as: how mathematics existed, where, when and who discovered mathematics etc. with this course, we learnt where mathematics started and how it was discovered. When we learned that mathematics has many examples in nature and it

has long history, we are **surprised**". Student's answers about "*What are the benefits of using the history of mathematics courses?*" are given in table 2.

Theme	Codes	Participants	Supporting Sentences
The benefits of using the history of mathematics in the curriculum	Providing the emergence of different ideas	S2	S2: different ideas emerged
	Showing that mathematics is associated with daily life	S3	S3: Yes, I can use the history of mathematics in daily life. Because we are learning history of mathematics
	Helping to understanding mathematical issues	S1,S2	S2: History of mathematics is helping us to better understand concepts
	Demonstrating how mathematics topics are related to our surroundings	S2,S3	S2: after this course, I understood that everything is related to mathematics concepts
	Using student's activities in mathematics courses	S2,S4	S2: this course consists of a combination of my friend's activities and the history of mathematics
	Learning where and how mathematics concepts originated	S3,S4	S4: we learnt where mathematics originated, I mean, if we learnt one concepts origin, we can deeper understanding and good knowledge of these concepts.
	Making mathematics topics meaningful	S4,S5	S5: after we learnt the history of mathematics, we can say these ideas forward in this course
	Increasing the interest and attractiveness of mathematics topics	S1,S3,S5	S1: I was very interested in the history of mathematics
	Showing that mathematics doesn't have just calculus	S2,S3,S4	S4: Our old courses were about calculative works such as $2*2=4$. But this course showed us that mathematics is in nature and fractal is a part of this nature.

Table 2 concludes that the history of mathematics provides conceptual learning. It increases the awareness of mathematics courses and shows that mathematics is more than just calculating. Another students' composition showed, *"This course provided a much deeper understanding than any other courses. While using the history of mathematics course, our general knowledge increased and focused on mathematical concepts"*. The students' compositions and their semi - structured answers support the positive aspects of the history of mathematics.

Table 3 shows the students' answers to "What do you think about the materials used in this study?"

Theme	Codes	Participants	Supporting Sentences
Properties of using history of mathematics' Materials	Providing fluency to course	S1	S1: If we learnt all courses like this, the topic of mathematics will be more practical and will given us a faster learning process. These topics provide us with a deeper understanding of mathematics.
	Making active student learning	S4	S4: the worksheets, given from teachers, have direct students' answers. This provides student centered learning
	Including history of mathematics	S4	S4: our materials are visual and they are related with history of mathematics.
	Containing useful information	S5	S5: it was good, useful and effective
	Showing that mathematics is a part of nature	S5	S5: the mathematics and history of mathematics were useful to learning
	Structuring of interest	S2,S3	S3: materials are very interesting and engaging.
	Facilitating the understanding	S1,S3,S5	S5: In this manner, the course is very professional and provided easy learning for us.

Table 3 shows that students are satisfied with use of materials. One students' composition is related to the history of mathematics and materials. It says *"This course, unlike other courses, use materials and situations to take our attention to mathematical concepts that's why the history of*

mathematics is so interesting. Furthermore, supporting learning with materials and using worksheets helps us to understand the mathematics topics better”.

Following this course, the teacher - educators were interviewed and enquired about the general assessment of the course. The teacher - educators answered are as follows *“Actually I never used the history of mathematics in my courses. After observing this, I noticed that the method provided to the student teacher had a wide understanding of how topics can turn to story, capturing the student’s attention”.*

DISCUSSION

In this study, it is found that student- teachers have positive attitude towards the course using the history of mathematics. Several studies have reached findings similar to this conclusion. In addition to this, teacher’s positive thoughts on the use of history of mathematics are also similar to the findings of the present study. It is believed that, the use of materials and videos summarizes the historical development of fractal that has an impact on the positive statement of students – teachers and teacher - educators on the history of mathematics.

CONCLUSION AND RECOMMENDATION

In this study, the impact of the course associated with the history of mathematics and the students’ impressions were carried out and it is concluded that students have positive attitudes towards this course. Similarly, the teacher educators were also excited and it arouses curiosity among them. It is understood from the interviews with the teacher- educators and a student- teacher, the courses in the history of mathematics is surprising as well as useful and the materials are interesting and effective. Therefore it is recommended that similar studies can be carried out for other subjects of mathematics and in-service courses should be given to teachers regarding the topic. With respect to the interviews with the teacher- educators and student-teachers, the involved time and the practice given for the placement exam LDE can be a problem in the use of history of mathematics in courses.

REFERENCES:

- Baki & Cabakcor, (2010). *A study of developing a scale towards using concrete materials in mathematics courses*. Karadeniz Technical University.
- Gleick, J. (2000), *Chaos: A new theory of science*. The scientific and Technological Research Council of Turkey.
- Hickman, F & Kapadia, R. (1983). A history of Mathematics courses for teachers, *International Journal of Mathematics Education in Science and Technology*, 14(6), 753-761.
- Mandelbrot, B.B. (1983). *The Fractal Geometry of Nature*, W.H. Freeman and Company.
- Peitgen, H.O. & Saupe, D. (1985), *The Science of Fractal Images*, New York.
- Wilson, P.S., & Chauvot, J. B. (2000). Who? How? What? A Strategy for using history to teach Mathematics. *Mathematics Teacher*, 93(8), 642 – 64.

IMPACT OF FLIPPED CLASSROOM STRATEGIES ON ENHANCING STUDENTS' TEACHERS PERFORMANCE IN MATHEMATICS

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ABSTRACT

Flipped classroom approach has become a popular pedagogy in many education institutes around the world. The basic notion of flipped classroom approach is to deliver the teacher's lectures before class through online videos, to free up the in-class time for active learning and problem-solving activities. The vital problems of using flipped classroom approach include teachers' considerable workload of creating flipped learning materials and students' disengagement in out-of-class learning. The study is quasi-experimental wherein a pretest-posttest nonequivalent groups design was employed. The sample for the present study consists of 60 students teachers studying in Thiagarajar College of Preceptors, Madurai district, Tamil Nadu. The Results of the present study clearly revealed that there is significant difference between the control and experimental group of students teachers in their post-test scores of performance in Mathematics. The finding of the present study revealed there is significant difference between the control and experimental group of students teachers in their gain scores of performance in Mathematics. As a result, it was determined that using a flipped-classroom approach to improve students' mathematical problem-solving ability was more effective and increased their performance on summative assessments.

Keywords: Flipped Classroom strategies, students teacher and academic performance

NEED AND SIGNIFICANCE OF THE STUDY

In our technologically advanced day, the flipped classroom teaching and learning strategy combine the finest characteristics of traditional learning with communication and resources available via the web and other sources. The flipped classroom strategy is intended to bring pedagogically successful teaching and learning strategies to the classroom. It improves both the learner's and the instructor's understanding of pedagogy. It prepares the path for student-centred

teaching and learning, improves self-learning, and aids in the development of the autonomous life-long learner. Because they can learn at their own pace wherever and whenever they need it, the learner seeks self-interest in the flipped classroom teaching and learning process. They use an online collaborative learning technique, and classroom engagement allows them to share their perspectives, experiences, and have access to the most up-to-date knowledge from across the world, which they can use to keep up with the demands of everyday life. It aids in the attainment of the major objectives of gaining necessary mathematical knowledge, abilities, interest, attitude, and mathematics teaching. It encourages students to recognise the importance of mathematics in the economy and national prosperity, as well as to develop moral qualities. The flipped classroom technique creates an aesthetic sense of mathematics instruction and piques students' interest in learning. It sufficiently engages students in the subject matter to stimulate higher-order thinking, which is a difficult task in traditional teaching methods, and group discussion (or) panel discussion strategies to develop students' knowledge and create a sense of responsibility in their learning process, and it ponders students to seek authenticity in their learning process. The flipped classroom teaching style fosters critical thinking and problem-solving skills in students while also allowing for creativity in the teaching and learning process. As a result, the development of a holistic learning process among students in the modern world necessitates the use of a flipped classroom teaching technique. Students can work more efficiently as a result of this holistic learning.

STATEMENT OF THE PROBLEM

The investigator deals with the present study entitled as “**Impact of Flipped Classroom Strategies on Enhancing Students' Teacher's Performance in Mathematics**”

OPERATIONAL DEFINITIONS OF KEY TERMS

Flipped Classroom: The Flipped classroom is a modern approach in which the teacher provides the content of the subject for the students in several forms such as recorded lectures, videos, and electronic readings so that students can review such materials and comprehend the information before attending the classroom. In the classroom, the teacher starts providing

opportunities to discuss, review, and analyze such information. Then, students start working in groups or individually to complete several activities or projects inside the classroom.

Mathematics: “Mathematics is not a collection of facts which can be demonstrated and verified”.

OBJECTIVES OF THE STUDY

The following are the objectives of the present study

1. To find out whether there is any significant difference between the control and experimental group students teacher in their performance in Mathematics with regard to
 - a. Pre-test
 - b. Post-test
 - c. Gain score
 - d. Effect size

HYPOTHESIS FOR THE STUDY

1. There is no significant difference between the control and experimental group students teacher in their performance in Mathematics with regard to
 - a. Pre-test
 - b. Post-test
 - c. Gain score
 - d. Effect size

DESIGN OF THE STUDY

The study used a pretest-posttest nonequivalent groups design, which is quasi-experimental. When the experimental and control groups are such organically constructed groups as intact classes, the pretest-posttest nonequivalent group's design is frequently employed in classroom investigations (Best & Kahn, 2006). The experimental group was taught using flipped Classroom strategies, while the control group received traditional instruction from a regular teacher. After that, both groups were given posttests.

Table: 1

Experimental Group	Control Group
Pre-test	Pre-test
Flipped Classroom Strategies	Conventional teaching
Post-test	Post-test

POPULATION OF THE STUDY

The population for the present study consists of students teachers of College of Education, in Tamil Nadu affiliated to Tamil Nadu Teacher Education University (TNTEU), Chennai.

SAMPLE

The sample for this study is made up of 60 students who are teachers at Thiagarajar College of Preceptors in Madurai, Tamil Nadu. The current study looked at 60 people who were divided into two groups: conventional and experimental. The respondents were chosen using the purposive sampling technique by the researcher.

DATA ANALYSIS

Null Hypothesis: 01

There is no significant difference between the control and experimental group students teacher trainees in their pre-test scores of performances in Mathematics.

Table: 2

Difference between the control and experimental group students teacher in their pre-test scores of performance in Mathematics.

Group(Pre-test)	N	Mean	SD	't' value	df	Remark
Control Group	30	12.50	1.17	0.715***	58	Not significant
Experimental Group	30	12.77	1.68			

***** indicated that not significant at 1% and 5% level**

Table 4.2 reveals that the mean scores for the control and experimental groups are 12.50 and 12.77, respectively, with standard deviations of 1.17 and 1.68. The calculated result ($t=0.715$) is lower than the critical values of 2.576 at a significance level of 0.01 with $df=58$. As a result, the null hypothesis is "There is no significant difference between the control and experimental group students teacher in terms of in performance in Mathematics."

Null Hypothesis: 02

There is no significant difference between the control and experimental group students teacher in their post-test scores of performance in Mathematics.

Table: 3

Difference between the control and experimental group students teacher in their post-test scores of performance in Mathematics

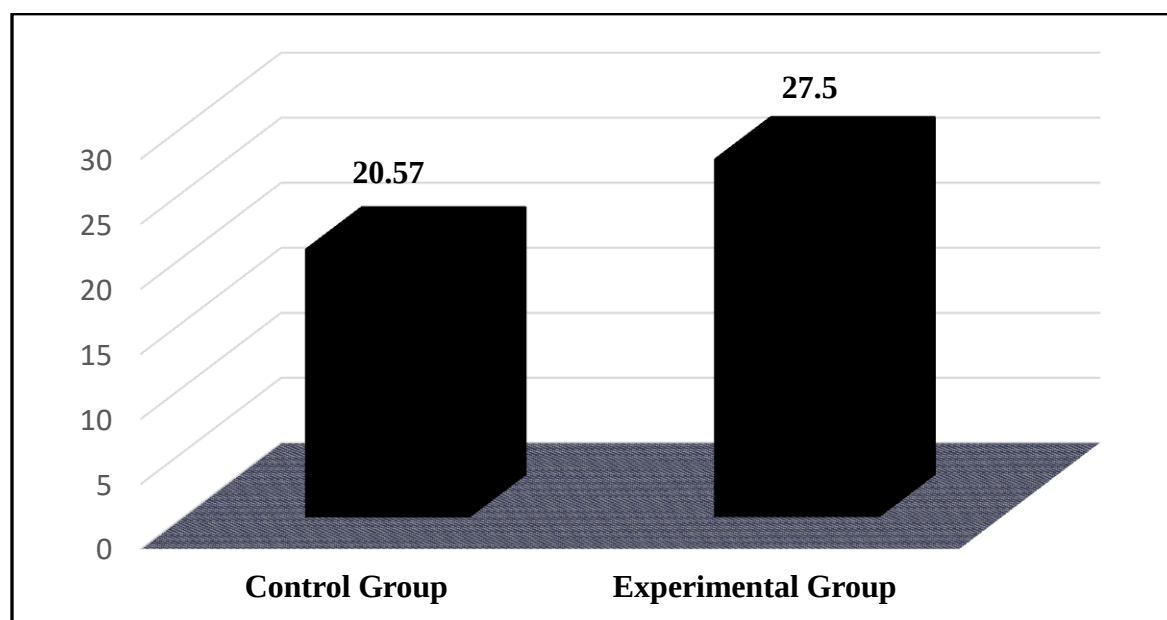
Group(Post-test)	N	Mean	SD	't' value	df	Remark
Control Group	30	20.57	2.01	16.76**	58	Significant
Experimental Group	30	27.50	1.04			

**** indicated that significant at 1% and 5% level**

The above table 4.08 shows that control and experimental group mean scores value is 20.57 and 27.50 respectively with a standard deviation of 2.01 and 1.04 respectively. The experimental group mean scores (M=27.50) are higher than the control group mean scores (M=20.57). The calculated 't' value (t=16.76) is greater than the critical values of 2.576 at 0.01 level of significance with df=58. Hence, the null hypothesis "There is no significant difference between the control and experimental group students teacher in their post-test scores of performance in Mathematics." is rejected and concluded that there is significant difference between the control and experimental group students teachers with reference to their Post-test scores of performance in Mathematics. Therefore, the Flipped classroom was found effective during an intervention.

Fig:1

Difference between the control and experimental group students teacher in their post-test



Null Hypothesis: 03

There is no significant difference between the control and experimental group students teacher in their gain scores of performance in Mathematics.

Table: 4

Difference between the control and experimental group students teacher in their gain scores of performance in Mathematics

Group(Gain Score)	N	Mean	SD	't' value	df	Remark
Control Group	30	8.07	2.29	11.55**	58	Significant
Experimental Group	30	14.73	2.18			

**** -indicated that significant at 1% and 5% Level**

The above table 4. shows that the control and experimental group mean scores value is 8.07 and 14.73 respectively with a standard deviation of 2.29 and 2.18. The experimental group mean scores (M=14.73) are higher than the control group mean scores (M=8.07). The calculated 't' value (t=11.55) is greater than the critical values of 2.576 at 0.01 level of significance with df=58. Hence, the null hypothesis is "There is no significant difference between the control and experimental group students teacher in their gain scores of performance in Mathematics." is rejected and concluded that there is a significant difference between the control and experimental group students teacher with reference to their Gain score of performance in Mathematics. Therefore, the Flipped classroom was found effective during the intervention.

