Eth. J. Indig. Know. Appl. Sci.
Vol. 1, No. 1, 2023, 26-36

Ethiopian Journal of Indigenous Knowledge and Applied Sciences

Teachers' Perception on Integrating Real Problems in the Teaching of Mathematics

Gizachew Kefelew Hailu*, Teferi Getachew, Hailemicheal Lemma, Endris Yimam, Birhanu Baye

Department of Mathematics, College of Natural Science, Debre Berhan University, Ethiopia

[3]College of Education, Debre Berhan University, Ethiopia

Abstract

Integrating real problems in the teaching of mathematics is an important and effective way to engage students in the learning process. The problems can also help students think critically and solve problems in problem solving mindset. However, most teachers employ lecture methods without creating problem based teaching environment. This study evaluates the appropriateness of integrating real problems in the teaching of mathematics from the perspective of teachers. The study involves six higher institutions in Ethiopia selected by purposive and stratified random sampling techniques. Yamane's formula was used to select seventy teachers who constituted the sample and were proportionately taken from the institutions. A validated, self-administered questionnaire that includes 18 questions to be answered on a likert-type scale and interview were used. Statistical analysis for quantitative data was performed using Statistical Package for Social Science-version 25 software and narrative interview analysis was used for the qualitative data. The findings revealed that teachers' perception toward integrating real problems in the teaching of mathematics (IRPs) is favorable and it is conceived as an enviable tool. Further, teachers indicated that IRPs should be imminent after teaching the mathematical contents. However, the teachers were stranded from integrating ample real problems in the teaching of mathematics due to the absence of adequate real problems that are well integrated and relevant to students' context in the teaching/reference materials. Therefore, there is a need to further integrate real problems and make them more relevant to students' lives.

Keywords: Real-problems, perception, mathematical model, optimal learning

.

1. Introduction

One of the seven national standards for teachers outlined by the Ministry of Education in Ethiopia is to know the content and how to teach it. Teachers' perception on incorporating real problems plays a dominant role in determining how teachers perform and how successful they are likely to be in carrying out their professional tasks [1]. Perception is defined as an intuitive judgment in one's own frame of reference [2]. As most teachers do not sufficiently employ real life problems that make connection to students' area of study in a way that the students discover new and related conjectures by applying mathematical theory, there is a need to fathom the views of teachers towards incorporating real problems being an essential component to achieve educational goals [3].

The education and training policy of Ethiopia envisages university graduates to work collaboratively in demanding projects, effectively use technological tools and possess more flexible, creative, and future-oriented mathematical skills [4]. Besides, experiences of many teachers show that students experienced serious difficulties in grasping mathematical contents; however, they tend to work comfortably when they work with problems that do present some level of connection to reality. To make students believe that mathematics is a tool in another area of knowledge

*Corresponding author: kgizachewy@gmail.com.
Received: Nev10/2023, Revis**ed- Dec 11/2023, Accepted**: Jan 17/2023, **Published**: Feb 1/2023.

it requires a teaching approach that involves real life problems. In the United States, teachers often use mathematics in a very limited scope that mainly focuses on analytical skills without allowing students to develop their own ideas and use their personal life experiences [5]. Real life connection inspired students to discover the links existed between mathematical contents and real-life problems, making the discipline more meaningful and pragmatic[6]. Research shows that students view Mathematics, Engineering and Science as completely separate entities without realizing the links that exist between the curricula. To this end, integrating real problems in the teaching of mathematics could help in the formation of basic ideas [7].

The students were also seen hardly working together in groups and on problems outside classes. As might be expected, there is a positive correlation between total time allotted to mathematics and mathematics achievement. The researchers presumed the lack of sufficient real-problems in the teaching of mathematics and the traditional teaching method which is mainly characterized by teacher-oriented instruction attributed to students' underperformance and declining of motivation.

