IJEISSAH

International Journal of Emerging Issues in Social Science, Arts, and Humanities
Vol. 2 No. 3; August 2024; Page: 43-58

An Analysis of the Competency-Based Assessment Process in Mathematics Education at the Senior Secondary Level in Sri Lanka

Fathima Ruzeika Fairoz[1*], Lubna Ali Mohammed[2]

[1&2] Faculty of Social Sciences, Arts and Humanities, Lincoln University College, Malaysia

***Corresponding author's e-mail:** rffairoz@lincoln.edu.my*

ABSTRACT

Background: Sri Lanka has a long history of having an examination-based education system that caters to three main examinations conducted nationally. After over a decade, the country has yet to achieve its objective of the competency-based education system introduced in 2007. Sri Lanka practices an eight-year curriculum cycle reform, which is presently overdue. The current study analyses the existing situation of the competency-based assessment process, which will provide information from the classroom level. The research will address three questions: 1. What assessment methods are used? 2. What are the challenges teachers face in the application? 3. What types of training and support are given by the authorities for applying CBE-based mathematics assessments at the senior secondary level? **Methods**: The study employed a quantitative approach, using a stratified random sampling method. A questionnaire was used to collect data from 276 mathematics teachers who teach grades ten and eleven in the Western Province. **Results**: The results revealed that the challenges were a lack of support facilities and resources, long working hours, overcrowded classrooms, and a low understanding of CBE concepts among teachers. Paper-and-pencil tests and questioning are the most common evaluation methods used in classrooms. **Conclusion**: It is recommended that the Department of Education, with the help of the school authorities, monitor the assessment process and provide adequate training for the teachers to integrate assessment with classroom activities, and provide necessary resources. A school-based assessment method must be integrated with the end-of-term examination, giving it equal weight.

Keywords: Assessment; Authentic Assessments; Competency-Based Education; Descriptive Assessments; Participatory Assessments

Background

Sri Lanka introduced a competency-based education (CBE) system in 2007. The main aim of this change was to create a generation that can change what is known, explore the new, and build up new skills that are required for the future (National Council of Teachers of Mathematics (NCTM), 2015). In

this context, mathematics competency became crucial in intelligent decision-making, daily life, and the dynamic work world (Wijesundera, 2021). Though Sri Lanka has implemented a CBE approach, it is questionable to what extent it is practiced in the teaching-learning process of mathematics (Egodawatte, 2014). The present education system must overcome three barriers: the curriculum (Widanapathirana, *et al*., 2016), the assessment (Egodawatte, 2014), and the quality of education (Aturupane *et al*., 2011). Inadequate educational quality mainly relies on the quality of the teaching-learning process. Improving education quality requires well-educated and trained teachers (Barrett *et al*., 2007). It is a national obligation that all children in the country have access to quality instructions in mathematics to achieve competencies in mathematics, which directly depends on the professional quality of teachers (Wijesundera *et al*., 2023).

Though teachers have received suitable training on implementing CBE in mathematics, they could face different challenges in applying CBE in the teaching and assessment process (Bandara, 2018) (Nawastheen, 2019). Thus, this paper focuses on understanding the current practice of the assessment process in senior secondary mathematics education from three perspectives: 1. To identify the types of assessments used in the lower secondary mathematics assessment process; 2. To identify the challenges teachers face in applying CBE-based mathematics assessment; and 3. To identify training and support received for applying CBE-based mathematics assessment at the senior secondary level from the perspective of teachers at the school level.

The general education system in Sri Lanka comprises primary and secondary education (Widanapathirana, *et al*., 2016). All government and government-approved private schools follow the curriculum the National Institute of Education (NIE) devised.

For several years, the Sri Lankan education system has been described as examination-oriented (Aturupanr & Little, 2020). The classroom teaching-learning process mainly focuses on the three main examinations conducted by the DoE of Sri Lanka: the grade V scholarship exam, GCE (O/L), and GCE (A/L). These examinations are loaded with cognitive material. The most common classroom assessments are paper-and-pencil and questioning. Summative tests are held at the end of the term and designed by the school or zonal level.