Null Hypothesis: 04

There is no significant difference between the post-test of control and experimental group students teachers in their performance in Mathematics with regard to effect size

Table: 5

Effect size between Control and Experimental group mean scores of post-test

Test	Group(Post-test)	Mean	SD	Effect size(d)	Effect
Performance in Mathematics	Control Group of	20.57	1.01	4.36	Large Effect
	Experimental Group	27.50	2.01		

The close perusal of the above table 5 reveals that the mean of the control group in post-test is 20.57 and the experimental group is 27.50. The effect size is found to be 4.36 which represents the large effect. Hence, the Experimental group performance is better than the control group. Hence, it is concluded that the exposure of Flipped classroom strategies in the performance in Mathematics helps the experimental group to perform tremendously in their performance. Thus, the experimental group who were taught using flipped classroom strategies in their performance in Mathematics was higher than the control group who were taught using conventional methods visualized.

FINDING AND INTERPRETATION

The results of this study clearly demonstrated that there is no significant difference in pre-test performance scores in Mathematics between the control and experimental groups of students teachers. In terms of Pre-test scores of performance in Mathematics, there is no significant difference between the control and experimental groups of pupils. As indicated by their pre-test, both the control and experimental groups had equivalent knowledge. As a result, both groups were homogeneous, as evidenced by the pre-test score. The results of the study are in confirmative with the studies of Brooks, Andrea Wilcox (2014).

The group are greater than those of the control group. As a result, interactive was found to be useful during the intervention. The flipped classroom style was proven to be more effective than a traditional method, as evidenced by their ability to answer math problems. As a result, it has been proven that teaching in a flipped classroom is superior to traditional teaching methods. Traditional learning and teaching approaches do not encourage convergent and rational thinking. Students in flipped classrooms have the ability to learn about and investigate topics related to their subject. Through the creative use of time in communal activities, personal engagement between the teacher and student, as well as with peers, and flipped classroom tactics, students have drilled a sense of tenacity, motivation, and a desire to outshine. It's also useful for making new discoveries. The flipped classroom approach group outperformed the standard technique group of students and teachers in terms of math performance. This may explain the significance. The findings of the study are also in conformance with the study of Khan, Ramzan (2018) Cilli-Turner, Emily(2015), zpinar, Ilknur; (2016) Bhagat, Kaushal Kumar(2016) Nielson, Burke, Alison S(2017) Perpetua Lynne(2018) Guo, Jianpeng(2019) Zainuddin, Zamzami(2019).

The results of this study revealed that there is a substantial difference in gain scores of performances in Mathematics between the control and experimental groups of students teachers. As a result, it was discovered that employing a flipped-classroom strategy to improve students' mathematical problem-solving abilities was more effective and resulted in improved summative assessment results. The flipped classroom approach worked better during the intervention, according to the findings. This could have been the reason for the significance of the event. The results of the present study go in line with the findings of Day, Leslie J.(2018), Ojennus, Deanna Dahlke (2016), Simpson and Richards (2015) Moraros et al. (2015), Brooks, Andrea Wilcox (2014). Willis (2014). Overmyer (2014). (Brame, 2013) and Bennet, et al., (2011).

In terms of effect size, there is a substantial difference between the post-test of control and experimental group B.Ed. teacher trainees in their performance in Mathematics based on the results obtained from the investigated in this study data. As a result, the Experimental group outperformed the Control group in terms of effect size. As a result, it can be deduced that exposing interactive multimedia package-based tactics in Mathematics performance greatly aids students in their performance. As a result, the experimental group that used a flipped-classroom approach scored higher in problem-solving in Mathematics than the control group who used traditional methods. The results of the present study go in line with the finding of of Cheng, Li; Ritzhaupt, Albert D.; Antonenko, Pavlo(2019) Amstelveen, Raoul(2019) Leo, Jonathan; Puzio, Kelly(2016).

CONCLUSION

In comparison to the traditional classroom, the flipped methodology is more effective; the goal is to increase students' performance, establish positive attitudes, and increase their motivation for the course. It has several advantages and benefits over standard teaching approaches. Educators should also employ technology in their classrooms to improve learning outcomes. To provide better learning possibilities for their students, educators should incorporate technology into their classrooms. In the teaching-learning process, flipped classroom tactics could be beneficial. This would improve the subject's conceptual clarity at any time and from any location.

REFERENCES

- Khan, Ramzan, N. (2018). The Flipped Classroom with coach Support: An Experience in first level Statistics, *Journal of University Teaching and Learning Practice*, 15 (3).
- Day, Leslie J.(2018). Experimented on a Gross Anatomy Flipped Classroom Effects Performance, Retention, and Higher-Level Thinking in Lower Performing Students, *Anatomical Sciences Education*, 11 (6) ,565-574 .
- Cheng, Li et. al. (2019). Effects of the Flipped Classroom Instructional Strategy on Students' Learning results, *Educational Technology Research and Development*, 67 (4) ,793-824.
- Amstelveen, Raoul (2019). Flipping a College Mathematics Classroom: An Action study Project. *Education and Information Technologies*, 24 (2) .1337-1350.
- Leo,J. (2016). The Flipped Instruction in a High School Science Classrooms. *Journal of Science Education and Technology*, 25 (5) .775-781.
- Brooks, Wilcox, A. (2014). A program that targeted Information Literacy and the Flipped Classroom: Examining the Impact of a One-Shot Flipped Class on Student Learning and Perceptions. *Communications in Information Literacy*, 8 (2) .225-235.

ACTION RESEARCH: A POWERFUL TOOL TO ENHANCE TEACHING LEARNING PROCESS

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ABSTRACT

Action research plays a vital role in the field of education as there is always space for improvement in the teaching and learning process. Action researchers use the idea of action research to develop principles and theories to guide their practice. There are many methods of teaching in the classroom and action research cycle offers opportunity for continued reflection and change the strategies to yield better student outcome. The ideas and experiences of the educator combined with the action research will be a powerful tool for effective changes in the student learning. In this paper, we discuss the Purpose, Process of Action Research and how Action Research Cycle can be used to enhance the teaching and learning process by helping teachers to organize and implement effective programs of student learning.

Key words: Action Research Cycle, Process, Reflection, Strategies, Outcome

INTRODUCTION

Action research was the term coined in 1933 by Kurt Lewin to describe a scenario in which a researcher and participants collaborate to solve a specific problem. Action research is a form of applied research which is equivalent to practitioner research, teacher research, insider research and self-study research when it is under taken by an educator personally. It is an approach to educational research that is commonly used by the educators to examine and thereby improve their strategies and learning experience. It is a process wherein research is to be done systematically to find a solution to a problem related to any area of teaching and learning. Hence, the ultimate goal of action research in a classroom is to enhance the teaching and learning processes.

PURPOSE OF ACTION RESEARCH

As one of many approaches to educational research, it is important to know the purposes of action research in the classroom. Action research enables and supports the educators in pursuing effective strategies by transforming the quality of teaching to enhance student engagement and learning. Action research is all about creating new forms of understanding, since action without reflection and understanding is blind, just as theory without action is meaningless. Keeping this in mind, the following areas of action research are important to consider as we engage with action research methodology in the classroom.

- Action research methods involve action, evaluation and reflection. It is a process to gather evidence to bring out changes in educational practices.
- Action research is participative and collaborative. It is executed by individuals with a common purpose.
- Action research is situation and context- based.
- Action research develops reflection practices based on the conclusions drawn.
- Knowledge is transferred through action and application.

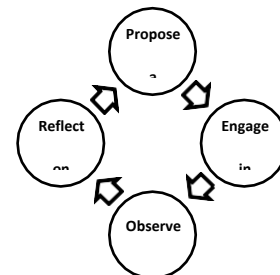
ACTION RESEARCH IN CLASSROOM

The action research process can help the teacher understand what is happening in the classroom and identify changes that improve teaching and learning. It can help answer questions the educators have about the effectiveness of specific instructional strategies, the performance of specific students and classroom management techniques. It also provides qualitative data that can be used to adjust the curriculum content, delivery and instructional practices to improve student learning. Qualitative research acknowledges the complexity of the classroom learning environment. While quantitative research can help only to see if improvements or declines have occurred, it does not help to identify the causes of those improvements or declines. When the educators reflect on their own actions and observe other master teachers, they will identify the skills and strategies that they would like to add to new ideas, will identify the skills, management and instructional training needed to make the changes they want to see.

REFLECTION AND PROCESS OF ACTION RESEARCH

Action research is concerned with the generation of knowledge, and typically creating knowledge related to a concept, idea, phenomenon, or topic. It generates knowledge around inquiry in practical educational contexts. When an educator engages in reflection on their actions or experiences, it is typically for the purpose of better understanding of those experiences. The reflective process generates new knowledge regularly for classroom teachers and informs their classroom actions. Educators are expected to draw upon formal types of knowledge, such as textbooks, content standards, teaching standards and behavioral programs to gain new knowledge and make decisions in the classroom. The reflective knowledge that educators generate through their pedagogy is an amalgamation of these types of knowledge enacted in the classroom. Therefore, reflective knowledge is uniquely developed based on the action and implementation of an educator's pedagogy in the classroom. There are many models for how the action research process takes shape and the following processes are utilized in every model.

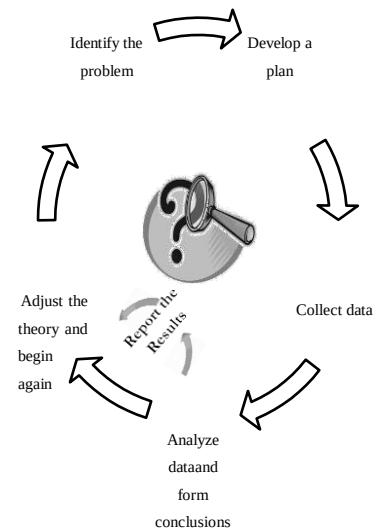
- Plan a change
- Take action to enact the change
- Observe the process and consequences of the change
- Reflection of the process and consequences
- Act, observe & reflect again



ACTION RESEARCH CYCLE

Action research is a cycle of inquiry and reflection. The educator can perform the action research by utilizing the following the cycle in the research process.

1. Identify the problem
2. Develop a plan of action
3. Collect data
4. Analyze the data and form conclusions
5. Modify the theory and repeat the cycle
6. Report the results



IDENTIFY THE PROBLEM

The process begins when the educator identifies a question or problem that needs to be addressed. Action research is most successful when there is personal involvement, so the educator should make sure that the questions or the problems are the ones that has to be solved. This could be an improvement that the educator wants to see happen in the classroom. Learning to develop the right questions takes time. The ability to identify the key questions will improve with each iteration of the research cycle. The questions chosen should be answered within the context of the daily teaching. In other words, the question selected should be both answerable and worthy of the time investment required to learn the answer.

DEVELOP AN ACTION PLAN

After the identification of the problem, a plan of action has to be developed. Brainstorming and reviewing the literature will provide with ideas for new techniques and strategies that will produce better results. In order to implement the techniques, the solution has to be translated into concrete steps that the educator can take into the classroom. Then a description of how each idea will be implemented and the time needed to do it to be noted. Once a clear vision of a potential solution

to the problem is found, the factors that might be keeping the educator and the students from the vision of success is to be explored. Thus, the plan has to be developed in such a way that it will completely implement the solution.

COLLECT DATA

Before implementing the plan of action, the educator needs to determine what data will help to make the plan succeed and how the data can be collected. There are many options for collecting the data. Selecting the most appropriate methodologies will result in more accurate, meaningful and reliable data. Obvious sources of data include Observation, Interviews and Reflective journals. The educator can also collect meaningful data from records like Attendance Logs, Grade Reports and Student Portfolios. The educator could also distribute questionnaires, watch videotapes of the class activity and administer surveys. A plan has to be created for data collection and should be followed as the research is performed. The students can also be encouraged to collect data on their own learning as it would help them to reflect on the learning environment and their own learning process.

ANALYZE THE DATA AND FORM CONCLUSIONS

The next step in the process is to analyze the data and form conclusions. Examining the data during data collection process can help to refine the action plan and revise the data collection plan. Adding data such as opinions, attitudes and grades to tables can help to identify relationships and correlations. Analyzing the data also helps to reflect on what has actually happened and if the outcomes are achieved. After analyzing the data, tentative conclusions have to be drawn. Action research is an iterative process. The data collected and the analysis of it will affect how the educator approaches the problem and implements the action plan during the next cycle. As the data has been analyzed and the conclusions are drawn it is advisable to share the findings. Discussing the results with other educators can often yield valuable feedback.

MODIFY THE THEORY AND REPEAT

When the final conclusion is drawn, the cycle begins again. As per the findings, the theory can

be adjusted or even made more specific. Then the plan of action has to be modified, the data to be collected again or new questions can be framed.

REPORT THE RESULTS

The ultimate goal of the action research is to promote effective changes in the teaching and learning process. Hence the educators should report the findings. Sharing the results will help to reflect further on the process and problem and also will allow others to use the results to help them in their own endeavors to improve the learning process of their students.

CONCLUSION

Action research also provides a reflective process that can be used to implement changes in the classroom and determine if those changes result in the desired outcome. It offers a way to formalize the knowledge generated by educators so that it can be utilized and disseminated throughout the teaching profession. As it involves continuous evaluation and modifications can be made easily as the research progresses, the educators if they perform the action research in the classroom systematically, the solution obtained can help the students become better learners and citizens.

REFERENCES

- Alexandra, O. (2019). How Action Research Can Improve Your Teaching.
<https://theartofeducation.edu/2019/10/28/how-action-research-can-improve-your-teaching/>
- Callister, J.M., Levitas, J. (2021). *Action Research in Education : Methods & Example*.
<https://study.com/academy/lesson/action-research-in-education-examples-methods-quizz.html>
- Sagor, R. (2005). *The Action Research Handbook*. Thousand Oaks: Corwin Press.
https://www.thecreativeeducator.com/v07/articles/Embracing_Action_Research
- Teacher Action Research Collaborative, Participatory and Democratic Inquiry.
https://www.sagepub.com/sites/default/files/upm-binaries/27030_2.pdf
- Using Action Research to Improve Teaching and Learning.
<https://microcredentials.digitalpromise.org/explore/using-action-research-to-improve-teaching-and-learning>

ACTION RESEARCH – EVIDENCE BASED TEACHING

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ABSTRACT

Action research is a combination of both action and research. It is well established that enables practitioners in a range of professional contexts to solve problems and improve their practice (Koshy, 2010). It provides a framework within which professionals can identify problems or challenges in their work, and seek solutions or improvements through reviewing appropriate evidence. Action research is a way to more systematically and rigorously examine its teaching and its impact on student learning. The school restructuring movement is based on a shared, site-based decision-making process. School teams are now responsible for their own programs and evidence-based teaching practices. Teachers around the world use action research in their classrooms and schools, in teaching and research.

Keywords: Action Research, Teaching, Teachers, School

INTRODUCTION

*“Action research is research used by teachers, supervisors, and
administrators to improve the quality of their decision and action.”*

----- C. V. Good

Action research in education is recognized for improving the professional practice of teachers and administrators and is considered beneficial by most educators for problem-solving in education. This is a training study usually conducted by teachers and administrators in schools. Action research is a cyclic or spiral process that includes problem identification (by a teacher, group of teachers or administrators), action, and finding facts about the outcome of the action taken. Action research in education helps teachers to adopt or develop the most appropriate strategies in

teaching and learning environments. Teachers around the world use action research in their classrooms and schools, in teaching and research.