1.1. Motivation and Objectives of the Study

Consequently, instruction seemed to have been focusing on delivering contents inappropriately, and students tended to learn counterproductive conceptualization of the nature of mathematics.
In order to make proper amendments on the delivery of mathematical contents, this study was initiated to examine teachers' perception on how to create greater opportunity for the students to learn mathematical processes.
The main objective of the study was to examine teachers' perceptions on incorporating real problems in the teaching of mathematics. Specifically, the study attempted to achieve the following objectives:

- ✓ Eliciting the opinions of teachers about the use of real problems in the teaching of mathematics ,
- ✓ Evaluating teachers' view on IRPs in the teaching of mathematics to achieve optimal learning, and
- ✓ Reflecting perspectives of teachers about the integration and relevance of real problems in the text and reference books.

According to recognized issues of assessment and related literatures on the use of real problems in the teaching of mathematics, the study entitled "Teachers' perception on integrating real problems in the teaching of mathematics: A case of higher institutions in Ethiopia" aims to answer the following question.

How do teachers perceive the integration of real problems in the teaching of mathematics, particularly making teaching authentic through real problems, promoting students' optimal learning, the integration and relevance of real problems in the teaching materials and promote the interaction via IRPs?

1.2. Significance of the Study

The findings of the research can help teachers understand the disposition of teachers toward integrating real problems in the teaching of mathematics. The study may also help teachers shift teaching style from teacher-centered to student-centered teaching where students are required to actively seek knowledge and inform curriculum developers about the weaknesses in the present mathematics teaching approach. It will also assist them in finding solutions to problems associated with the teaching style of mathematics and identifying teachers' views that is one expedient way

- ☞ To bring about students' interest in studying mathematics in the fields of science and engineering,
- ☞ To instruct mathematics with real life problems and create the environment that encourages optimal learning,
- ☞ To develop the ability of learners to realizing the links that exist between mathematics and real-life situations, and
- ☞ To provide a blend of knowledge required for lifelong by providing a meaningful learning.

Lastly, it is to recommend a new approach of teaching mathematics for science and engineering students based on the findings of the research.

2. Literature review

Educators stress that real-world connections in teaching is important to increase students' interest and understanding of mathematics. Every person performs based on his or her own perceptions, and teachers are no exception. Teachers' perception on teaching with real problems plays a key role in determining how teachers perform and how successful they are likely to be in carrying out their professional tasks [8]. There is a need to benefit

from the views of teachers as it is one of the main essential components to achieve education goals.

Most teachers do not seem to challenge students by providing authentic problems that require great deal of emphasis to link mathematics with real life. This led to study on teachers' perception on the use of real problems that can meet the basic requirements to make teaching authentic.. To be consistently better in adapting new teaching styles, teachers' knowledge of teaching and learning styles will help both teachers and students to be consistently better at learning and adapting to future changes [9].

Problem solving means engaging in a task for which the solution method is not known in advance. In order to find a solution, students must draw on their knowledge, and through this process, they will often develop new mathematical understandings [10].

Without an in-depth understanding of mathematics, teachers would neither choose appropriate tasks for nurturing student problem-solving strategies, nor plan appropriate problem-based classroom activities [11].

The construct of mathematics knowledge during instruction is based on the underlying concepts in a problem and may be able to make connections to more abstract ways of representing the problem using concrete objects. This makes mathematics learning different from others. For example, a traditional lecture-based mathematics instruction supported by tutorial sessions presumes as the typical mathematics classroom that has been found to have lecture or demonstration followed by individual practice that take up the majority of the class time.

This imparts the instruction is one way that stems from the instructor and the students learn mathematics from the instructor and then practice by their own. Such a learning environment leads students to know mathematics in a very individual and superficial way [12].

Education has a relational character, and it is precisely that relationship between the teacher and the student, and even possibly the student and his or her classmates, that affords the community the opportunity for the interaction in education In this relational world of knowing, learners improve their knowledge and further develop understanding by making greater connections—with material, concepts, and others [13]. This consistently matches with the definition of mathematical learning for understanding that has been widely encouraged and supported in the mathematics teaching community. Understanding a mathematical notion is best when it is connected with reality, and the extent of understanding depends on how it is connected in different scenarios.