Statement of the Problem

The Sri Lankan curriculum and examinations rely on outdated models (Sedere *et al*., 2016), featuring content-heavy, lower-order thinking questions that emphasize short-term memory. National assessments have been conducted every four years since 2002, providing a comprehensive analysis of students' achievements at different stages. While these assessments offer valuable insights into student performance, they do not explain the low achievement levels in mathematics. No follow-up studies have been done to explore the current implementation of the CBE assessment process or the challenges teachers face. This study will examine CBE's application in mathematics assessments from the perspectives of teachers and students, aiming to improve senior secondary mathematics education in Sri Lanka. The findings will guide educational reforms and benefit teachers, administrators, curriculum developers, and students by promoting learner-centered assessment approaches.

Thus, it will contribute directly to the mathematics achievement levels and the acquisition of 21st-century skills among students.

Scope of the Study

The key question to be answered in this study is, “To what extent is CBE practiced in the teaching-learning process of mathematics at the senior secondary school level in Sri Lanka?

To address the above key question, the following questions were formulated:

1. What assessment methods are used in the CBE-based assessment at the senior secondary level?

2. What challenges do teachers face in applying CBE-based assessments at the senior secondary level?
3. What types of training and support are given by the authorities for applying CBE-based mathematics assessments at the senior secondary level?

The main purpose of the current study is to analyse the current application of a CBE-based mathematics assessment process at the senior secondary level in Sri Lanka. To achieve this purpose, the following objectives were formulated:

1. To identify the different types of assessments used in the lower secondary mathematics assessment process.
2. To identify the challenges teachers, face in applying CBE-based mathematics assessment.
3. To identify the training and support given by the authorities for applying CBE-based mathematics assessment at the senior secondary level.