Action research is an attractive option for teacher researchers, school administrative staff, and other stakeholders in the teaching and learning environment to consider (Mills, 2011). Specifically, action research in education can be defined as the process of studying a school situation to understand and improve the quality of the educative process (Hensen, 1996; Johnson, 2012; McTaggart, 1997). It provides practitioners with new knowledge and understanding about how to improve educational practices or resolve significant problems in classrooms and schools (Mills, 2011; Stringer, 2008).

IMPORTANCE OF ACTION RESEARCH

1. Action research is a kind of cooperative and integrative process involving teachers, administrators, supervisors, students and parents, etc.
2. Action research focuses on the daily problems of teachers or school administrators regarding classroom practices.
3. Improve practitioners' skills. It allows them to have a clear view of the problem situation to help identify ways and means of addressing the problem.
4. Action research improves teachers' professional development and ethics.
5. Promote openness to new ideas and encourage creativity.
6. Action research offers educators new ways of seeing and addressing educational issues and problems and new ways of examining our educational practices.
7. Produces practical knowledge useful in everyday life.
8. Addresses both the quality of student education and the professional growth of teachers.
9. Work in schools today has become so mechanical and routine that teachers are afraid to take a step forward. Action research reduces waste and stagnation in the teaching-learning process by developing a progressive vision and bringing flexibility to the curriculum.
10. Everyone comes together to improve educational practices. It gives rise to cooperative feelings and develops love and mutual understanding.

ROLE OF ACTION RESEARCH IN TEACHER'S EFFORT

The research-based teaching approach could also be linked to evidence-based teaching, implying that teaching could be based on quantitative and qualitative research data, as well as on experiences within the school (i.e. context-specific). The evidence-based design emphasizes teachers' professional consideration and the fact that teaching is a multidimensional process in which simple solutions are not possible. Evidence-based processes are initiated "bottom-up" by the teachers themselves (Timperley 2011). The evidence-based movement also seeks to improve student achievement, but from a bottom-up perspective, based on complex needs and conditions in school practice and not on simplified and detached knowledge: evidence from large-scale research (Levinson 2013).

Action research can be seen as a way to work with research from this bottom-up perspective, where teacher improvement issues and issues are at the heart of research engagement processes, but can be quantitative studies and systematic reviews are also taken into account (Timperley 2011; Wahlgren and Aarkrog 2020). These processes develop over time and are based on teachers' experiences and contextual knowledge, teacher collaboration and ownership (Kemmis 2009; Lloyd and Davis 2018). Action research enhances teachers' professional learning and also enhances their teaching when they collaborate with researchers as equal partners (Leeman, van Koeven & Schaafsma 2018).

The motivations and expectations of teachers for engaging in an action-research process can act as a driving force, influencing the process from the beginning, but also throughout the process, thus governing actions to achieve the intended goals. Furthermore, attempts to build research-based education could create tensions in teachers' practice as they encounter conflicting motivations based on different conceptualizations of a research-based teaching method.

INSURING SECLUSION OF THE STUDENT

*“Research concerned with school problems carried on by school personnel
to improve school practice is action research.”*

--- Blackwell

Teachers often learn about student information that students or their families may not want to post. For example, suppose you have a student with an intellectual disability in your class and you want to study how that student learns. Observing the student working (and possibly grappling with) academic activities may be fully compatible with the responsibilities of a teacher; after all, teachers should normally pay attention to their students' academic efforts. But the student or family may not want these observations to be made public or even shared informally with other parents or teachers. They may feel that this would risk publicly stigmatizing the student.

To respect the student's privacy while studying his or her learning behavior, the teacher (aka the "action seeker") must therefore disguise the student's identity each time the research results are made public. In any written or oral report, or even in any corridor conversation about the project, the teacher/researcher would use a pseudonym for the student and change other identifying information such as the physical description of the student or even the gender of the student. There are, however, limits to what can be masked without changing essential information. The teacher could not, for example, hide the fact of intellectual disability without compromising the purpose of the study; however, the intellectual disability may be unusual enough to effectively identify the student being studied.

CONCLUSION

Where there are no problems, there are no significant changes, but the problems themselves are not the most important encouragement for actions, it is the vision for a better future. Even though the change process is much more complex than expected at the beginning, and although some of the initial expectations turned out to be unrealistic, believe that all of this contributed to the change and personal learning. . By helping teachers to realize that this will not be possible without the understanding and active participation of many social factors. Understand now that this is a complex goal that is not easy to achieve. The main point to remember is that action research is more than just passive observation of students and classes; it also includes educational interventions, efforts to stimulate students to new thoughts and new responses. These are characteristics of regular education; the difference is mainly in the way to do them in a systematic and thoughtful way.

Action Research is the only research that gives priority to the real agent at the micro level such as teachers and students. If the teacher can apply the research effectively and improve the situation then it will be a real improvement in the education system (Begum et.al.2002). From this point of view, one should encourage teachers for conducting action research-evidence based teaching.

REFERENCES

- Hensen, K. T. (1996). *Teachers as researchers: Handbook of research on teacher education* (4th ed.). Macmillan.
- Johnson, A. P. (2012). *A short guide to action research*. (4th ed.). Pearson Education.
- Kemmis, S. 2009. "Action Research as a Practice-based Practice." *Educational Action Research*. 17 (3). 463–474.
- Koshy.V. (2010). *Action Research for improving Educational Practice* (2nd ed.). Sage Publication.
- Leeman, Y., Koeven, E. & Schaafsma, F.(2018). "Inter-professional Collaboration in Action Research." *Educational Action Research* .26 (1). 9–24.
- Loyd, M., and J.P. Davis. (2018). "Beyond Performativity: A Pragmatic Model of Teacher Professional Learning." *Professional Development in Education* .44 (1). 92–106.
- Taggart, M.R. (1997). Reading the collection. In R. McTaggart, *Participatory action research* (pp. 1-12).
- Mills, G. E. (2011). *Action research: A guide for the teacher researcher* .(4th ed.). Pearson.
- Stringer, E. T. (2008). *Action research in education*. (2nd ed). Pearson.
- Timperley, H. (2011). *Realizing the Power of Professional Learning*. Open University Press.
- Wahlgren, B., Aarkrog, V. (2020). "Bridging the Gap between Research and Practice: How Teachers Use Research-based Knowledge." *Educational Action Research*.
<https://www.bedguide.in/2020/04/bed-notes-on-action-research-pdf.html>

FACILITATING MATH LEARNING THROUGH DIGITAL GAMES

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ABSTRACT

Technology provides students with easy access to information, accelerated learning, and enjoyable opportunities to put what they've learned into practice. It allows students to gain a deeper understanding of difficult concepts, especially in STEM. Students can gain 21st-century technical skills for future occupations using technology both inside and outside the classroom. Games are something that children enjoy. Game is considered as an energetic way to learn because it allows students not only to learn the concepts but enjoy learning too. Digital games are currently rapidly expanding, owing to their status as the most popular technology in children's entertainment. One of the most pressing challenges in education is students' math performance. Students are impacted greatly by the rapid changes in the educational system and delivery methods. The significance of incorporating digital games into mathematics teaching and learning is discussed in this paper. The advantages of using digital games in classroom instruction are also explored.

Keywords: Digital Games, Digital Game-based learning, Mathematics

INTRODUCTION

Technological breakthroughs are unavoidable. It has also been incorporated into the world of education where children get into a new experience of learning and educators get into practice more effective methods of teaching (Digital Learning Network, 2020). The National Education Policy, 2020 emphasized the usage of technology in education. Technology has advanced education by breaking down the barriers of classroom walls. The insight they got from this interaction was much deeper than what they would have gotten from reading books and listening to lectures.

Integration of technology in education simply refers to the use of technology to improve the learning experience of students. Using interactive technology in the classroom results in learners who are actively engaged with learning objectives. The use of technology in education can help students understand and retain concepts better. The use of technology also creates pathways for differentiated instruction to meet the unique needs of students (Drexel University School of Education, n.d.). Education has shifted from passive and reactive to interactive as a result of technological advancements. Integrating technology into education may be the only way to meet the demands of the modern era.

Mathematics has penetrated all aspects of human endeavor such as education, business, social, politics, domestic activities, etc. It is a leading subject in the study of science and arts. Mathematical development is extremely significant for children's learning. Students' mathematics performance is one of the main concerns in mathematics education. Mathematics supports the development of critical and logical thinking. It provides kids an effective power to analyze, describe, and change things. Students are affected greatly by the rapid changes in the educational system and delivery methods. This condition necessitates that children study more effectively and independently (Winters, Greene & Costich, 2008, as cited in, Rameli & Kosnin, 2016). To achieve this, students need to be trained on how to enhance their skills to choose the most appropriate learning strategy (Azevedo & Cornley, 2004).

DIGITAL GAMES

Games are considered to be attractive because of their entertaining features in combination with their pleasant environment, their esthetic quality (graphics, effects, music), the existence of a structured framework, their learning goals (also presented as problems demanding solution), and the existence of the gaming dimension (causing also the strong participation of the learner) (Manesis, 2020). Digital educational games are an innovation in education that can enhance children learning. As a learning approach, digital educational games are considered to be contemporary learning tools and modern mediums of learning by bringing education to a new dimension. Digital games can immerse students in a rich instructional experience when they are used in an educational setting. Generally, game-based learning is designed to balance the subject matter with gameplay and the ability of the player to retain and apply the subject matter to the real world (Mary & Raja, 2021a). Digital games offer ample resources to facilitate learning.

WHY IS IT IMPORTANT TO INTEGRATE DIGITAL GAMES IN THE CLASSROOM?

When technology is used for educational purposes, it has both advantages and disadvantages. Integrating digital games is simple enough with today's software, but is it the correct option for the students? Several studies have been conducted to investigate the effect of digital games on learning, and the overall conclusion appears to be —yes! According to research studies, there is a link between higher educational attainment and the use of GBL/DGBL strategies (Juraschka, 2019). Students who have a negative perception of mathematics, such as believing that it is too difficult and confusing to learn, will quickly lose interest and motivation to complete the course. For successful classroom games, the teacher should ensure that the game matches the mathematical objective.

Also, the game should include enough chance that weaker pupils feel like they have a chance to win (Alridge & Badham, 1993).

Multiplex researchers on digital games have looked into the educational goal and effectiveness of them. Computer-based video games improve students' learning performance (Chang & Chen, 2007; Cremers et al., 2015; Hung et al., 2015; Chen & Law, 2016; Lin et al., 2017; Kert et al., 2017; Chiang & Qin, 2018; Bahari, 2020; Espinoza et al., 2020). Game increases students' involvement in a game-based learning environment (Farrell et al., 2011; Samur, 2012; Eseryel et al., 2013; O'Rourke, Main, & Ellis, 2013; Gerber et al., 2014; Hsieh et al., 2015; Hung et al., 2015; Bressler & Bodzin, 2016; Holbrey, 2020; uratich & Yuratich, 2020). Digital game-based learning improves learning outcomes (Kim & Chang, 2010; Shapiro & Squire, 2011; Anderson & Barnett, 2013; Hwang, Hung, & Chen, 2014; Ku et al., 2014; Chu et al., 2015; Chen & Law, 2016; Panoutsopoulos et al., 2017; Ahmad et al., 2018; Chen, Liu, & Shou, 2018; Chen, Chen, & Dai, 2018; Yang et al., 2018; Liao, Chen, & Shih, 2019; Yeh et al., 2019; Yoon & Kim, 2019).

BENEFITS OF DIGITAL EDUCATIONAL GAMES AS LEARNING TOOLS

Mathematics teachers are responsible for directing and shaping their students' learning opportunities. How digital games improve students' performance is abstracted hereunder.

Engages students. Digital games engage students. It is interactive, regardless of whether they are working independently or collaboratively. What makes games so engaging is that they foster a responsive environment in which players receive quick feedback.

Helps students with different learning styles. Teachers can use technology to differentiate instruction and modify information for their students' specific learning abilities. Students can work at their own pace when using games.

(Drexel University School of Education, n.d.) The most essential feature of digital games is the ability to enable each learner to study at their own pace and on their route (Iyappan, 2020).

Increases learning. Games can lead to more learning than formal activities because of the interaction between children, and opportunities to test intuitive concepts, and problem-solving methods.

Independence in learning. The students can work independently of the teacher. The rules of the games and the children's motivation usually keep them on track.

SITES TO EXPLORE FOR ONLINE MATH GAMES

There are numerous platforms available for teachers to use with their students. On platforms such as scratch and game froot, which allow users of all ages to design, program, and publish their games (Weisburgh & Malmstrom, 2016) as Here is a list of the useful websites for educational games covering important topics.

Math Nook: A website with online math games for all types of basic math skills such as estimation, place value, and the four operations.

Manga High: It provides free and subscription packages to teachers in the classroom and at home. Students can play basic games to reinforce math skills and compete against the computer or others on the free website.

Math Playground: Motto of this game is "Play with Numbers and Workout Your Brain." Assign games to students to play that are related to logic, number skills practice, geometry, algebra, probability, fractions, and other topics.

Math Game Time: This has games ranging from prekindergarten to seventh grade. Aside from being organized by grade, games are also organized by skill, such as fractions, probability, multiplication, and so on (Quick, 2016).

Education.com: This website contains a collection of educational games created by teachers. Students will develop foundational skills in everything from counting to reading comprehension, fractions to basic coding, and much more, with activities geared towards preschool through eighth grade.

CONCLUSION

Teachers' roles have shifted from dissemination of information to cultivating students' minds so that students can act independently and self-regulate their learning. Thus, incorporating digital games into instructional practices can assist students in realizing their full potential. Embracing technology does not diminish the importance of teachers; rather, it assists them in providing a more effective learning experience for students. Digital games are a powerful tool that can produce some remarkable results. Though digital games have some limitations in terms of design and cost-effectiveness, their implementation in education would benefit the student community greatly, as they are the unavoidable part of the next generation.

REFERENCES

- Anderson, J. L., & Barnett, M. (2013). Learning physics with digital game simulations in middle school science. *Journal of Science Education and Technology*, 22(6), 914–926.
- Azevedo, R., & Cromley, J. G. (2004). Does training on self-regulated learning facilitate students' learning with hypermedia. *Journal of Educational Psychology*, 96(3), 523–535.
- Bahari, A. (2020). Game-based collaborative vocabulary learning in blended and distance L2 learning. *Open Learning: The Journal of Open, Distance and e-Learning*, 35(3), 34–59.
- Bertram. (2020). Digital learning games for mathematics and computer science education: The need for preregistered RCTs, standardized methodology, and advanced technology. *Frontiers in Psychology* <https://www.frontiersin.org/articles/10.3389/fpsyg.2020.02127/full>
- Bressler, D. M., & Bodzin, A. M. (2016). Investigating flow experience and scientific practices during a mobile serious educational game. *Journal of Science Education and Technology*, 25(5), 795–805.
- Cremers, A., Stubbé, H., Beek, D. Van Der, & Roelofs, M. (2015). Does playing the serious game B-SaFe! make citizens more aware of man-made and natural risks in their environment? *Journal of Risk Research*, 18(10), 1280–1292.
- Chen, C. H., & Law, V. (2016). Scaffolding individual and collaborative game-based learning in learning performance and intrinsic motivation. *Computers in Human Behavior*, 55, 1201–1212.

Digital Learning Network. (2020). *National Education Policy advocates use of technology in education*. <https://digitallearning.iletsonline.com/2020/07/national-education-policy-advocates-use-of-technology-in-education/>

Drexel University School of Education. (n.d.). How to use technology in the classroom: benefits & effects. <https://drexel.edu/soe/resources/student-teaching/advice/how-to-use-technology-in-the-classroom/>

Eseryel, D., Law, V., Ifenthaler, D., Ge, X., & Miller, R. (2013). An investigation of the interrelationships between motivation, engagement, and complex problem-solving in game-based learning. *Educational Technology and Society*, 17(1), 42–53.