Teachers create a learning environment for mathematics instruction that facilitates construction of knowledge while creating strong connections between mathematics and students' interest. They should also incorporate the ideologies that enable as many students as possible the freedom to create those connections and relationships outside classrooms.

To impact students' learning and achievement, it is required to define the attitudes and beliefs of teachers about teaching with real problems.

Protagonists of mathematical problem solving insist that students become good problem solvers by learning mathematical knowledge heuristically. Students' successful experience in managing their own knowledge also helps them solve mathematical problems well [14]. When teachers use real problems in their class and employ teaching method around problem solving strategies, the teaching learning environment provides students to think criticall, present their ideas in a creatively and be reflective while communicating with their peers mathematically [11]. The conventional way of teaching does not enable students to develop mathematical thinking skills. Limitations of traditional ways of teaching mathematics are associated with teacher-oriented instruction and the "ready-made" mathematical knowledge presented to students who are not receptive to the ideas

The use of real problems in teaching needs to be fathomed by teachers. For example, students in problem based teaching-learnign environment typically have greater opportunity to learn mathematical processes associated with communication, representation, modeling, and reasoning [15].

To put these mathematical processes into effect, the study on mathematical teachers' perception on IRPs is imperative. For example, an in-depth understanding of the mathematical contents that contributes to students' success in mathematical problem-based learning environment is crucial. Teachers need to have a comprehensive understinding of matheamtics in order to teach their students how mathematics can be applied to solve problems in daily life situations, and they also need to design the real problems appropriately [16].

A review of the literature about the theoretical background of the study showed that real problems are critically important to ensure quality of mathematics education.

However, none of the reviewed research has investigated teachers' perception on the use of real problems in the teaching of mathematics in the same setting of this study.
In addition, no studies focused on the domains that this study encompassed. Therefore, it is believed that the results of the study may fill a gap in literatures of the same topic.

3. Materials and Methods

In order to address the key objectives of the study, the study adopted quantitative and qualitative approaches. These approaches enabled the triangulation of the data in order to corroborate one set of findings with the other, allowing for the convergence of both sets of data into a communal proposition. Triangulation also establishes the validity of the approaches [17]. Qualitative data were collected using interviews and quantitative data using questionnaire.
The validated and self-administered questionnaire contained 18 statements that allowed respondents to express their feelings, attitudes and experiences associated with employing real problems in the teaching of mathematics. Statements 1 to 9 were categorized under subscale 1 (IRPs for the efficacy of teachers) statements 10 to 12 were categorized under subscale 2 (IRPs for students' optimal learning), statements 13 to 16 were categorized under subscale 3 (integration and relevance of real problems) and statements 17 and 18 were categorized under subscale 4 (Interaction through IRPs). In addition, one open question was deliberated: "Do you have any idea or suggestion on how to improve the conventional teaching methodology?".

The sample size for administering the questionnaire was determined by the formula: Yamane's Formula ….2

$$n = \frac{N}{1 + N * e^2}, \text{where } n = \text{sample size}, N = \text{Population size}, e = \text{Level of precision or sampling of error, which is } \pm 10\%$$

The total population was 234. The formula yielded 70 teachers who were selected proportionally from the participating universities.
In the questionnaire, a 5-point Likert scale of measurement was used. This sought information on teachers' perception of teaching with real problems.
The questionnaire was administered to mathematics teachers who were teaching mathematics courses for science and/or engineering students from March to May 2022, and the responses were anonymous. Likert items were used to measure respondents' perception to a particular statement. To analyze the quantitative data, the likert scale was coded as follows.

- *1=Strongly disagree*
- *2=Disagree*
- *3=Neutral*
- *4=Agree*
- *5=Strongly agree*

Responses were entered into a database, and the data were rectified. Statistical analysis for quantitative data was performed using Statistical Package for Social Science (SPSS)-version 25 software and narrative interview analysis was used for the qualitative data.
Reliability of the questions under each subscale was checked separately using Cronbach's alpha with a limit of reliability set at 0.70.
To further supplement the quantitative data, face-to-face semi-structured interviews were conducted for 20 teachers. Responses from the interviews helped the researchers to uncover issues that were not well represented in the quantitative data.