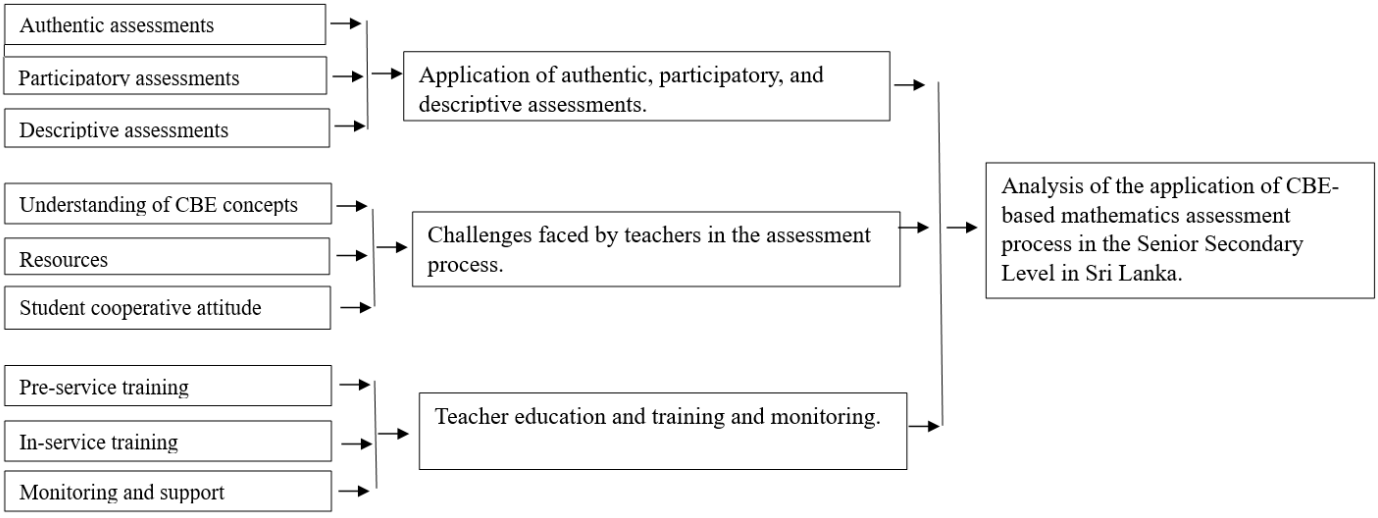

Figure 1 – The Conceptual Framework of the Study

Literature Review

The Assessment System in Sri Lanka

For several years, the Sri Lankan education system has been described as examination-oriented (Aturupanr & Little, 2020). Three public examinations conducted by the DoE dominate teaching and learning: the Grade 5 Scholarship Exam, the GCE (O/L), and the GCE (A/L) examination. However, according to the Sri Lankan Education System and Current Situation (2023), public exams and the massive overloading of the curriculum have put immense pressure and stress on students. Many students fail to move above GCE (O/L) for various reasons. The most common classroom assessments are paper-and-pencil and summative tests. The most common tests are at the end of the term and are designed by the school or zonal level. Teachers frequently test students through questions that rely on short-term memory and are based on lower-order thinking (Sedere *et al*., 2016). Further, 90% of their instructional time is testing students through questioning Lukindo (2016).

Though teachers use various forms of continuous assessment methods to assess students, policymakers worldwide use external assessments (examinations) to gauge students' mathematical knowledge for various reasons. Thus, these external assessments influence teachers' instructional practice on a large scale. Suurtamm *et al*., (2016) suggest that a stand-alone approach cannot assess the complex nature of

mathematical knowledge. Thus, teachers should be encouraged to use a variety of formats for assessments, such as conferencing, observation, or performance tasks. Also, teachers should use daily instructional activities to assess the students's current knowledge on a given topic or competence. It should be an integral part of classroom instructions. Tambwe (2019). However, according to Sedere *et al*., (2016) and Wijesundera *et al*., (2023), although the MoE of Sri Lanka has introduced 23 modalities of assessments to be used in the classroom, teachers mainly use questioning and paper-pencil tests, which require only recall.

Types of Assessments

Haris *et al*., (2021) identifies three types of assessments: authentic assessments, participatory assessments, and descriptive assessments. Authentic assessments are done in consistent, systematic, and programmed ways by using verbal and written tests and non-test assessments, performance observations, attitude measurements, and scoring of students' creations in the form of assignments, projects, products, portfolios, and self-assessments. Participative learning involves students assessing their own learning (Suurtamm *et al*., 2016). Participative assessments involve communication between the student and the teacher. Through discussion, the student understands the assessment outcomes and what they must do in the future. This information can be reported further through a descriptive assessment process. A detailed assessment maps students' stages until they can demonstrate an understanding or skill. Mapping all the steps children take as they successfully progress toward demonstrating an understanding or skill is called descriptive assessment because it tells us in observable terms what all the students can do (Wongnaa & Boachie, 2018; Haris *et al*., 2021).

Teacher Education and Training

Bandara, (2018) and Wijesundera, *et al*., (2023) describe Sri Lankan teacher education as pre-service and in-service. In-service training includes seminars, workshops, and research, primarily introducing syllabus changes and national reforms, limiting professional development. These trainings, often led by unqualified personnel using traditional methods, lack follow-up. The last two decades saw the implementation of school-based teacher professional development (SBTPD), with the MOE circular encouraging activities like staff meetings, peer coaching, and classroom-based action research.

Nawastheen (2021) emphasizes the need for curricular reform to focus more on teachers, who are key to implementation. Continuous evaluation of teachers' responses to reforms should use models like the Concern-Based Adoption Model (CBAM). Despite their interest in innovative teaching methods, mathematics teachers often lack environmental support (Sedere *et al*., 2016). Bingham, Adams & Stewart, (2021) found that, even with a decade-old CBE model, teachers faced challenges and needed ongoing practice, highlighting the importance of sustained effort at both teacher and organizational levels.

Poor pre-service training and inadequate subject knowledge have led to students advancing without necessary math skills (Makunja, 2016). Sedere *et al*., (2016) notes that trainee teachers received minimal supervision and lack assessment skills. Despite pre-service development, teachers struggle with CBE approaches due to insufficient in-service training.

Availability of Resources

Bingham, Adams & Stewart, (2021) identified time, student progress, communication, and state-level requirements as primary challenges in implementing CBE in classrooms. According to the researcher, under the CBE approach, teachers must study standards, prepare lessons, deliver instructions, evaluate student work, and analyse data throughout the learning process. Thus, the author identified time as a challenge in applying CBE approaches in the assessment process.