Espinoza, C., Orvis, K. S., & Brophy, S. P. (2020). Learning the electron transport chain process in photosynthesis using video and serious game abstract. *Journal of Biological Education*, 4(3), 1–21.

Kim, S., & Chang, M. (2010). International forum of educational technology & society computer games for the math achievement of diverse students. *Journal of Educational Technology & Society*, 13(3), 224–232.

Hung, C. Y., Sun, J. C. Y., & Yu, P. T. (2015). The benefits of a challenge: student motivation and flow experience in tablet-PC-game-based learning. *Interactive Learning Environments*, 23(2), 172–190.

Iyappan, V. (2020). *Digital learning platforms for prospective teachers and teacher educators*.

Juraschka, R. (2019, Sep 30). How digital game-based learning improves student success. <https://www.prodigygame.com/main-en/blog/digital-game-based-learning/>

Kert, S. B., Büyükimdat, M. K., & Uzun, A. (2017). *Comparing active game- playing scores and academic performances of elementary school students*. 4279.

Lin, C., Liu, E. Z., Chen, Y., Liou, P., Chang, M., Wu, C., Yuan, S. (2017). Game-based remedial instruction in mastery learning for upper-primary school students. *Journal of Educational Technology & Society*, 16(2), 271–281.

Mary, T.S., Raja, B.W.D. (2021a). Digital games an innovative learning approach. *An International Multidisciplinary Double-Blind Peer- Reviewed Research Journal*,

- 3(4), 148-152.
- Mary, T.S., Raja, B.W.D. (2021b). Virtual games in enhancing knowledge and skill. In M. M. Saroja et al (Eds.), *Modern Skills for Modern Teachers* (pp8-12). AkiNik Publications.
- Manesis, D. (2020, Feb). Digital games in primary education.
<https://www.intechopen.com/chapters/71084>
- Rameli, M.R.M., & Kosnin, A.M. (2016). Challenges in mathematics learning: a study from school students' perspective. *Universiti Teknologi Malaysia*.
- Shapiro, R. B., & Squire, K. D. (2011). Games for participatory science: A paradigm for game-based learning for promoting science literacy. *Educational Technology*, 51(6), 34–43.
- Samur, Y. (2012). Measuring engagement effects of educational games and virtual manipulatives on mathematics. *Virginia Polytechnic Institute and State University*, 1–258.
- Sun, L., Ruokamo, H., Siklander, P., Li, B., & Devlin, K. (2021). Primary school students' perceptions of scaffolding in digital game-based learning in mathematics. *Learning, Culture, and Social Interaction*, 28. <https://doi.org/10.1016/j.lcsi.2020.100457>
- The Scientific World. (2018, Nov 07). What is the importance of mathematics in our daily lives?
<https://www.scientificworldinfo.com/2018/11/what-is-importance-of-mathematics-in.html>
- Quick, J. (2016, Nov 15). Best online game sites for home school math. *Jimmie's collage*.
<https://jimmiescollage.com/10best-math-games/>
- Way, J. (1999). Learning mathematics through games series. *NRICH*. [http://www. Learning Mathematics Through Games Series: 1. WhyGames? \(maths.org\)](http://www.LearningMathematicsThroughGamesSeries:1.WhyGames?(maths.org)).

APPROACHES TO IMPROVE STUDENTS ENGAGEMENT IN MATHEMATICS THROUGH ONLINE CLASSROOM

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ABSTRACT

Everyone has the power for creating innovative things through education. To enhance quality of education teachers need to update their knowledge based on the current situation. In this present situation COVID-19 has shifted us to online learning. Online learning is a learning process through internet. Continuous learning is important for every learning. To continue the learning this online learning is more important during this lockdown period. Online learning makes the mathematics class effectively. In Mathematics subject basic operations and formula are important. If people understand the concepts and steps, it will clear in their mind. Even though Mathematics subject is hard for students, lot of apps and devices are helping to makes effective the online learning. Teacher should aware of these devices and apps. So, everyone uses these devices and apps to enhance the best practice for the mathematics classes.

Key words: Online education, best practices or tools, Mathematics, effectively and Internet.

INTRODUCTION

Education is needed for everyone in this world. But in ancient days a particular group alone got education. Nowadays all the people also get through education modern society. Everyone has modified or changed their behavior from the teaching learning process in this world. Students also think critically using education process. It is very essential for everyone. A programme of training may encompass the purchase of the maximum dependable techniques human have evolved for coming across the reality approximately themselves and the world. The competencies of the educator make the students to motivate for what they may

be doing and encourage them to be wise and reflective within side the workout in their competencies (Rajagopalan.I, 2019).

Many students are thinking Mathematics is hard subject. If everyone understands the concept it will be useful. No need to study extra time in Mathematics subject as the other subject. That is the real thing about the mathematics. In many countries teachers are required to take a formal course on educational principles that teaches the concepts of teaching and learning. However, this exposure to teachers does not exist for professional teachers who enter the teaching profession without having completed formal education. This can hamper the process of effective teaching and learning (Sequeira, 2012).

ONLINE TEACHING AND LEARNING

Learning process through online is easy except Mathematics. Teachers may use the PowerPoint and recorded video to explain another subject. But the Mathematics class is very hard to teach with the PowerPoint. Online teaching learning plays a significant role in the education system. It is a form of education which is given by teacher through Internet. Online learning is also called computer- based learning, web-based learning, internet - based training, m-learning, e-learning and computer-aided distance education. “Online education is electronically supported learning that relies on the internet for teacher/student interaction and the distribution of class materials”. Some panic situation stimulates us to adopt highly innovative communication technology and e-learning tools. This COVID-19 pandemic also stimulates us to shift the online mode. So, the total world has shifted to this online mode.

These online methods support and facilitate the educational activities. If everyone makes the e-learning, people need to focus the use of technology more efficiently. Many of the teaching strategies such as lectures, case-study, debates, discussions, experiential learning, brainstorming sessions, games, drills etc. are used in the online classroom to facilitate effective and efficient teaching and learning practice The e-learning method is an improvement of adult students studying Mathematics at the secondary levels compared to the expository method. In this case the improvements occur in motivation, autonomy, participation, concepts, results, evaluations and teacher evaluations. Therefore, the use of e-learning methods for implementation in adults studying Mathematics in high school would be effective (Tull et.al. 2017).

BEST ONLINE PRACTICES FOR MATHEMATICS CLASSROOM

Best practice in the sense we people give extra time to work to develop their knowledge in teaching learning process. In Mathematics class, it is a mandatory for teachers as well as the students. There are many of best practices available in Mathematics. In this pandemic situation, teachers should include this type of best practices which are enhancing the student's engagement as well as the understanding. In this modern world there is lot of technologies available. The need of the online practices as follows:

- ✓ To understand concept without doubt
- ✓ To retention the Mathematical basic operations
- ✓ To enhance the continuous learning process
- ✓ To remind the basic formulas
- ✓ To remember the steps
- ✓ To know steps clearly

BEST ONLINE TOOLS/PRACTICES FOR MATHEMATICS CLASSROOM

- ✓ Microsoft Math Solver
- ✓ Microsoft White board
- ✓ Seesaw app
- ✓ Photo Math

Microsoft Math Solver

Everyone can get this app from the play store through the gadgets. In this app there are three options. People can choose language as our wishes. Scan the question, which needs the answer. People may get the answers through lot of methods. It will give the explanation of every step. Quiz programme are also available in this app. The second option is drawing. The last one is typing.

Microsoft White Board

People may get this free app from Google. After opening we give get started button. In this app lot of options are available such as extra setting, pen tool add notes, Insert option, and add image, undo and redo. In this pen tool lot of colors and highlights are also available. People use the eraser, ruler and select option sizes. This type of app not only functions with

touch board, but also with the mouse. People add the pictures through add image button. Mikut

See saw

Seesaw is the best platform that allows students to demonstrate and share what they have learned. Students use powerful tools in the seesaw app to bring their learning to life, reflect, and demonstrate. When students share what they have learned in their swing portfolio, teachers and families gain valuable information about their students' knowledge and can better support their development. Teacher also directs the students who use this app empowered, motivated and proud, and that they are engaged in more meaningful ways. This seesaw app is used in two lakhs classrooms over the countries, and one out of two schools in the United States. It works on any device, shared or one to one. Teachers see what students know and get ideas for activities in seesaw. 97% of administrators report that see saw to helps develop a better relationship with their parent community. 95% of administrators report that seesaw for schools helps them to use technology more effectively at their career.

Photo Math:

Everyone can choose language as our interest. Students can scan the questions may get the solution. The sub-category option is also available. If students click the explain setup, they get lot of steps and explanations.

BENEFITS OF BEST ONLINE PRACTICES

- **Make real time collaboration easier:** We introduce a number of new features to make this a reality. Collaboration cursors help us to remote by showing other collaboration in the whiteboard. It gets people's attention as our sharing the new ideas. It reduces the distractions while guiding. These features improve the collaboration, engage all participants and reduce hybrid work barriers.
- **Boost creativity with rich and interactive content:** It allows everyone to contribute in the way that best suits their idea, device type, or personal preference. It combines shapes, lines, text and link to creative diagrams. It makes connection, annotate, and together across multiple type of content with our new insert image and document capabilities.

- **Experience a unified modern look and feel:** With the introduction of new collaboration features and content types have created a new user interface to support our ever-growing capabilities. The new white board provides a single unified user experience across all devices, operating systems and platforms; ultimately, the new whiteboard user interface emphasizes what matter most- people and content – so we can do our best.
- **More robust creative tools:** Including multipage, unlock new ways for students to demonstrate learning without a bunch of different apps. Schedule see saw activities and save an unlimited number of activities in up to 100 collections. Family engagement is even easier. Connect more co-teachers and specialists.
- **Equity and Consistency:** Seesaw for schools is packed with tools to make it easy for all teachers, students and families regardless of their level of classrooms knowledge, to get started with the see saw and use it effectively.
- **Visibility and connection:** Staff can quickly identify the school-wide learning process, understand trends in family engagement and better support teachers with the admin panel.
- **Streamline assessment and more:** Create an ongoing record of your learning path that is easily accessible to teachers, families and students throughout our school career.
- Explain the different types of angles through the online mode using these apps.
- Students can learn anywhere at any time.

CONCLUSION

Lot of research has said online learning enhancing the Mathematics classes among the students. Nowadays students are very familiar with these devices and technologies. To explain this it is clearly observed that the latest apps are used effectively. Teachers use these apps and explain the concept of Mathematics. The suggestions are given and training for government school teachers as well as the private teachers, provides the awareness on devices and apps and adequate facilities to enhance the best online practices. So, the online learning makes the Mathematics classroom effectively with the help of devices and apps.

REFERENCES

- Deepa,F. (2016). *Effectiveness of E-Learning on Pupils Achievement in Mathematics at High School*
- Guerrero. A. (2020). *E; Learning in the Teaching of Mathematics: An Educational Experience in Adult High School*
- Lockee.B.B.(2021). Online Education in the Post-COVID era.
- Rajagopalan.I.(2019). Concept of Teaching. *International Journal of Education*.7 .(2). doi: <https://doi.org/10.34293/3ducation.v7i2.329>
- Sequeira.A.H. (Sep, 2012). Introduction to Concepts of Teaching and Learning
- Shivangi &Dhawan., (2020). Online Learning: A Panacea in the Time of COVID-19Crisis., *Journal of Educational Technology System*.49 (1). 5-22. doi: 10.1177/0047239520934018
- Tull.S. P. C., Dabner, N.,& Ayebi-Arthur. K ((2017). Social media and e-learning in response to seismic events: Resilient Practices, *Journal of Open, Flexible and Distance Learning*.21 (1).63-76.
- <https://www.eschoolnews.com/2015/05/18app-of-the-week-seesaw/>.
- <https://www.indiaeducation.net/online-education/article/what-is-online-education .html>
- <https://apps.apple.com/us/app/seesaw-class/id930565184>
- <https://www.infoworld.com/article/2619882/microsoft-s-5-biggestweaknesses.amp.html>.
- <https://techcommunity.microsoft.com/t5/microsoft-365.blog/meet-the-new-microsoft-whiteboard-designed-for-hybrid-work/ba-p/2445539>

PROMINENCE OF COLLABORATIVE ACTION RESEARCH IN MATHEMATICS CLASSROOM

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ABSTRACT

Social systems are founded on beliefs; particularly in particular, assumptions about what will benefit the greatest number of people in a society. Beliefs, and particularly the rationale or support for them, are not always easy to exhibit or see as part of our reality. There are numerous methods for conducting research. Each of these approaches is employed in a variety of fields, such as psychology, sociology, social work, medicine, nursing, and education. However, action research, an interactive way of gathering information that is used to investigate themes such as teaching, curriculum creation, and student behaviour in the classroom, is frequently utilised in the field of education. In the realm of education, action research is particularly popular because it is useful in areas of teaching practice that need to be studied or in situations where continuous development is the goal. Action research, commonly referred to as practitioner research, is a method of systematic investigation. In various aspects, this form of research differs from traditional research. To improve an area of her/his pedagogy, the educator/researcher engaged in action research-based inquiry. She or he created evidence that she or he had increased her or his pupils' comprehension of mathematics by integrating it with other topics, particularly in the social and ecological context of her classroom, school, and community. This paper explores the importance of collaborative action research in mathematics

Key Words: Action research, Collaborative action research, Teacher, Mathematics

Research is involved with the creation of knowledge, and is usually focused on a concept, idea, phenomena, or issue. In practical educational environments, action research creates knowledge around inquiry. Traditional research is frequently undertaken by objective researchers who are not affiliated with the study. The factors are controlled by these researchers since they define the study conditions. Action research allows educators to learn from their activities in order to grow professionally or personally. Stakeholders conduct

action research to solve specific and focused problems (Springer, 2014). In school action research, a wide range of evaluative, investigative, and analytical research methods are used to diagnose problems or weaknesses—whether organisational, academic, or instructional—and to develop practical solutions that can be addressed quickly and efficiently by educators.

Action Research is a form of systematic inquiry that instructors use to investigate their own practise as researchers. The inquiry involved in Action Research is frequently visualised as a cyclical process, as demonstrated in the two examples below.

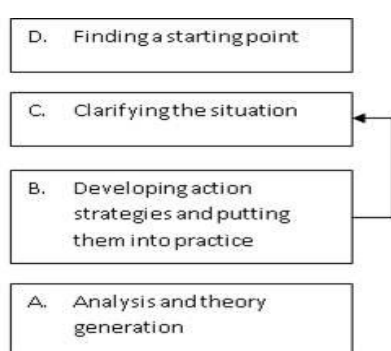


Figure 1: Stages of action research process
(Altrichter, Posch and Somekh, 1993, p.7)

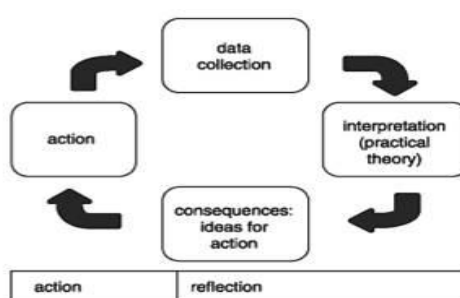


Figure 2: The circle of action and reflection
(Altrichter, Posch and Somekh, 2007, p.8)

ACTION RESEARCH METHODS AND TYPES

Action research can be done in a variety of ways- Observing individuals or groups • Using audio and video tape recording • Using structured or semi-structured interviews • Taking field notes • Using analytic memoing • Using or taking pictures • Distributing surveys or questionnaires are some of the ways. Researchers can combine several of the strategies listed above to help them obtain rich and useful data.