4. Results and Discussion:

The internal consistency of the items in the questionnaire was established through reliability statistics using Cronbache's alpha. **Table.1.** depicts alpha values for internal consistency for each subscale. Alpha values ranged from 0.766 (IRPs for students' optimal learning) to 0.895 (Integration and relevance of RPs).

Table. 1. Cronbache's alpha values for items under each subscale

Subscales	Cronbache's alpha
IRPs for the efficacy of teachers	0.827
IRPs for students' optimal learning	0.766
Integration and relevance of real problems in the text and reference books	0.895
Interaction via IRPs	0.770

The alpha values of the internal consistency indicated that the questionnaire implemented was statistically reliable.

4.1. IRPs for the Efficacy of Teachers

Responses represented in Table 2 shows that 36.6% of the respondents strongly agreed that IRPs boosted teachers confidence in linking mathematics with real life situations. 23.9% agreed to the same item, while 38% were uncertain if IRPs boosted teachers' confidence in linking mathematics with real life situations. In exploring more applications of mathematical contents, 39.4% of the respondents strongly agreed that IRPs motivates teachers with another 29.6% agreed to the same item. 29.6% were not sure if IRPs motivates teachers to explore. 29.6% of the respondents strongly agreed and the same percent agreed that IRPs helps teachers explore different resource materials while the remaining 39.4% were uncertain if it does. Regarding problem solving mindset, 31.0% of the respondents strongly agreed and 29.6% agreed that IRPs helps teachers train students to think with a problem solving mind set. 35.2% of the respondents strongly agreed that IRPs helps teachers engage students in the process of problem solving and applying knowledge to real life situations and another 23.9% agreed to the same item. The remaining 39.4% were not certain. About 50% of the respondents strongly agreed that IRPs improved teachers explicating attributes and 32.4% of the respondents agreed to the same item. Only 15.5% of the respondents were uncertain. Regarding making mathematics pertinent and thrilling through IRPs, 40.8% of the respondents strongly agreed and 21.1% agreed. 14.1% were uncertain. In helping teachers to create a balance between theory and practice in mathematics education, 45.1% strongly agreed and 39.4 agreed. 14.1% were uncertain. 36.6% strongly agreed that IRPs helps them choose appropriate tasks for nurturing student problem solving strategies, and 28.2% agreed while 2.8% disagreed to the same item. 31% of the respondents were uncertain.

No	Statements		St. disagree	Disagree	Uncertain	Agree	St. agree
1	Integrating real problems in the teaching of mathematics (IRPs) boosts my confidence in linking mathematics with real life situations.	Count	0	0	27	17	26
		Percentage	0.0	0.0	38	23.9	36.6
2	IRPs motivates me to explore more applications of mathematical contents.	Count	0	0	21	21	28
		Percentage	0.0	0.0	29.6	29.6	39.4
3	IRPs helps me explore different resource materials.	Count	0	0	28	21	21
		Percentage	0.0	0.0	39.4	29.6	29.6
4	IRPs helps me train students to think with a problem-solving mindset.	Count	0	0	27	21	22
		Percentage	0.0	0.0	38.0	29.6	31.0
5	IRPs helps me engage students in the process of problem solving and applying knowledge to real life situations.	Count	0	0	28	17	25
		Percentage	0.0	0.0	39.4	23.9	35.2
6	IRPs improves my explicating attributes.	Count	0	0	11	23	36
		Percentage	0.0	0.0	15.5	32.4	50.7
7	IRPs helps me make mathematics pertinent and thrilling.	Count	0	0	26	15	29
		Percentage	0.0	0.0	36.6	21.1	40.8
8	IRPs helps me create a balance between theory and practice in education.	Count	0	0	10	28	32
		Percentage	0.0	0.0	14.1	39.4	45.1
9	IRPs helps me choose appropriate tasks for nurturing student problem solving strategies.	Count	0	2	22	20	26
		Percentage	0.0	2.8	31.0	28.2	36.6

These findings revealed that the majority of respondents (more than 60%) perceived that IRPs in the teaching of mathematics enhances teachers' confidence as it provides opportunities for teachers to make connection between mathematics and real life situations. As IRPs requires deep understanding of mathematical contents, most respondents perceived that IRPs motivates teachers

to explore more applications of mathematical contents from different resource materials.