Insufficient teaching and learning resources were one of the main challenges teachers face in implementing a Competency-Based Curriculum (CBC) with variation from one school to another (Makunja, 2016), (Tambwe, 2019) (Amukowa *et al*., 2020). Further emphasis is that the education sector suffers from severe funding limitations. Also, the large class sizes prevented pupil-teacher interaction, pupil-pupil interaction, and classroom sharing of material and discussions (Wijesundera *et al*., 2023; Makunja 2016). Technology is only limited to a calculator in the classroom.

Cooperative Attitude of Students

Students are used to spoon-feeding approaches like memorising and cramming. They could have been more cooperative when given class activities requiring them to solve problems and think critically (Tambwe, 2019; Mkonongwa, 2018). According to the researchers, this was mainly due to students needing to be oriented to a learner-centered approach.

Further elaborating, the curriculum forced many learners to learn things they did not know they were learning and how and where they could apply such knowledge and skills in their daily lives. According to Rameli & Kosnin (2017) and Wijesundera *et al*., (2023), a negative attitude towards mathematics was a challenge in learning mathematics. Five main factors challenged the cooperation attitude in the learning process of mathematics: self-factors, teachers, parents, friends, and other factors.

Methods

The study employed a survey research approach with a quantitative data collection method. Systematic data collection was done using a well-structured questionnaire for teachers.

Population and Sampling

The population of the study was the lower secondary mathematics teachers who taught middle school (grades six to eleven) in the Western Province of Sri Lanka. According to the DoE (Western Province), the population consisted of 840 mathematics teachers.

The selection of teacher samples was based on the number of 1AB, 1C, and Type 2 schools in the three districts. Two-stage stratified random sampling was employed as the sampling technique in this study. In the first stage, schools were selected based on the number of 1AB, 1C, and Type 2 schools in the districts. In the second stage, 276 teachers were selected.

Table 1 - Description of the Teacher Sample

		Gender		School Type			Age				Years of Experience				Educational Qualification				Major Subject at Bachelor's Degree		No. of Students in the Class				No. of Periods Worked for a Week			
District	Total	Female	Male	1AB	1C	Type2	20-30	31-40	41-50	More than 50	0-10	11-20	21-25	More than 26	Trained	Graduate	PGD	Masters	Maths	Other	11-20	21-30	31-40	41-50	Upto 10	11-20	21-30	More than 30
Colombo	38%	30%	8%	21%	15%	3%	2%	15%	16%	5%	5%	23%	4%	6%	2%	22%	13%	1%	26%	12%	2%	8%	6%	22%	1%	10%	25%	2%
Gampaha	37%	22%	15%	15%	19%	3%	1%	9%	18%	9%	15%	14%	2%	6%	12%	15%	10%		18%	19%	2%	18%	8%	9%	1%	12%	19%	5%
Kalutara	25%	20%	5%	11%	12%	3%	1%	7%	10%	8%	13%	4%	1%	8%	10%	9%	5%	1%	19%	6%	3%	11%	3%	8%	4%	9%	10%	1%
Total		72%	28%	46%	31%	9%	4%	31%	44%	22%	33%	41%	7%	20%	24%	46%	28%	2%	63%	37%	7%	37%	17%	39%	7%	31%	54%	8%

Data Collection Instruments

The questionnaires were formulated based on the attributes of previously conducted studies adapted to the Sri Lankan context. They were translated into Sinhala and Tamil and administered physically by the

researcher using a Google form. The responses to each question were rated using a 4-point Likert scale (strongly agree, agree, disagree, and strongly disagree).

Data Collection Procedure

The researcher administered the questionnaires in person by visiting most of the schools. Prior permission was obtained from the MoE to visit the national schools in the Western Province and from the DoE (Western Province) to visit the provincial schools. Also, permission was obtained from the principals to visit each school. Participants who taught grade ten and eleven classes were randomly selected.

Data Analysis

The quantitative data collected was analysed using IBM SPSS statistical analysis version 26. The survey was analysed first by item for a mean and standard deviation. Tables, graphs, pie charts, and comparisons were used to present the data.

Ethical Issues

The researcher obtained prior permission from the MoE and DoE (Western Province) to visit the schools to collect data. Before visiting the schools, the principals and mathematics teachers also consented.