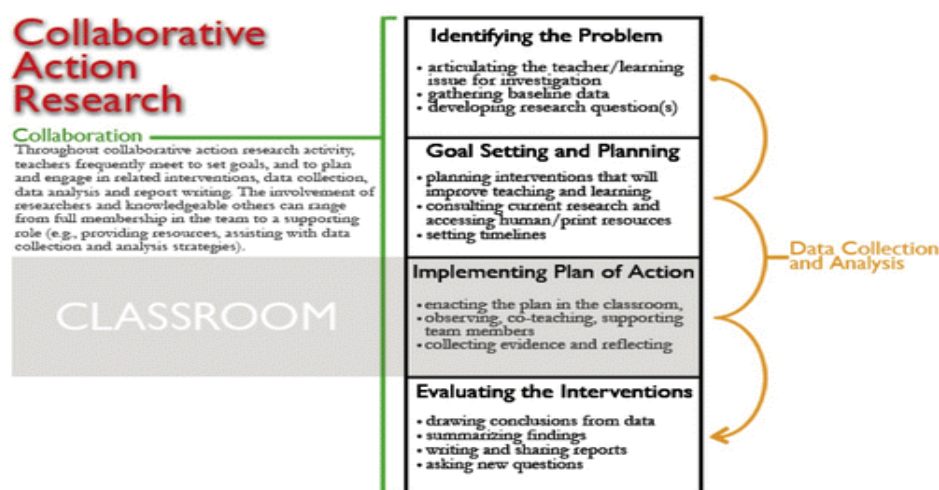
Individual action research, collaborative action research, and school-wide action research are examples of several types of action research in the subject of education. Consider the following scenario:

- Individual action research entails working on a project independently, for example, an elementary school teacher undertaking her own in-class research project with her students.

- Collaborative action research entails a group of instructors or researchers collaborating to investigate a topic that may exist outside of a particular classroom, such as at the departmental or grade level.
- School-wide/district-wide action research focuses on challenges that affect the entire school or district as a whole. Using school-wide action research, teams of staff members would collaborate. As you can see, action research has a wide range of applications in education.

COLLABORATIVE ACTION RESEARCH

Action is the focal point of collaborative action research. It necessitates researchers becoming involved and acting in a reflective manner to enhance teaching practises in a classroom or throughout a school (Carson, et. al., 1989a). Collaborative action research is also democratic in that it encourages a lot of discussion and contact among colleagues, encouraging active participation in a shared effort to enhance education. In a collaborative action research study, all participants are equal partners in decision-making processes that affect the research's means and outcomes. Collaborative action research is not pushed on teachers in a "top-down" manner as a result of this cooperation, but rather in a "horizontal" one.



Creating mutually productive ties between instructors and researchers in the field of education has proven to be a difficult task. Many educators and academics have noticed a communication gap between "what the study indicates" and "what practitioners practice." Teachers and researchers have traditionally created their own worlds, communities of

practice, and modes of operation and communication. 'In higher education, the emphasis on research helped build a division of labor between those who undertook intellectual work (researchers) and those who put others' ideas into action (teachers)' (Hayes and Kelly 2000, 454). Furthermore, some teachers believe they have been treated as study subjects, with unreasonable expectations of what they can and should achieve (Vaughn, Klingner, and Hughes 2000). Direct involvement of instructors in research and direct involvement of researchers in teaching is one way to bridge the gap between teaching and research. The most notable use of this was in the 1990s, in the form of collaborative action research (Hubbard and Power 1999; Ross, Rolheiser, and Hogaboam-Gray 1999; Sagor 1992, 2005; Wells 1994; Whitehead and McNiff 2006). Collaborative action research, according to Ross, Rolheiser, and Hogaboam-Gray, is "a systematic study into teacher practise undertaken by a team of teachers and university researchers working as equal partners" (1999, 256).

KEY CHARACTERISTICS OF COLLABORATIVE ACTION RESEARCH

Capobianco outlined the following features of collaborative action research in 2007:

- The teachers and the researcher define the research problems together;
- Teachers and researchers work together to find solutions to difficulties in the classroom.
- Teachers build research skills in data collection, analysis, and interpretation, while the researcher (re)educates herself or himself in the most relevant research procedures for the situation.
- As an integral part of the research process, the researcher and teachers share and shape their ongoing, personal, and critical reflections; 5. Results from the collaborative action research contribute to the collective knowledge of teaching and learning and are shared with others with the goal of improving education practises.

COLLABORATIVE ACTION RESEARCH OBJECTIVES

Collaborative Action Research is a method for systematically assessing evidence. Data analysis can be done by one or many action researchers, but it is more effective when done with a group of people who are invested in the outcome. This type of research contributes to the advancement of knowledge, theory, and practice. To obtain a deeper knowledge of

organizational change through collaborative actions; • To improve the community in which one's work is embedded through participatory action learning or research.

COLLABORATIVE ACTION RESEARCH'S IMPORTANCE

"The technique is only action research when it is collaborative," according to Kemmis and McTaggart (as cited in Burns, 1999), "but it is vital to note that the action research of the group is achieved through the critically reviewed action of individual group members" (p. 5). Collaborative action research is the joint research between two or more teachers, or between university faculty and teachers. They collaborate and influence changes in the curricular approach and focus mainly on practical problems or individual teachers (Vula & Berdynaj, 2011). "Collaboration" is encouraged in teacher action research to bring co-researchers into an inter-subjective dialogue intended to open and refine different ways of knowing (Pine, 2009).

"A sort of communal self-reflective inquiry," they define action research as. That is certainly the case with this action research study, and it might be claimed that completing action research through collaboration is the most efficient way to do so. Collaborate is the way because when AR is combined with collaborative work, the teachers participating have a lot more opportunity for professional development. "Collaborative action research methods improve the chances for the outcomes of practice-based research to be fed back into educational systems in a more meaningful and critical way," according to Burns (1999). (p. 13). According to López-Pastor, Monjas, and Manrique (2011), collaborative work is the result of a multi-stage research study and is particularly useful for PD. As a result, CAR is research that involves teachers in collaborative work groups and allows them to reflect on their pedagogical approaches.

CHALLENGES FACED BY TEACHER AND RESEARCHERS

Teacher researchers' unique perspectives Some of the following experiences as problems experienced by teacher researchers are highlighted in reports of empirical investigations on action research undertaken by individual teachers or groups of teachers.

Obtaining replacement teachers during school release days designated for action research activity, according to Zeichner (2002), has an impact on the action research experience for teacher researchers. Furthermore, he cites 'narrowing down an area of interest

into a research question and finding time to write in their action research journals' (Zeichner 2002, 309) as particularly difficult and irritating for teacher researchers, as well as a lack of time for sharing progress with others. Cook (1998) outlines how teachers find it difficult to change data from an apparently disordered condition into something that allows for new possibilities to emerge. Additional challenges identified by McKernan (1996, 38) include "better training courses, research skills, money and other resources, collaboration possibilities, and, of course, expertise with curriculum inquiry." Some of these issues are classified by Cole and Knowles (1993) as technical/logistical issues (e.g., when and where to conduct research), personnel issues related to collaborative group dynamics, procedural issues in conducting robust research, and ethical issues related to acquiring and maintaining ethical research. Because the literature does not 'explain the action research approach more expansively and openly,' teacher researchers are often ignorant of the hurdles involved in the procedure (Cook 1998, 106). Cook goes on to say that, while the literature reveals that instructors face difficulties, there is a need to investigate the 'messiness' of these difficulties in the action research process because the 'account of action research often tidies away this component of the activity' (1998, 107).

RELATED STUDIES OF COLLABORATIVE ACTION RESEARCH IN MATHEMATICS

Catherine Diane Bruce (2001) studied Building a teacher-researcher community through collaborative action research on improving student communication in mathematics. The goal of this study was to look into three teacher researchers' relationships as they formed a small community of practice around student communication in mathematics. The teachers set specific goals for instructional improvement. Their reform based interventions were monitored, as were student mathematics learning logs. Simultaneously, activity and reflections of the teacher-researchers were documented over eight months. A grounded theory approach was used to analyse data through the processes of open, axial, and selective coding. The data were used to create an overarching model for collaborative action research. Interviews, observations, group meetings, learning logs, and teacher-researcher journal entries were among the data sources. The study's main finding was that successful instructional change required: 1) participants' active reflective stance; 2) a small supportive community of practice; and 3) the elimination of sources of tension.

Leinenbach M., & Raymond A. M., (2001) A story of one mathematics teacher's development through collaborative action research on the learning and teaching of algebra. The goal of this collaborative research, which was conducted by a university mathematics educator and an eighth-grade mathematics teacher (Marylin), was to look into the results of "implementing a 'Hands-On Equations' approach to teaching algebra." To be successful in mathematics, students must be able to communicate in the language of mathematics (Pimm, 1987; Moschkovich, 2012).

Vula Eda, & Lirika Berdyna (2011), Collaborative Action Research: Teaching of multiplication and division in the Second grade of Primary School. Here 58 students of three second grade classes, 3 teachers of those classes and a university professor were involved. Aim of this study was using a different approach in their teaching of multiplication and division in the second-grade classes, here all three teachers were agreed to cooperate and jointly plan the learning activities, to observe systematically their students and to reflect on the outcomes.

Vula Eda, et.al., (2012). Collaborative Action Research to Solve Mathematical Word Problems .

The impact of explicit mathematical vocabulary training and meaningful formative assessment feedback on third grade students' abilities to answer word problems in mathematics was explored by two researchers, a third-grade teacher and a professor of mathematics education. The impact of explicit mathematical vocabulary instruction and substantive formative assessment feedback on third grade students' abilities to solve word problems in mathematics was investigated in this study by two researchers, a third-grade teacher and a professor of mathematics education. As part of a collaborative action research project, the authors worked together to observe, reflect, plan, and implement. The interventions were evaluated after the first research cycle was completed. The qualitative (interviews with students, observations, and journal entries) and quantitative (surveys and exams) data revealed that students' word-problem solving abilities had significantly improved. The improvement of the 'gap' in the problem-solving process was due to the development of mathematical vocabulary, which enabled them to understand mathematical terms and requirements while providing feedback on problems assessment.

Collaborative action research According to Hendricks (2006), collaborative action research is a system of action research in which multiple researchers from school settings

work together to study educational problems. Among action methodologies, collaborative action research holds its place as a fully collaborative method for practicing inquiry into questions of shared importance among all the participants. Researchers have promoted the notion of collaborative learning communities as imperative for the success of teacher inquiry (Levin, 1999). Although teachers often have difficulty seeing themselves involved with research, when they became active researchers in their classrooms or collaborative partners in other studies, teacher development often occurs (Lieberman & Miller, 2001).

REFERENCES

- Bruce, C. D., Flynn, T., & Peterson, S. S. (2011). Examining what we mean by collaboration in collaborative action research: a cross-case analysis. *Educational Action Research*. <https://www.tandfonline.com/doi/full/10.1080/09650792.2011.625667>
- Capobianco, B. M. (2007). Science Teachers' Attempts at Integrating Feminist Pedagogy Through Collaborative Action Research. *Journal of Research in Science Teaching*, 44(1), 1–32.
- Chiou-hui Chou, (2010). Investigating the effects of incorporating collaborative action research into an in-service teacher training program. *Procedia Social and Behavioral Sciences* 2, 2728–2734.
- Cole, A. L., & Knowles, J. K. (1993). Teacher development partnership research: A focus on methods and issues. *American Educational Research Journal*, 30(3), 473–4
- Cook, T. (1998). The importance of mess in action research. *Educational Action Research*. 6(1), 93–109.
- Eileen, F. (2000). *Action Research*. https://www.brown.edu/academics/educationalliance/sites/brown.edu/academics.education-alliance/files/publications/act_research.pdf
- Jaipal, K., & Figg, J. C. (2011). *Educational Action Research*. 19(1), 59-72. https://www.researchgate.net/publication/233231713_Collaborative_action_research_approaches_promoting_professional_development_for_elementary_school_teachers
- McKernan, J. (1996). *Curriculum action research*. Routledge.
- Vula, E., & Berdynaj, L. (2011). Collaborative action research: Teaching of multiplication and division in the second grade of primary school. *Turkish Online Journal of Qualitative Inquiry*, 2(2), 7-16.
- Vula, E., & Kurshumlia, R. (2012). Mathematics Word Problem Solving through

Collaborative Action Research. *Journal Of Teacher Action Research*,

http://www.practicalteacherresearch.com/uploads/5/6/2/4/56249715/vula_34-46.pdf

Zeichner, K. M. (2002). Teacher research as professional development for P–12 educators in the USA. *Educational Action Research*. 11(2), 301–26.

Kemmis, S. & McTaggart, R. (1998) (3rd ed.). *The Action Research Planner*, Deakin University.

WAYS TO DEVELOP MATHEMATICAL THINKING SKILLS OF CHILDREN WITH VISUAL IMPAIRMENT

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ABSTRACT

Mathematics is a foundation for everything in the world. A critical thinker builds the blocks of the knowledge to find various ways to find the solution through mathematics. Mathematical literacy is linked in our daily life activities. Individuals develop their thinking capacities from different places. Mathematics also enhances the creative thinking of the individuals. It challenges to bring out their knowledge from real life experiences. There are many ways to foster the mathematical skills in normal children; but the children with visual impairment also have the same capacity and fostering the skills in mathematics is very essential for their academic and social lives. Children with visual impairment lag behind their peers since they do not have much exposure to the mathematical concepts like the normal children. Teachers have to improve their thinking skills in mathematics in the way they prefer to learn. Bringing out their talents in the society to show them as good critical thinkers in mathematics is in the hands of a teacher. They have to explore their ideas, motivate their interest by adopting new strategies or finding new ways to enhance their mathematical skills. Proper guidance and training will enhance them as good thinkers in mathematics. This paper attempts to explain the various strategies that can be used to develop the mathematical skills of the children with visual impairments.

Keywords: Mathematics, mathematical literacy, mathematical concepts, mathematical skills, children with visual impairment

WAYS TO DEVELOP MATHEMATICAL THINKING SKILLS OF CHILDREN WITH VISUAL IMPAIRMENT

“Mathematics is the queen of the sciences”

- Carl Friedrich Gauss

Maths is a building block for each and everyone's daily life. It is concerned with logical study of shapes, arrangement and quantity. It is an art of thinking to achieve the goal. The ancient vedic period scholars Jain, Bhaskara, Aryabhata used mathematics for investigating the foundation of the world (Tularam, 2018). The National Policy on Education (1986) states, “Mathematics should be visualised as the vehicle to train a child to think, reason, analyse and to articulate logically”. It involves each individual to think their situations along with solving their problems through logical calculations. Godino (1996) declares mathematics as a human activity that involves giving solution to problematic situations. Mathematics as a subject should be given to all students from primary schools to equip them with the ability to think logically, analytically, systematically, critically and creatively as well as with the ability to cooperate (Lince, 2016).

IMPORTANCE OF MATHEMATICAL LITERACY

Mathematical literacy refers to the knowledge about numeracy (the ability to recognize numerals), a basic number sense, and grasping of simple mathematical concepts. The duty of a mathematics teacher is to understand the ways to explore the needs of all the learners and support them to achieve their goals. “Knowing mathematics is doing mathematics” (Kusmaryono, 2014). Mathematics literacy helps to discover about the different situations and to know the surrounding of them as an active, creative thinker. Mathematics helps individually to acquire knowledge and also helps to transform their experience from one to another. The fact of mathematics is to gather the concepts and to achieve the skills through different methods and to equip them through inquiry and reasoning (Kusmaryono, 2014). In daily life, it helps to manage the time, budgeting, cooking, driving, decorating at homes, stitching and each and every work.