The results also showed that most teachers conceived that IRPs helps teachers train students to think with a problem-solving mindset while engaging them in the process of problem solving and applying knowledge to real life situations. Further, they conceived that IRPs improves teachers 'explicating attributes, helps teachers make mathematics pertinent and thrilling, creates a balance between theory and practice in education, and helps teachers choose appropriate tasks for nurturing student problem solving strategies.

Table.2. Percentage of responses on IRPs for the efficacy of teacher

No	Statements		St. disagree	Disagree	Uncertain	Agree	St. agree
1	Integrating real problems in the teaching of mathematics (IRPs) boosts my confidence in linking mathematics with real life situations.	Count	0	0	27	17	26
		Percentage	0.0	0.0	38	23.9	36.6
2	IRPs motivates me to explore more applications of mathematical contents.	Count	0	0	21	21	28
		Percentage	0.0	0.0	29.6	29.6	39.4
3	IRPs helps me explore different resource materials.	Count	0	0	28	21	21
		Percentage	0.0	0.0	39.4	29.6	29.6
4	IRPs helps me train students to think with a problem-solving mindset.	Count	0	0	27	21	22
		Percentage	0.0	0.0	38.0	29.6	31.0
5	IRPs helps me engage students in the process of problem solving and applying knowledge to real life situations.	Count	0	0	28	17	25
		Percentage	0.0	0.0	39.4	23.9	35.2
6	IRPs improves my explicating attributes.	Count	0	0	11	23	36
		Percentage	0.0	0.0	15.5	32.4	50.7
7	IRPs helps me make mathematics pertinent and thrilling.	Count	0	0	26	15	29
		Percentage	0.0	0.0	36.6	21.1	40.8
8	IRPs helps me create a balance between theory and practice in education.	Count	0	0	10	28	32
		Percentage	0.0	0.0	14.1	39.4	45.1
9	IRPs helps me choose appropriate tasks for nurturing student problem solving strategies.	Count	0	2	22	20	26
		Percentage	0.0	2.8	31.0	28.2	36.6

4.2. IRPs for Students' Optimal Learning

As shown in Table 3, the majority of respondents 37.1% st. agreed and 24.3% agreed that IRPs develops students' ability to deepen subject knowledge through horizontal and vertical integration. The remaining 38.6% were uncertain. 27.1% of the respondents strongly agreed and 41.4% agreed that IRPs encourages and reinforces students' curiosity, critical thinking, and creativity. 40% of the respondents strongly agreed that IRPs helps students execute problem-solving strategies. 31.4% agreed to the same item, and the remaining 28.6% remained uncertain.

These findings revealed that significant number of respondents perceived that IRPs develops students' ability to deepen subject knowledge by connecting mathematics to other mathematical ideas. Similar perspectives have been reflected regarding IRPs that reinforces students' curiosity, critical thinking, and creativity and helps students execute problem-solving strategies

Table .3. Perception on IRPs for students' optimal

No	Statement		St. disagree	Disagree	Uncertain	Agree	St. agree
1	IRPs develops students' ability to deepen subject knowledge through horizontal and vertical integration.	Count	0	0	27	17	26
		Percentage	0.0	0.0	38.6	24.3	37.1
2	IRPs encourages and reinforces curiosity, critical thinking, and creativity in my students.	Count	0	0	22	29	19
		Percentage	0.0	0.0	31.4	41.4	27.1
3	IRPs helps my students execute problem-solving strategies.	Count	0	0	20	22	28
		Percentage	0.0	0.0	28.6	31.4	40.0

learning

4.3. Integration and Relevance of Real Problems

Figure. 1 shows that more than half of the respondents believed that real problem-based activities including word problems are not integrated well into text books and reference materials of mathematics courses. A small number n<5 respondents agreed that the activities are well integrated in the text books and reference materials.