Results

What assessment methods are used in the CBE-based assessment at the senior secondary level?

The data collected from the teachers' questionnaire were used to analyse the assessment methods practiced in the CBE-based assessments.

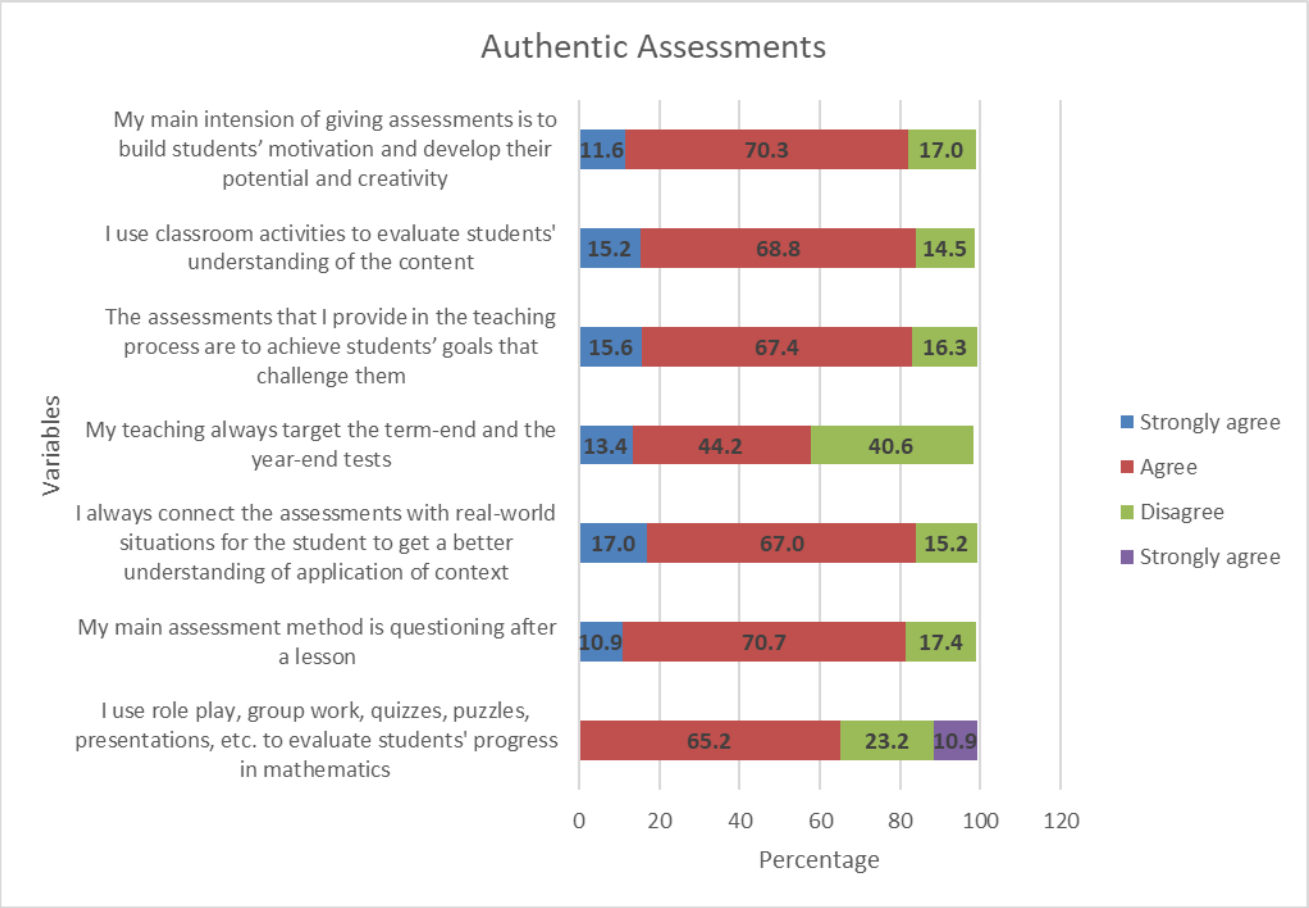

Figure 2 – Authentic Assessments Conducted by Teachers

According to Figure 2, 34.1% disagreed or strongly disagreed that they use various activities to evaluate students' progress in mathematics. Similarly, 81.6% agreed that their primary classroom assessment method was questioning. 57.6% agreed they mainly target the term-end and year-end tests in their teaching. Around 14%–18% disagreed with the rest of the questions about authentic assessments conducted by teachers.