MATHEMATICS SKILLS

According to Winteler (2000), budding interest in math is flourished through puzzles, block plays, solving word problems, building houses out of cards, reading books and conversing with others about science and philosophy. Children are internally motivated to develop their intellectual and procedural math knowledge. To gain mathematical literacy, the teachers have to teach the basic mathematical concepts like size, shapes, colours, comparison, fundamental arithmetic operations – addition, subtraction, multiplication and division, different measuring methods and solving simple maths problems step-by-step. Once when these basic concepts are learnt thoroughly, this helps the children to develop their mathematical skills in classroom. Some of the important skills that develop through learning mathematics are problem solving, critical thinking, creative thinking, analytical thinking, reasoning, and also able to communicate and connect concepts, manage time and instil positivity and confidence.

Problem solving skill: Problem solving is a good learning to prepare the students to solve their real problems. The children's problem-solving habits are developed through experiences they gain by working with situations (Rigelman, 2007). Children are prepared as a good problem solver and are able to analyse the problem. Problem solving skill also helps to link the previous ideas to the new invention.

Critical-thinking skill: The mathematical critical-thinking skill is a process of thinking systematically to develop logical and critical thinking on mathematical problems, which demand to learn in the 21st century. The mathematical critical-thinking skill is very important for children also. The children will be able to make decisions to express an idea with the help of their rational thinking, brave to make conclusions with alternative logical thinking, and able to examine and disregard various complex problems in learning mathematics. Mathematics learning does not occur, if the learning process has not demonstrated the spirit of developing mathematical critical thinking skills in the children (Syafri, 2019).

Creative thinking skill: Math is unique and it develops the ability to think critically. For developing creative thinking skills, the children should be free to try their own solutions (Lince, 2016). The creative thinking avoids the students memorizing the concepts, formulae and the logics. The main challenging task is to try their own knowledge and use the real experience to challenge the problems. By overcoming the challenges, it helps the children to

achieve the learning and improves their attitude towards learning mathematics. The creative thinking skills in mathematics is equipped through different ways such as group discussion, multiple choice or any other task that kindles creativity.

Reasoning: Scusa (2008) states that a child who is good at reasoning can effectively explain his or her thinking and do more than just list the procedure or summarize the answer. One who is good at reasoning will be a good arguer or conjecture and uses various reasoning methods and makes others to think by showing proofs. The concepts make them to think and use their knowledge to find the solution. Teachers should provide tasks related to their suitable environment because the task leads them to achieve the goal through mathematical reasoning. It develops them as a logical thinker and as a result they found themselves as a good problem solver. They investigate the mathematical questions in a structured form to find a solution. Mathematical reasoning is improved in classes by having high interaction, active participation and interest to found a solution.

Communication skill: Communication skill is also having equal importance to problem solving, mathematical reasoning and other skills. The mathematical communication skill refers to the skill to understand, interpret, express, respond, and use mathematical symbols to present ideas in oral and written forms. This skill is related to the cognitive and psychomotor aspects. Children who lack in their communication are unable to convey their ideas in learning mathematics. Teachers have to provide positive environment to speak their ideas independently. The task must be designed to explain their ideas in front of their peers. It leads them to bring down their anxiety. Children should be given equal chance to explain their ideas. When one's thinking is clear and concise, and develops their idea with a proof, then they can communicate properly (Scusa, 2008).

Connecting the concepts: Children are prepared to connect their mathematical ideas with the real world. Teachers should not only convey the abstract concepts that are in the book but must teach them to connect their ideas to their daily life activities. To improve this skill, the children should be provided the assignments which connect mathematical concepts to their real life situations. They should be able to apply the concepts or ideas outside the classroom to lead a successful life (Scusa, 2008).

Positivity and confidence: Making the children confident is vital to perform their best in a mathematical class. Teachers must provide a healthy mindset to boost their thinking skills. Creating an opportunity for children to express their thinking avoids their difficulty in mathematics. Positive reinforcement from teachers helps them to learn mathematics with curiosity. They can also improve their thinking skills by rewarding the children.

Repetition: Teachers should make their students to repeat them or practice to update their mathematical thinking skills. Repetition is a good practice to achieve their goal. They can explore more ideas and concepts. There are different formulae, problems, equations which can be solved through practice. The children who practice more times can generalize their creative ideas in the problems.

INSTRUCTIONAL STRATEGIES FOR CHILDREN WITH VISUAL IMPAIRMENT

Children with visual impairment face more challenges in their learning especially in mathematics. Mathematics teachers' have to make them to think logically, solve a problem and calculate the answers. Mathematics that is highlighted as a visual representation is a great obstacle for children with visual impairment and it is a challenge to foster their mathematical thinking skills in learning. Instructional strategies and tools are provided to promote access to mathematics content, for children with visual impairments. They require on-going adaptations and accommodations in mathematics to provide access to the mode of learning that best fits their learning needs (Emerson & Anderson, 2018). Decisions regarding instructional strategies must be made based on accurate and comprehensive assessment of the child's vision. Some of the following strategies can be offered to provide possible adaptations, which enhances their mathematical skills.

Abacus: The tool named crammer abacus is to teach the students with visual impairment to do the mathematical problems. It is used to teach the operations of addition and subtraction to the children. They can also count the numbers by using abacus. It helps them to be well trained in their basic skills of arithmetic. At higher order level, they are using different technologies for doing calculations in multiple digits. Abacus skills also to be included in their education plan because it seems to be enjoyable and also gives positive results. It helps them to improve their creative ways of using abacus.

Braille codes: Braille is also an effective tool for students with visual impairment to do their mathematical work and to solve the problems. Braille code is developed by Dr. Abraham Nemeth to induce the steps of using the braille signs for mathematical signs and scientific notation. Without aware of these codes, they can't do their mathematical calculations. Teachers ensure them to cover the codes but they may get confused while writing the symbols. So teachers can keep a code game by instructing the students. It helps them to practice to store the codes and use for calculations.

Tactile graphics: Dhawan revealed that to teach mathematics, the teacher needs to train the children tactile skills by using teaching aids such as toys, counting apparatus, embossed pictures and diagrams. It is also a good tool as they can learn or read through touching the graphics. It is represented as print illustration and the content are designed as information and print diagrams that they can feel while touching. Specifically, these tactile graphics are used for students to do their graphs, geometry and data analysis. Teachers provoke them to understand the concept by the use of different models and objects. It is a great opportunity for the children to handle the objects and they can know how to use the object. It keeps the children very active to gather more information by using the tactile graphics. It assists them to understand the visual mathematical concepts through their senses.

Concrete materials: The materials are available for children with visual impairment in multiple forms. Physical object is a teacher's tool used to active the students which helps as a hand for learning of mathematics. It helps them to gather the ideas of the concepts like addition and subtraction, operations with integers, fractions, counting money, telling time, measurements and place value. These are the concepts which help to connect them to handle their real-life situations. Various geometric shapes of different sizes, textures and colours, felt boards, symbol stickers and base ten blocks can be used to help students with visual impairments to conceptualize what is being taught include (Johnson, 2016). These help the students to remember their concepts to solve the problems.

Playful learning: Playful learning is a wide concept that encapsulates both free and guided play (Fisher, 2012). Free play includes the object play, socio-dramatic play, games and rough

and tumble play. In free play there are no external goals, it is just for fun, and flexible and indeed the students actively gain mathematical skills. Guided play, Child-centered is a two-way approach which involves both teacher and students. It allows students to choose their demands, choices and it is a learning of their own environment (Fisher, 2012). By repeating the practice of solving the problems through playing the different tasks leads them to solve the real-life tasks playfully.

EDUCATIONAL IMPLICATION

Materials provided to students enable them with the chance of touching the objects which help to realize the object through the sense of touching. Teachers can provide the children with visual impairment in primary classes which will be reflected in their higher studies. Teachers should mould them into critical thinkers to make a decision on their own. Mathematical concepts help them to be self-paced in their life. Sound in basic concepts makes the students enjoy mathematics in their career. Practices gained from apt materials will help them to develop the necessary skills which will be used in their life situations. Curriculum designers have to prepare books for them with activities which connect them to handle the real-world situations.

REFERENCES

- Buton, M. D. (2015). *The history of mathematics an introduction*. (7 th ed.). McGraw Hill.
- Emerson, R., & Anderson, D. (2018). Using description to convey mathematics content in visual images to students who are visually impaired. *Journal of Visual Impairment & Blindness*, 112(2), 157–168.
- Fisher, R. K., Pasek, H. K., & Golinkoff, M. R. (2012). *Fostering mathematical thinking through playful learning*. Contemporary debates on child development and education.
- Godino, D. J. (1996). *Mathematical concepts their meanings and understanding*.
https://www.researchgate.net/publication/25327929/Mathematical_concepts_their_meanings_and_understanding1
- Johnson, N. & Brawand, A. (2016). Effective methods for delivering mathematics instruction to students with visual impairments. *Journal of Blindness Innovation and Research*, 6(1).
- Kumaryono, I. (2014). *The importance of mathematical power in mathematics learning*. International Conference on Mathematics, Science and Education, Semarang state university.

- Lince, R. (2016). Creative thinking ability to increase student mathematical of junior high school by applying models heads together. *Journal of Education and Practice*, 7(6).
- Rigelman, R. N. (2007). Fostering mathematical thinking and problem solving: the teacher's role. *Teaching children mathematics*, 13(6), 308-314. doi: 10.5951/TCM.13.6.0308
- Scusa, T. (2008). Five process of mathematical thinking. *Summative projects for MA degree*, 38. <https://digitalcommons.unl.edu/mathmidsummativem38>
- Syafril, S., Aini1, N. R., Netriwati, Pahrudin, A., Yaumas, N. E. & Engkizar. (2019). *Journal of Physics: Conference Series*, Young Scholar Symposium on Science Education and Environment. Indonesia.
- Tularam, A.G. (2018). Vedas and the development of arithmetic and algebra. *Journal of Mathematics and Statistics*, 6(4), 468-480.
- Winteler, M. (2000). Albert Einstein, a biographical sketch. *Sprinker Link*, 5, 111-120. doi: <https://doi.org/10.1007/BFD2837913>

IMPACT OF ACTION RESEARCH ON THE PROFESSIONAL DEVELOPMENT OF BIOLOGY TEACHERS

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ABSTRACT

Educational renewal is necessary for the development of human resources (HR) so that they can compete in the Millennium Development Goals that have been proclaimed by the government. The choice of teaching method exerts a significant influence on developing different types of knowledge and skills. The mode of assessment of learning outcomes is also a strong driving force. The process of engaging in AR for Professional development is explored through a pragmatic lens, insisting on treating research as a human experience based on the beliefs and actions of practitioners. To improve learning and classroom instructions, educators can conduct studies in the classrooms and schools for determining the effectiveness of instructional techniques and curricula. Action Research in the Pedagogy content knowledge in the biology teachers helps the teachers spotlight their capacity as learners, including the corresponding learning processes. It enables the teachers to better the quality of overall teaching. So the present study focuses on the impact of action research on the professional development of Biology teachers. The Pedagogy Content Knowledge (PCK) discussion also pushes teachers into the spotlight in their own capacity as learners, including the corresponding learning processes. The consideration is raised that such teacher learning is the key to bettering the quality of overall teaching.

Keywords: Instructional techniques, Pedagogy Content Knowledge (PCK), Professional development, Classroom instruction

INTRODUCTION

Action Research differs from traditional scientific research in its purpose, it focuses and its methods. The teacher is the key to the qualitative improvement of education systems. Understanding the process of science teachers professional development has become one of the principal themes in the agenda of science educational research (Grila,P.D.,etal. 2011). Professional development was considered to be any intentional sustained activity in which teachers engaged for the express purpose of improving their knowledge and skills to teach students science (Banilower, Boyd, Pasley, & Weiss, 2006). Action research has been used in both preservice and Inservice science teacher education, and as a way for teachers to collaborate with one another to improve practice. Teacher-based action research is a reflective study undertaken by a group of teachers for the purpose of helping them both to improve their teaching and to gain a richer understanding of that teaching . Constructivist-base programmes for the professional development of teachers have evolved from initial conceptual change by substitution through competition towards more gradual change. In addition, doing action research can help improve the teacher's self-esteem. Documented action research can be one source of solving problem.

INQUIRY BASED LEARNING IN SCIENCE TEACHING LEARNING

Action research has been utilized in three domains of science education: teacher education and professional development; research on science learning; and curriculum development and implementation. In all cases teachers are in the role of researcher, either studying their own methods of instruction and assessment; examining the cognitive processes of learning; or participating in the process of curriculum research and development.. The attitude towards the course, there are some difficulties experienced in its implementation. Lack of time, teacher beliefs, insufficient materials, pedagogical deficiencies, lack of motivation, administrative problems, crowded classrooms and safety problems constitute an impediment for the implementation of inquiry-based learning activities (Cheung, 2011). Inquiry learning is a learner-centred pedagogy in which students play an active part in the process of knowledge discovery or acquisition. Prospective teachers designed, conducted, and presented research projects, used reflective journals as research notebooks, and participated in seminars. The process was found to help participants focus more on student conceptions and explanations, important aspects of teaching for conceptual change (Bergendahl, V.C.B.2007). The process of structuring the educational initiative and its assimilation and the research

surrounding it reflect high order thinking processes during which the teacher identifies the need for the change and the essence of what should be changed. This is based on educated mapping of the needs of the school system, on mapping the existing and desired state of affairs, and on identifying an area for an educational initiative that will be linked to an area that is significant to the teacher himself (Hoekstra & Korthagen, 2011).

ACTION RESEARCH IN PROFESSIONAL DEVELOPMENT OF TEACHERS

Classroom action research can be considered a viable means for professional development for several reasons. Classroom action research allows for maximum accountability in terms of addressing variable contexts and student differences. Teachers in urban settings face the extra challenges of high student mobility, language barriers, generational poverty and the effects of violent crime on students. Moll (1990) suggested that teachers should seek out and integrate into classroom practice learning strategies uniquely situated within the cultures of their students. He termed these cultural resources funds of knowledge. The practical and cyclical nature of classroom action research may be one way that teachers may systematically connect to the specific learning needs and potential of the students. There is a high level of teacher engagement in professional development enacted as classroom action research because the teacher initiates the research question. Teachers who choose to participate in classroom action research report feelings of empowerment and increased efficacy to help their students achieve (van Zee, Lay & Roberts, 2003). In light of the negative view that the public media portrays urban teachers, professional development that foregrounds teacher practical knowledge may be viewed as a refreshing morale booster.

- It enables teachers to systematically examine an aspect of their teaching.
- It helps to collect information and evidence about a situation.
- Enact a changed aspect of practice.
- Evaluate and analyse the information in order to review whether the situation has improved or not and the use the fresh evidence to substantiate the changed practice. (McGregor & Cartwright, 2011).

ACTION RESEARCH IN TEACHING

According to Shulman (1986), the professional development focused on increasing teacher learning frequently is based on teacher content knowledge, subject content knowledge, curricular content knowledge, and pedagogical content knowledge. It focused on

transforming national and state standards into measurable student learning. Many districts have adopted the policy of developing SMART (Specific, Measurable, Attainable, Results-oriented, and Time-bound) goals to link teacher knowledge, curriculum standards and student conceptual understanding (Kelleher, 2003). Effective teacher professional development must lead to improved student achievement. Measuring the effectiveness of professional development cannot be based upon the “happiness quotient- how satisfied teachers are with a particular workshop- but rather what effect professional development will have on student learning” (Kelleher, 2003).