Seven respondents were uncertain about the integration of real problems into reference materials. Nearly two-third of the respondents felt that real problems in text and reference books do not attempt to promote problem solving skills. A respondent agreed to the same item while 4 respondents were uncertain. 41% of respondents strongly agreed that real problems in the text and reference books are not relevant to students' lives or interests. These findings revealed that majority of the respondents believed that real problem-based activities including word problems are not integrated well into text books and reference materials of mathematics courses.

Many respondents felt that real problems in text and reference books do not attempt to promote problem solving skills. Moreover, majority of respondents expressed that real problems in the text and reference books are not relevant to students' lives or interests.

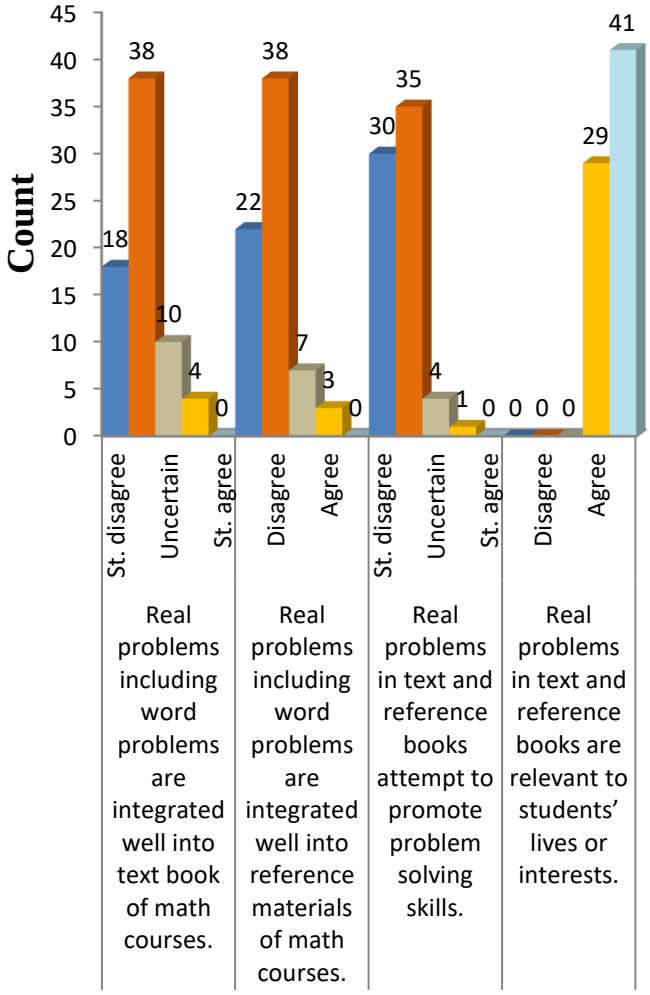

Figure.1. Number of respondents on integration and relevance of real problems in the teaching materials

4.3 Interaction through IRPs

The tabulation of respondents indicated that 48.6% of respondents strongly agreed that IRPs improves teacher-student interaction and 44.3% of the

respondents agreed while two respondents disagreed to the same item. Only 4.3% of the respondents were not sure about the role of IRPs in improving teacher-student interaction. More than half of the respondents strongly agreed that IRPs helps promote student-student interaction, and 40% of the respondents agreed to the same item. Only 2.9% were uncertain. The findings indicate that IRPs received positive attitude by most teachers in improving teacher-student interaction and helping to promote student-student interaction during the teaching learning process.

Table.4. Percentage of respondents showing attitudes towards interaction through IRPs

No	Statement		St. disagree	Disagree	Uncertain	Agree	St. agree
1	IRPs improves teacher-student interaction.	Count	0	2	3	31	34
		Percentage	0.0	2.9	4.3	44.3	48.6
2	IRPs helps me promote student-student interaction.	Count	0	0	2	28	40
		Percentage	0.0	0.0	2.9	40.0	57.1

The summary of responses gathered from the open ended questions were presented in the form of citations and sorted into three major themes: Nature of problems, teaching style while IRPs, and ways of presenting problems.