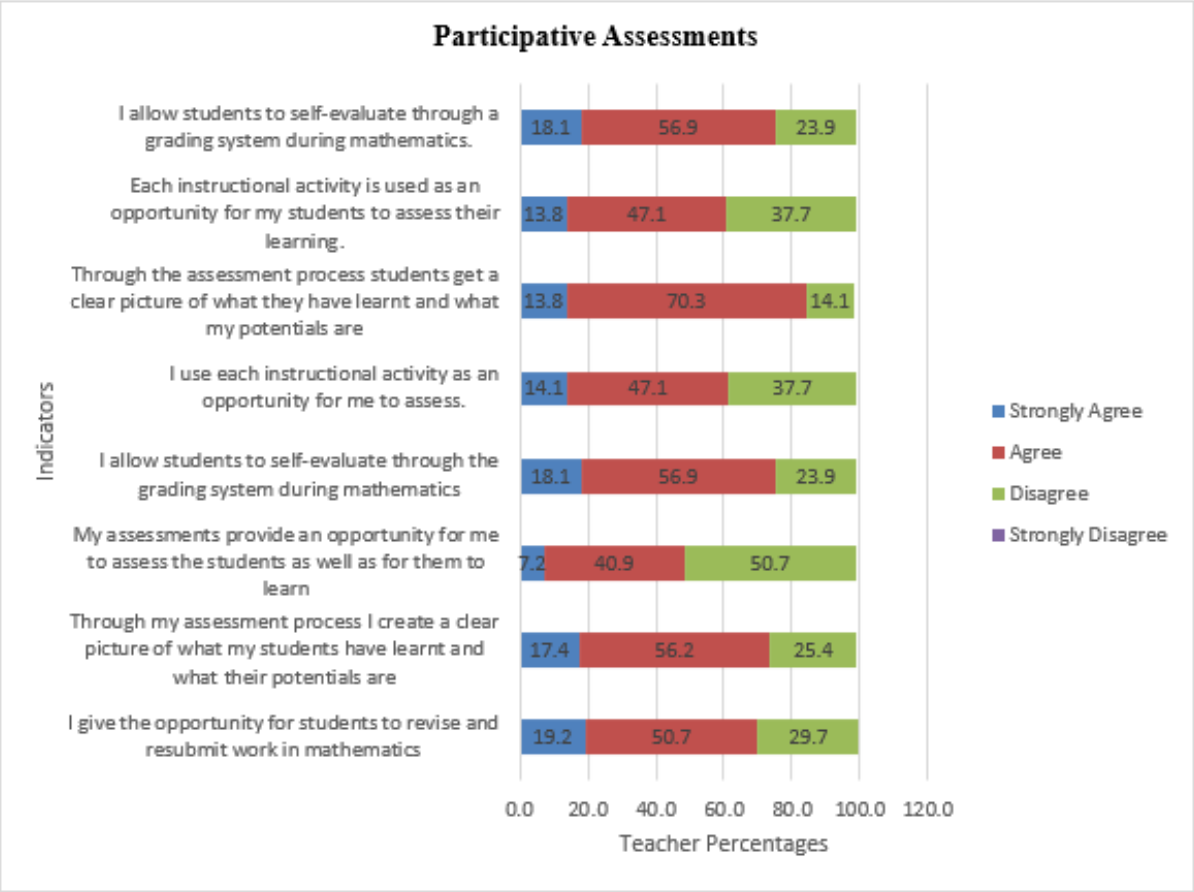

Figure 3 – Participatory Assessments Conducted by Teachers.

According to Figure 3, 29.7% of the teachers disagreed that their assessments provided an opportunity for them to assess the students and learn. 37.7% disagreed that each activity given to students was used for them to assess the students and for the students to assess themselves. Around 14%–30% disagreed with the rest of the questions related to participatory assessments held in the teaching-learning process.