- AR helps to assess biology teachers’ current evolution teaching practices and their Professional Development needs.
- Based on their current practice, teachers may have differing PD needs.
- e -content assessment items to assess teachers’ content knowledge and uncover their misconceptions, including nature of science misconceptions.
- Emphasis phylogenetics and developing students’ tree thinking skills.
- Emphasis the need to teach macroevolution and explore instructional materials for teaching macroevolution.
- Help teachers develop a rationale for teaching evolution as a theme in their biology courses and explore what this means.
- Working in small groups, teacher could brainstorm evolution connections across the curriculum and develop short evolution connection materials to share with each other.
- Provide teachers with supplemental materials, labs and resources for teaching evolution, and allow time to explore these materials. Consider forming study groups in which teachers explore various evolution education materials.
- Promote the exploration and classroom use of excellent webbased evolution education resources, such as the Understanding Evolution website.
- In developing PD workshops for biology teachers teaching evolution, place a greater emphasis on investigations using real data and/ or live organisms, current evolution research, contemporary evolution examples, evolution simulations, and common student misconceptions related to evolution.

BIOLOGY TEACHER LEARNING AND INSTRUCTIONAL IMPROVEMENT

- Action research provides avenue for teacher learning.

- It helps teachers to appreciate their own ability to increase knowledge through their own projects (Johnson & Buttons 2000).
- It teaches the opportunities to identify changes they need to make their teaching practices by providing teachers the framework to build their own classroom projects (Sax & Fisher, 2001).
- The teacher designs their own action research projects, they use a systematic approach to ascertain answers to instructional questions or issues.
- The quality of the biology teachers can be improved by changes in this pedagogy, changes in their thinking, and confidence leads to professional growth and improvement.
- Teachers learning occur in numerous ways including new strategies, evaluating programs, expanding instructional repertoires and engaging in professional development (Hensen, 1996).

ACTION RESEARCH ADVANTAGES FOR TEACHERS

The following are the few advantages of action research for teachers

- It encourages critical observation and self-examination; This procedure helps teachers to foster self-belief and to recognize their own abilities and potential.
- This process derives them to develop their self-efficacy; It promotes the forming of a future perception of the teachers based on intensifying the practical and theoretical knowledge.
- Integrating AR in the educational system contributes to the teachers in their classes' to the team partnership and to the school system.
- It promotes the professional development of in-service teachers in the field.
- It is important to use action research as a permanent component in teachers' training, as a tool for in-service teachers.
- It is also important to use action research as a permanent component in the professional development of in-service teachers in order to improve existing and desired processes.
- It is important to use the action research as a tool for realizing the teaching vision with a face to the future (Nachshon, M., Rom, A. 2020).

CONCLUSION

Action research process is an effective professional process that impacts on teaching – learning process. It leads to the improvement in educational practices. It can empower teachers to change by pushing a teacher out of their comfort zone. This leads to the empowerment of teachers and allows teachers to implement instructional programs which help to meet the needs of their students. It helps to develop other attitudes in view of their own teaching approach and the necessity of innovation and translated these into action with self-confidence. Thus, action research plays a significant role in molding the biology teachers in the teaching profession

REFERENCES

- Cheung, D. (2011). Teacher Beliefs about Implementing Guided-Inquiry Laboratory Experiments for Secondary School Chemistry. *Journal of Chemical Education*, 88(11), 1462-1468. doi: 10.1021/ed1008409
- Christina,V.,&Bergendahl,B. (2003). Action Research as a Means of Professional Development: reflections on research and action in university chemistry education *Journal of In-service Education*, 29 (3), 363-374.
- McGregor, D. & Gunter, B. (2001) ‘The CASE for technicians’, *School Science Review*, 82, (30),103–108.
- Michal Nachshon,M., & Amira Rom,A.(2020). The methodology of Action Research (AR) and the impact on teachers' professional development. *Education and new developments*.324-328.
- Henson,K.T.(1996). *Teachers as researchers: Handbook of Research on teacher education*. (2nd ed). Macmillan.
- Sax,C.,& Fisher,D.(2001). Using aualitative action research to effect change:Implicatins for professional education. *Teacher Education* .28(2),71-80.
- <https://www.tandfonline.com/doi/pdf/10.1080/13674580300200223>
- <https://www.ericdigests.org/2003-1/action.htm>
- https://www.researchgate.net/publication/304348594_The_impact_of_action_research_on_teachers'_continuous_professional_development.
- https://www.researchgate.net/publication/234749663_Action_Research_A_Tool_for_Improving_Teacher_Quality_and_Classroom_Practice.
- <https://files.eric.ed.gov/fulltext/EJ1110254.pdf>

COVID-19: IMPACT OF TECHNOLOGY ON ONLINE LEARNING

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ABSTRACT

This paper tends to explore the effect of technology in the education field. Technology in 21st century is a great boon to the world especially to education. With the help of technology everyone can import knowledge to every corner of the world. And in this century during this pandemic, Technology helps the educator to educate their students. Using technology in the class room makes the students understand the concept clearly with their visual effects and the teacher to get the true satisfaction of importing knowledge of the students. The conventional way of teaching and learning text book are long lasting but the new way of teaching and learning through technology is being updated up to date. Technology in education has it own positive and negative impact of students. Online education serves as the positive mode of learning especially in this pandemic situation. When everyone not supposed to meet anyone else personally each and every one communicates and teach them education through online mode. Everyone have the advantage that have the positive way of sharing knowledge and maintain clear record and learn at any distance. Students are much interested and motivated and the method of learning through online, but it has own negative side of creating some problems in physical, and mental health. Students face many problems in online learning. So, Action research is used to improve the educational practise in class room.

Key Words: Technology, Education, Class room, Online learning, Action research.

The twenty-first century is frequently referred to as the technological era. Technology now plays a significant part in our lives. Distances are no longer a barrier, and education may be brought to the student's doorstep thanks to technology. The impact of technology can be felt in almost any industry, and education is one of them. Education, in its broadest sense, is a

type of learning in which a group of people's knowledge, abilities, and habits are passed down from generation to generation through teaching, training, and research. (Budhwar, 2017). Technology has four purposes in the field of education: it is used as part of the curriculum, as an instructional delivery method, as a means of assisting with instructions, and as a tool to enhance the entire learning process (Raja, 2018).

TECHNOLOGY IN CLASSROOM

One of the most significant contributions of technology using technology in the classroom improves not only teaching but also students' learning. Students' involvement and attention are increased when technology is employed in the classroom, which helps them stay focused and understand subjects. When teachers use technology to teach their students, the rate of retention improves, allowing them to retain material for longer period of time. This is helpful for both the student's and the teachers' development. Using technology in the classroom makes learning even more enjoyable since students learn more when they interact with pictures. It has been proven that when interacting with visuals, the human mind understands even more swiftly.

IMPACT OF TECHNOLOGY IN CLASSROOM

The impact of technology can be felt in almost any industry, and education is one of them (Raja,. 2018). It will assist students in preparing for future occupations that will require them to use wireless technology. Technology integration in the classroom is a fantastic approach to cater to a wide range of learning styles. It encourages collaboration, which allows pupils to interact more with their classmates. Teachers may use technology to help pupils prepare for the real world. Integrating technology into education encourages students to become more interested in learning because they are thrilled about the prospect of being able to use technology and thus are more likely to study. In the classroom, mobile technology is available, allowing students to access the most up-to-date material faster and more easily than ever before. With technology in the classroom, the typical passive learning attitude is disrupted, and the teacher takes on the roles of encourager, consultant, and coach. Students can use digital textbooks, which are continually updated and are often more vivid, useful, and imaginative than the traditional bulky volumes.

POSITIVE AND NEGATIVE IMPACT OF TECHNOLOGY ON EDUCATION

Because of the rapid advancement of technology in the field of education, the way knowledge is delivered and the ability to learn new things has changed as well. Technology has both positive and negative effects. Technology has a good impact on education, but it can also have detrimental consequences. Teachers and students should seize this opportunity in a positive perspective and reduce the barriers that are preventing many kids and schools from attaining excellence. As a result, it is past time for each country to implement a more technologically advanced education system in the future. (Raja, 2018).

(I) Beneficial Impact of Technology Learning

The impact of technology on student learning expectations and outcomes is good. Technology integration is also growing increasingly widespread in both public and private schools, according to evidence. Technology integration has been proved to be useful for children of all ages, as well as for students with particular learning needs. (Costley, 2014). Technological integration provides the following advantages: 1) Enhanced student motivation, 2) Increased student engagement, 3) Increased student collaboration, 4) Increased hands-on learning opportunities, 5) provides for learning at all levels, 6) Increased student confidence, and 7) Increased technical skills.

Easy access to study materials: E-books, revision guides, and past examination papers are all available on the internet, and students can use them to expand their knowledge base.

Continuous learning: - With the use of information technology in education, students can continue to learn regardless of where they are, including at home. As a result of this, the efficiency of the education sector has substantially improved.

Knowledge sharing: - Students from all over the world may get together and share their experiences; geographical distances are no longer a barrier, and this is only possible because of technological advancements.

Learning aids: - We can give some practical component to the theory taught in class by using audio and video materials, and students can gain a deeper comprehension of the topics being taught.

Distance learning: It is now feasible to attend a college in another country without ever leaving y native country and earn at own pace. Anyone can obtain a second degree or other certificates by taking online courses. Online education has become a realistic and appealing choice for corporate professionals, stay-at-home parents, and other similar demographics as a result of these demands. Aside from flexibility and accessibility, distance learning has become more appealing due to a variety of other benefits, such as programme choice and time efficiency (Wladis et al., 2015). As a growing number of students seek online education, computer-assisted learning is transforming the pedagogical environment. Colleges and universities are already extolling the benefits of Web-based education and are quickly establishing online classes to satisfy the demands of students all around the world. Increases in the number of online courses offered by colleges have been rather considerable over the previous couple of years. (Lundberg et al., 2008).

Keeping accurate records: - Unlike in the past, when records were kept manually and there were numerous incidents of lost files, the use of information technology in education has made safe and proper record keeping possible.

(ii) Negative Impact of Technology on Education

In the sphere of education, technology has made teaching and learning a lot easier, but on the other hand, excessive use of technology has had a negative impact on our physical and mental health in some circumstances. Let us now turn our attention to the detrimental effects of technology on education. Excessive usage of technology has a negative impact on pupils' health. Technology has an impact on both physical and mental health.

Physical Problems: Obesity, Reduction in blood circulation, Backbone that is curved, Body posture is poor, Headache, Poor vision,

Mental problems: Distraction, Depression, Anxiety.

ESSENTIAL OF UTILIZE EDUCATION DURING PANDEMIC

In today's world, facilities such as the internet are available in every home. In the time of Corona, online schooling is proving to be quite efficient. Nowadays, whether in a village or a city, online education is become increasingly popular. Today's students are benefiting greatly from online education. Education and educational systems all across the world have been

adversely impacted by the pandemic. In an effort to mitigate the effects of Corona, educational institutions around the world were temporarily closed. Due to school closures, 1.077 billion students have been impacted. The most pressing concern now is: how do pupils obtain education? For many large enterprises, there is just one solution: online education. Online education is achieved in part through the use of computers and in part through the use of the internet. For online education, computers and a variety of other devices are used. However, the internet's quality must be good for this, and we must pay attention to this. Although there is no such thing as lockdown, a deadly disease like corona persists. As a result, online education is preferred by schools, college and universities. During the Covid-19 shutdown phase, online learning is advocated for the following reasons. One can gain information while remaining socially isolated by staying at home. Due to social isolation, the spread of Covid-19 can be kept to a minimum. It provides excellent learning conditions. It provides students with additional interactive support that allows them to learn at their own speed and at any time. Online learning allows us more flexibility in scheduling. It may be accessed from any location with an internet connection, and students can use their own devices to participate (mobile, computers, tablets, etc.). Deals with student monitoring and reporting in real time. Improves the institution's image by providing technical solutions that address real-world issues" (Jena, P.K.2020).

ISSUES IN ONLINE CLASSES

Internet Abuse: The most serious drawback of the internet is that, regardless of their financial situation, parents must provide their children with mobile phones, laptop and computers. However, whether or not the youngsters are receiving sufficient instruction from them, they are completely unaware of these issues. Children, on the other hand, take advantage of this and begin playing games in it. Alternatively, they may open the incorrect items, which are not appropriate for them.

Lack of harmony between teacher and student: The absence of harmony between the teacher and the students is another downside of online education. In traditional school, if a student did not grasp something, they would discuss the teacher in class. However, with online education, teachers are unable to communicate concepts to students, and students are unable to comprehend and remain compatible with both topics.

Online education causes physical harm: Due to the use of online education, both teachers and students are experiencing physical difficulties. When a student engages in online education for a period of 6-8 hours, the light from a computer or laptop screen has a negative impact on their eyes. As a result, their skin and bodies become dull, which is physically harmful.

Lack of focus: When a student is unable to devote adequate attention to their studies while attending school, where devote adequate attention in online education? He/she is free of the fear that many students experience while in school. In online education, students frequently abandon their lessons in the middle, which is incorrect. It's difficult to make online education accessible to everyone. It's possible that online education isn't for everyone. Where can a person supply computer, cell phone, and laptop facilities for their children. As a result, children from low-income households are unable to advance in their schooling and are compelled to remain at home.

Many students do not have the high bandwidth or robust internet connection required for online courses, and as a result, they fall behind in their virtual lessons. The absence of computer knowledge is a big concern in today's world. Because online courses need a significant amount of time and effort, time management is a difficult problem. Self-motivation is critical for E-Learning, yet many online learners, to their surprise, lack it. Sometimes there are compatibility issues (with operating systems, browsers, or cell phones), the courses never get off the ground, or the student is unsure how to proceed. Versatility frequently leads to action. The student has not accessed or completed the course on the training platform despite the passage of time. Students may become unhappy due to a lack of human interaction, the absence of a teacher, and the inability to discuss it with their peers. Many online courses overlook this section in favour of focusing on theoretical material and external teachings. Students find it difficult to transition from traditional classroom learning to online learning right away. Due to the sudden change, they are unable to adjust to commuter-based learning. Students lose hope when they experience obstacles in online learning. Learning from home is a great experience; things are different at home. However, with online learning, even minor disruptions at home can quickly cause pupils to become confused. Learners who are enrolled in online classes often lack effective communication skills. Some students may not find dedication in this programme as compared to a traditional one. Many educators are dealing with technology challenges that are unavoidable and might

be stressful. They become powerless if there are any technological errors during the live session or while dealing with pupils.

CLASSROOM ACTION RESEARCH

Action Research is a process in which educators examine their own practice systematically and carefully using the techniques of research. Participants design a research question, collect data throughout the year, analyze what they have learned, and write about their findings. Observations, interviews, surveys and journals are typical data methods that participants use to investigate their questions.”(Khasinah, 2013). Action research is an investigation that is carried out in order to better understand, assess, and modify educational practises (Bass1998). It's vital to separate the potential aims of action research in the classroom as one of many methods to educational research. The process of action research is used to improve educational practise. Its methods include taking action, evaluating it, and reflecting on it. It is a method of gathering evidence in order to make changes in procedures. Individuals with a common goal conduct action research, which is participatory. Action research is centred on the scenario and context. Based on the interpretations offered by participants, action research produces reflection methods. Action and application are the means through which knowledge is created. If the solution to the problem leads to an improvement in practise, action research can be based on problem solving. Action research is iterative; plans are developed, implemented, revised, and implemented again, allowing for a continuous cycle of reflection and revision. (Clark, S. et al., 2020). Cycle of Action Research: 1. Determine the source of the problem 2. Data collection and organisation 3. Data interpretation 4. Data-driven action 5. Introspection. (Koshy, 2010)

Education plays an important role in the development of every human being. Technology is a great boon to the human being. Both the education and Technology facilitate the learning processes easily. E-learning is the one of the recent technologies for learning. Before COVID-19 pandemic very few schools only take their class in online, but after the corona pandemic each and every institution comes under the online mode of learning, every institution prefers online mode to continue the education. Through this everyone gain knowledge but also students faced some physical and mental process. Online education has both benefits and drawbacks, but the most essential thing is to receive an education. Before corona pandemic many classrooms action research were conducted to solve the problem of

students to enhance teaching. Very few action research has been conducted for online learning in order to improve the study, teaches have to be motivated to conduct action research while taking class through online mode.