Nature of problems

"The problems should be posed in a way that students are more interested in formulating a mathematical model for a given practical problem and solving the models (most often equations) to find the solutions using the easiest possible method."

Teaching style while IRPs

"All the tutorial classes should be allotted for providing students application problems related to mathematical contents they learned"

"A detailed step by step approach applied to solving practical application problems should be sufficiently provided."

"If the application area seems to be unfamiliar to the teacher, then a team teaching is recommended to be conducted."

Ways of presenting problems

"Worksheets shall include 50% application problems, and project works need to be designed based on practical problems that can be solved using mathematical theories and principles."

Results from the interview showed that teaching experience and the frequency of using problem based teaching approach during mathematics instruction are positively correlated (with Pearson correlation 0.828).

57 respondents reflected that teaching with real problems should be conducted after teaching the theoretical aspects of the topic delivered during the interview.

The interview also showed that respondents having less teaching experience were constrained in designing contextual problems that can be connected with the intended mathematical concepts as indicated with the Pearson correlation value of 0.792.

Table. 5. Correlation between experience and teaching via real problems

Category	Correlation	Teaching experience	Teaching via real problems
Teaching experience	Pearson Correlation	1	.828**
	Sig. (2-tailed)		.000
	N	70	52
Teaching via real problems	Pearson Correlation	.828**	1
	Sig. (2-tailed)	.000	
	N	52	52

Table. 6. Correlation between teaching experience and inability in designing contextual problems

Category	Correlation	Teaching experience	Constrained in designing contextual problems
Teaching experience	Pearson Correlation	1	.792**
	Sig. (2-tailed)		.000
	N	70	70
Constrained in designing contextual problems	Pearson Correlation	.792**	1
	Sig. (2-tailed)	.000	
	N	70	70

Mathematics teachers whose experience is 5 years and less seem to be constrained in designing contextual problems during instruction. To implement the problem based teaching in mathematics, we really want them to acquire a new mathematical notion and not to limit their work to the "how to use it", which is quite natural quest of most students. We also need to develop some specific contents (Such as the notions of matrix, linear mapping, derivative, integral, differential equations, Eigen-value problem, ….) prior to the implementation of IRPs.

- How the teaching with real problems fosters an interest in studying mathematics in the fields of science and engineering?

problem based teaching fosters students' interest by developing problem solving skills, deep conceptual understanding, or a mental framework for how ideas fit together. Students learn mathematics as a result of solving problems.

"Mathematical ideas are the outcomes of the problem solving experience rather than the elements that must be taught before problem solving." How can teachers develop the ability of students to realizing the links that exist between mathematics and real-life situations?

The steps followed by students during the implementation of problem based teaching include

(1) Understanding the problem,
(2) Formulating the problem (Identifying relevant factors and finding mathematical description),
(3) Finding the solution of the equation formulated in step (2), and (4) Interpreting the solution.

In lieu of these steps, the correlation between interviewees' knowledge of steps followed by students and their teaching experience is found to be significant as indicated in Table 7.

Table. 7. The correlation between teaching experience and knowledge of steps of solving application problems

As real problem activities are not well integrated into text books and reference books, teachers need to be encouraged to provide students with interesting tasks, problems. Mathematics curricula need to interrelate mathematics, engineering and science since a blend of knowledge is required for lifelong and meaningful learni. Most teachers believe that text books and reference books hardly present problems having connection with the reality. This leads students to become active problem-solvers and self-directed learner**s.**

Category	Correlation	Teaching experience	Knowledge of steps
Teaching experience	Pearson Correlation	1	.623**
	N	70	70
Knowledge of steps	Pearson Correlation	.623**	1
	N	70	70

Table. 8.