REFERENCES

- Budhwar, k. (2017). The Role of technology in Education. *International Journal of Engineering Applied Sciences and Technology*, 2(8).
- Clark, S., Porath, S., Thiele, J., & Jobe, M. (2020). *Action Research*. New prairie press.
- Costley, K.C. (2014). *The Positive Effects of Technology on Teaching and Student Learning*. PHI learning.
- Devi, B. (2020). Importance of Online Education
<https://timesofindia.indiatimes.com/readersblog/personal-blog/importance-of-online-education-36962/>
- Jena, P. K. (2020). Online Learning during lockdown Period for Covid 19 In India. *International Journal on Multi Dicipilinary Educational Research*. 9(8).
- Lundberg, J., Merino, D.C. & Dahmani, M. (2008). Do online students perform better than face-to-face students? Reflections and a short review of some Empirical Findings. *Rev. Univ. Soc. Conocim*. 5, 35–44. doi: 10.7238/rusc.v5i1.326
- Raja, R. & Nagasubramani, P. C. (2018). Impact of Modern Technology in Education. *Journal of Applied and Advanced Research*. 3(1).33.
<https://www.researchgate.net/publication/325086709-impact-of-modern-technology-in-education>. doi:10.21839/jaar.2018.v3iS1.165
- Saminathan, V. (2020). Problems of Online Classes. *International Journal of Academic Research Reflector*, 9. <http://dx.doi.org/10.6084/m9.figshare.13573550>
- Wladis, C., Conway, K. M., and Hachey, A. C. (2015). *The online STEM classroom-who succeeds? An exploration of the impact of ethnicity, gender, and non-traditional student characteristics in the community college context*, 142–164. doi: 10.1177/0091552115571729
- Positive and Negative Impact of Technology in Education.
<https://techbaji.com/positivenegative-impact-of-technology-on-education/>

TEACHERS AS ACTION RESEARCHERS FOR CONTINUOUS PROFESSIONAL DEVELOPMENT (CDP)

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ABSTRACT

The quality of education in a country rest on school communities as a whole. However, the real implementers of innovations and changes in curriculum are teachers. Teachers are the ones most often held accountable for successes and failures in educating Pupil. The way to facilitate teachers in handling challenges and keeping up with curriculum renewals is through constant support in the form of continuing professional development with the help of action research. Action research as continuing professional development has been viewed as a critical platform for change, which is the outcome of teachers' ability and autonomy to lead in making advanced decisions about their own practices. The importance of action research to teacher practitioners and school leaders, and in providing an identity to the action research approaches conducted in the historical trail of action research presents a window into the nature of continuing professional development concerns of each country, as well as the successes and challenges of conducting action research as continuing professional development for sustained impact.

Keywords : action research, reflection practice, continuous professional development, teacher.

INTRODUCTION

Educational research is to engage in disciplined inquiry to generate knowledge on topics significant to the students, teachers, administrators, schools, and other educational stakeholders. The approach to research will be shaped by context, professional identity, and paradigm (set of beliefs and assumptions that guide your inquiry). Action research represents an extension of the reflection and critical self-reflection that an educator employs on a daily

basis in their classroom. When students are actively engaged in learning, the classroom can be dynamic and uncertain, demanding the constant attention of the educator. Considering these demands, educators are often only able to engage in reflection that is fleeting, and for the purpose of accommodation, modification, or formative assessment. Action research offers one path to more deliberate, substantial, and critical reflection that can be documented and analyzed to improve an educator's practice.

WHAT IS ACTION RESEARCH?

There are many ways to conduct research. All the ways is used in various professional fields, including psychology, sociology, social work, medicine, nursing, education and so on. However, the field of education often uses **action research**, an interactive method of collecting information that's used to explore topics of teaching, curriculum development and student behavior in the classroom.

There are many methods for teaching in the classroom, but action research works very well because the cycle offers opportunity for continued reflection. In all professional fields, the goal of action research is to improve processes. Action research is also beneficial in areas of teaching practice that need to be explored or settings in which continued improvement is the focus.

THE CYCLE OF ACTION RESEARCH

As you can see, the process first starts with **identifying a problem**. Then, you must **devise a plan** and **implement the plan**. This is the part of the process where the action is taking place. After you implement the plan, you will **observe** how the process is working or not working. After you've had time to observe the situation, the entire process of action research is **reflected upon**.

METHODS OF ACTION RESEARCH

There are many methods to conducting action research. Some of the methods include:

- Observing individuals or groups
- Using audio and video tape recording
- Using structured or semi-structured interviews
- Taking field notes

- Using or taking photography
- Distributing surveys or questionnaires

Researchers can also use more than one of the methods above to assist them in collecting rich and meaningful data.

While there are various methods to conducting action research, there are also various types of action research in the fields of education, including individual action research, collaborative action research and school-wide action research. For example:

- **Individual action research** involves working independently on a project, such as an elementary school teacher conducting her own, in-class research project with her students.
- **Collaborative action research** involves a group of teachers or researchers working together to explore a problem that might be present beyond a single classroom, perhaps at the departmental level or an entire grade level.
- **School-wide action research** generally focuses on issues present throughout an entire school or across the district. Teams of staff members would work together using school-wide action research. As you can see, action research can be used in many educational settings.

There are two examples of action research being used in the field of education. The first example discusses observation as the method of choice for collecting data in the classroom. The second example discusses using surveys as the method of choice for collecting data. The cycle of action research is emphasized in each of the examples.

REFLECTION AND THE PROCESS OF ACTION RESEARCH

When an individual engages in reflection on their actions or experiences, it is typically for the purpose of better understanding those experiences. The consequences of those actions are to improve related action and experiences in the future. Reflection in this way develops knowledge around these actions and experiences to help us better and to regulate those actions in the future. The reflective process generates newer knowledge continuously for classroom teachers and informs their classroom actions.

The knowledge generated by educators through the reflective process is not always prioritized among the other sources of knowledge educators are expected to utilize in the classroom. Educators are expected to draw upon formal types of knowledge, such as textbooks, content standards, teaching standards, curriculum and behavioral programs, etc., to gain new knowledge and make decisions in the classroom. All these forms of knowledge are important for the reflective knowledge that educators generate through their pedagogy is the amalgamation of these types of knowledge enacted in the classroom. Therefore, reflective knowledge is uniquely developed based on the action and implementation of an educator's pedagogy in the classroom. Action research offers a way to formalize the knowledge generated by educators so that it can be utilized and disseminated throughout the teaching profession.

Action research generates knowledge around inquiry in practical educational contexts and it allows educators to learn through their actions with the purpose of developing personally or professionally. Due to its participatory nature, the process of action research is also distinct in educational research. There are many models of action research process takes shape. A few of the action research process are listed down. Plan a change;

- Take action to enact the change;
- Observe the process and consequences of the change;
- Reflect on the process and consequences;
- Act, observe, & reflect again and so on.

It is important to prioritize the flexibility of the process, and encourage to only using these models as basic guides for process. Your process may look similar, or you may diverge from these models as you better understand your students, context, and data.

A JOINT REFLECTION

This paper described three examples applying Action Research to education. All three have a completely different character. The first was an **interactive course design**, which successfully qualified experienced teachers to use Action Research in innovating and reflecting upon new practices in their own individual school environments. It also taught them the skills necessary to become innovative leaders with the ability to inform their school colleagues and to implement Action Research beyond their own classrooms. The second

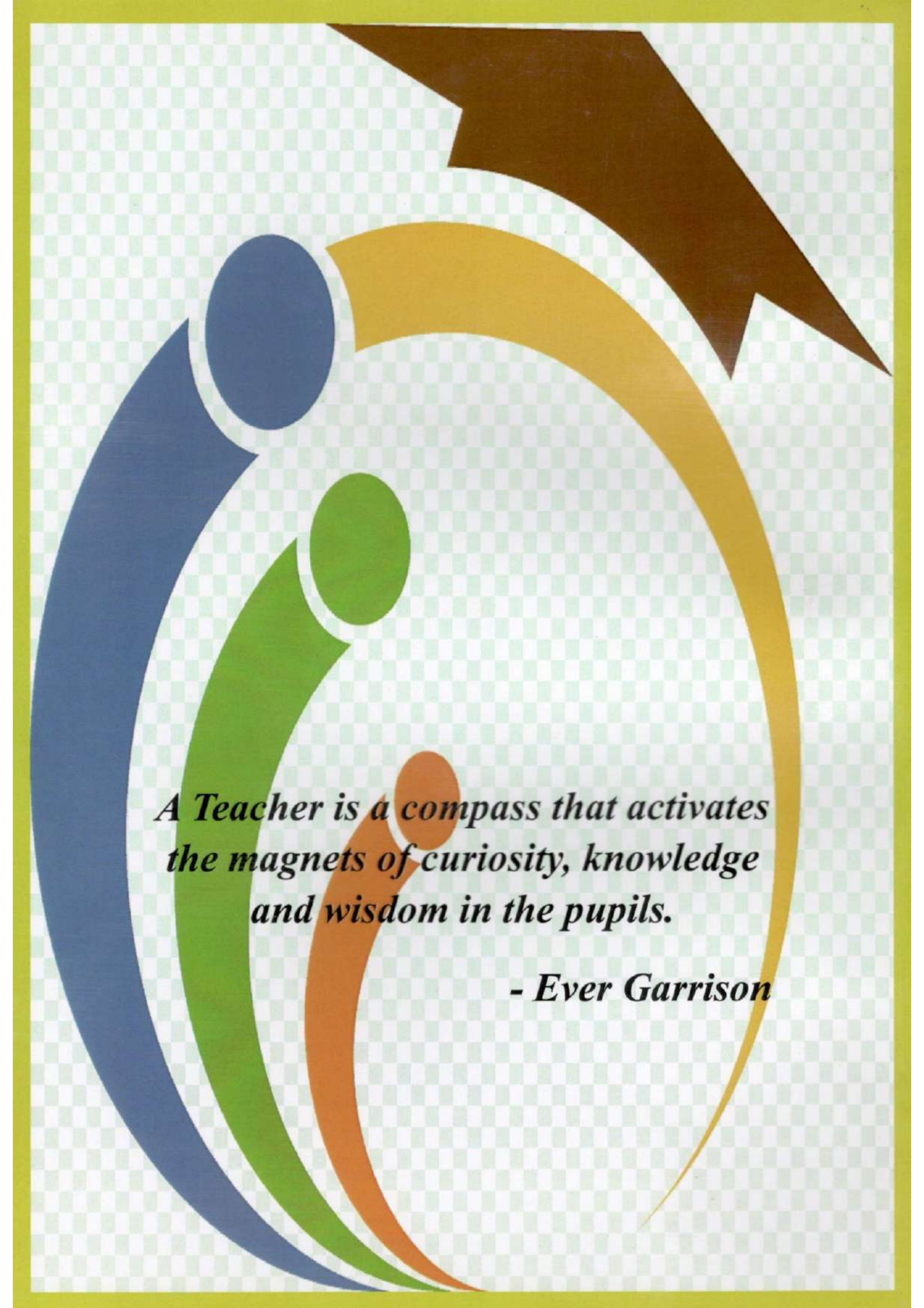
project created a **network of teachers** from different schools, accompanied by a university science educator. This group learned how to develop and research innovative curricula and methodological approaches in chemistry education with the goal of generating both curricular structures and teaching materials which could be widely disseminated. It also contributed to changing individual teaching practices and to promoting teachers' ongoing professional development via the Action Research process. Within the third project teams of teachers **developed cross curricular science labs**. In a whole school approach these teachers negotiated with colleagues and the head teachers which changes necessary in the curriculum eventually should be accepted by other subject groups (i.e. languages, humanities). The ongoing reflection and reporting as well as the exchange among teachers from different schools turned out to be very supportive to overcome obstacles at their own schools. This was made possible by networks on a local (school district) and regional level involving not only teachers but also local school authorities, teacher education and research institutions as well as businesses. In terms of reflection and documentation so called "writing workshops" offering three days of intensive reflection, writing and sharing were seen as very helpful. All three projects can be considered successful in their own individual ways.

CONCLUSION

Action research is a form of research where teachers learn to improve their practice and improving the understanding of their practice. It is a more systematic and collaborative process. Action research has become common as a form of in-service training. Teachers are empowered to examine their own teaching practices rather than receiving outside in-service training that may or may not be of value to the teachers. Action research support teachers in studying their teaching practice and to actually take action to improve what they are doing in their classrooms. Teachers should certainly use theoretical research to help in their understanding of what occurs in their classrooms. The action research cycle relies on teachers developing a focus for study in their classrooms or their schools. Teachers must plan out an area of interest or concern in their practice. They certainly should receive feedback and advice from their mentors/supervisors, but they need to learn and embrace the concept that they must assume personal responsibility for improving their own practice. The long-term goal of such a process is to not only improve teachers' practices and their understanding of their practices but to also build self-efficacy in preservice candidates' teaching.

REFERENCES

- Anderson, G., Herr, K., & Nihlem, A. (1994). *Studying your own school: An educator's guide to qualitative practitioner's research*. Thousand Oaks, CA: Corwin Press.
- Cochran-Smith, M., & Lytle, S.L. (1999). *The teacher research movement: A decade later*. *Educational Researcher*, 28(7), 15-25.
- Darling-Hammond, L. (2006). Constructing twenty-first century teacher education. *Journal of Teacher Education*, 57(3), 300-314.
- Elder, L., & Paul, R. (2007). *The thinker's guide to analytic thinking: How to take thinking apart and what to look for when you do*. Dillon Beach, CA: The Foundation for Critical Thinking.
- Fairbanks, C.M., & LaGrone, D. (2006). Learning together: Constructing knowledge in a teacher research group. *Teacher Education Quarterly*, 33(3), 7-25.
- Geertz, C. (1973). *The interpretation of cultures*. Basic Books.
- Glaser, B.G., & Strauss, A.L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago, IL: Aldine.
- Henn, M., Weinstein, M., & Foard, N. (2006). *A short introduction to social research*. Sage Publications.
- Shaik,S.Abdullah, Suppiah, K. Shanmugam & Chinnappan.M .(2020). *Action Research as Continuous Professional Development in Southeast Asia*.
<https://doi.org/10.1093/acrefore/9780190264093.013.699>
- Shanks, J. Miller, A& Rosendale, S. (2012). Action Research in a Professional Development School Setting to Support Teacher Candidate Self-Efficacy, *SRATE Journal*, 21(2), 26-32.
- Taylor, S.J., & Bogdan, R. (1984). *Introduction to qualitative research methods: The search for meanings*, (2nd ed.) .John Wiley & Sons.
- Whitehead, J. (2000). How do I improve my practice? Creating and legitimating an epistemology of practice. *Reflective Practice*, 1(1), 91-104.
- Zeichner, K. (2007). Accumulating knowledge across self-studies in teacher education. *Journal of Teacher Education*, 58(1), 36-46.



*A Teacher is a compass that activates
the magnets of curiosity, knowledge
and wisdom in the pupils.*

- Ever Garrison