Conclusion and Recommendation

In conclusion, this research has revealed that teachers have a productive disposition towards integrating real problems in the teaching of mathematics. Integrating real problems helps teachers create a balance between theory and practice, boost their confidence, and motivate them to explore more applications of mathematical contents from different resource materials. Furthermore, integrating real problems can help students to think critically and execute problems in problem solving mindset, and improve interaction in the class. Nevertheless, the teachers perceived that the real problems in the text book and reference books are not well integrated and relevant to students' lives.

The results from this study suggest that teachers need to incorporate real problems that can help mathematics teachers engage students in the process of problem solving and applying knowledge to novel situations and achieve more interaction between teacher and students and among students. There is also a need for professional development especially for newly recruited teachers about integrating real problems. It is required to ensure teachers' positive disposition towards integrating real problems a habitual inclination in order to make mathematics sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy. Tutorial classes can serve for providing students more application problems around mathematical contents. Besides, worksheets should be prepared in a way that they include 50% application problems, and/or project works that need to be designed based on practical problems that can be solved using mathematical theories and principles. Syllabi of mathematics courses need to be amended by incorporating real problems that makes mathematics teaching authentic and enhance students' optimal learning. Team teaching could also be an urge if showing the application around key mathematical contents requires further understanding.

References

1. Herro D, Quigley C: Exploring teachers' perceptions of STEAM teaching through professional development: implications for teacher educators. *Prof. Dev. Educ.*, 2017, 43(3)

2. Mezirow J: Learning to think like an adult. *J. Acad. Librariansh.* 2001, 27(5).

3. M. Rubie-Davies C: Flint A, McDonald LG: Teacher beliefs, teacher characteristics, and school contextual factors: What are the relationships?. *Br. J. Educ. Psychol.* 2012,82: 270-228.

4. Schleicher, A., Teaching Excellence through Professional Learning and Policy Reform: Lessons from around the World. International Summit on the Teaching Profession, *OECD Publishing*. 2016.

5. Saglam Kaya Y: Perceptions of Pre-Service Teachers Regarding the Model Eliciting Activities. *MIER J. Educ. Stud. Trends Pract.* 2021.

6. Shi C. and et al.: Analysis of Railway Ballasted Track Stiffness and Behavior with a Hybrid Discrete–Continuum Approach. *Int. J. Geomech.* 2021, 21(3), 7.

Hernandez P R. *et al.:* Connecting the STEM dots: Measuring the effect of an integrated engineering design intervention. *Int. J. Technol. Des. Educ.* (2014). 24: 107–120.

8. Alzobiani I: The Qualities of Effective Teachers as Perceived by Saudi EFL Students and Teachers: *English Lang. Teach.* 2020,**13**(2)..

9. Mensah FM: Culturally Relevant and Culturally Responsive, Two Theories of Practice for Science Teaching. *Natl. Sci. Teach. Assoc.* 2021,**58**(4).

10. Chapman O: Mathematics teachers' knowledge for teaching problem solving. *Lumat Int. J. Math, Sci. Technol. Educ.* 2015, **3**(1).

11. Astuti R, Mardiyana, Triyanto: Analysis of the Problem Based Learning Syntax in Vocational Mathematics Books on Matrix Material 704. *Int. J. Multicult. Multireligious Underst.* 2021:7(1).

12. Sadeghi R., Sedaghat MM, and Sha Ahmadi F: Comparison of the effect of lecture and blended teaching methods on students' learning and satisfaction. *J. Adv. Med. Educ. Prof.*, 2014, 2(4).

13. DeBoer GE: Scientific literacy: Another look at its historical and contemporary meanings and its relationship to science education reform. *J. Res. Sci. Teach.*, 2000, 37(6): 14.

14. Perkins DN, Salomon G: Are Cognitive Skills Context-Bound?, *Educ. Res.* 1989, 18(1) 15. Roh, K. H., Problem-Based Learning in

Mathematics. ERIC Digest., *Rep. EDO-SE-03-07. 4pp. 2003*, 2003.

16. Westwood P: The problem with problems: Potential difficulties in implementing problem-based learning as the core method in primary school mathematics. *Aust. J. Learn. Difficulties* 2011,16(1).

18. Mathison S: Why Triangulate?," *Educ. Res.* 1988, 17(2).