According to Figure 4, 50.7% disagreed that students were assessed using rubrics or criteria. Also, 48.6% disagreed that they used the assessment details as mapping for all stages a student passed through until the student demonstrated the skill or understanding. Around 10% disagreed with the rest of the questions.

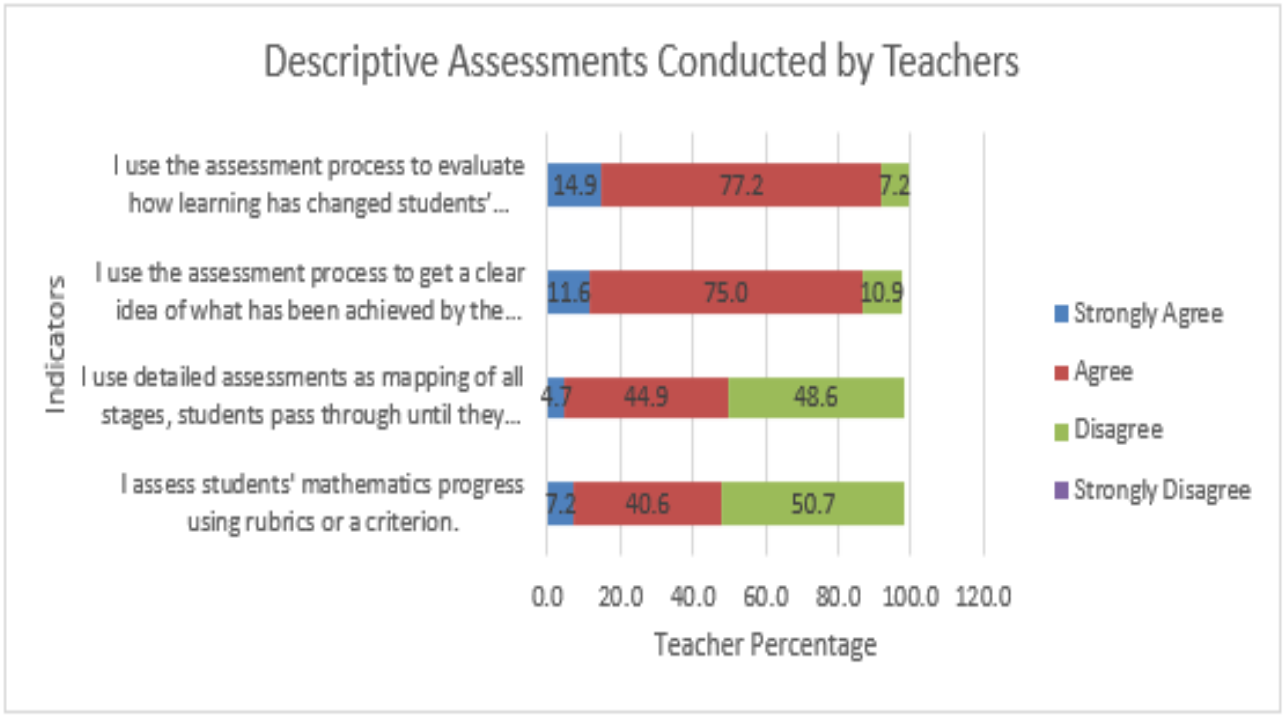

Figure 4: Descriptive Assessment Conducted by Teachers

What challenges do teachers face in applying CBE-based assessments at the senior secondary level?

By analysing the pertaining literature, three themes were identified to analyse the prevailing CBE-based assessment process.

1. Teacher understanding of CBE concepts related to assessments.
2. Availability of resources, and 3. Students' cooperative attitude towards the assessment process.
3. The challenges teachers face in the application of CBE-based assessments.

Teacher Understanding of CBE Concepts

According to Figure 5, around 76%- 80% disagreed or strongly disagreed that they set personalised learning goals and that students continue to work on a given topic until they reach the expected competency level. 46% disagreed that they used assessment data to identify their students' learning needs. 84% agreed that all the students move on to the next topic, unit, or competency regardless of whether they have achieved mastery of the previous unit.

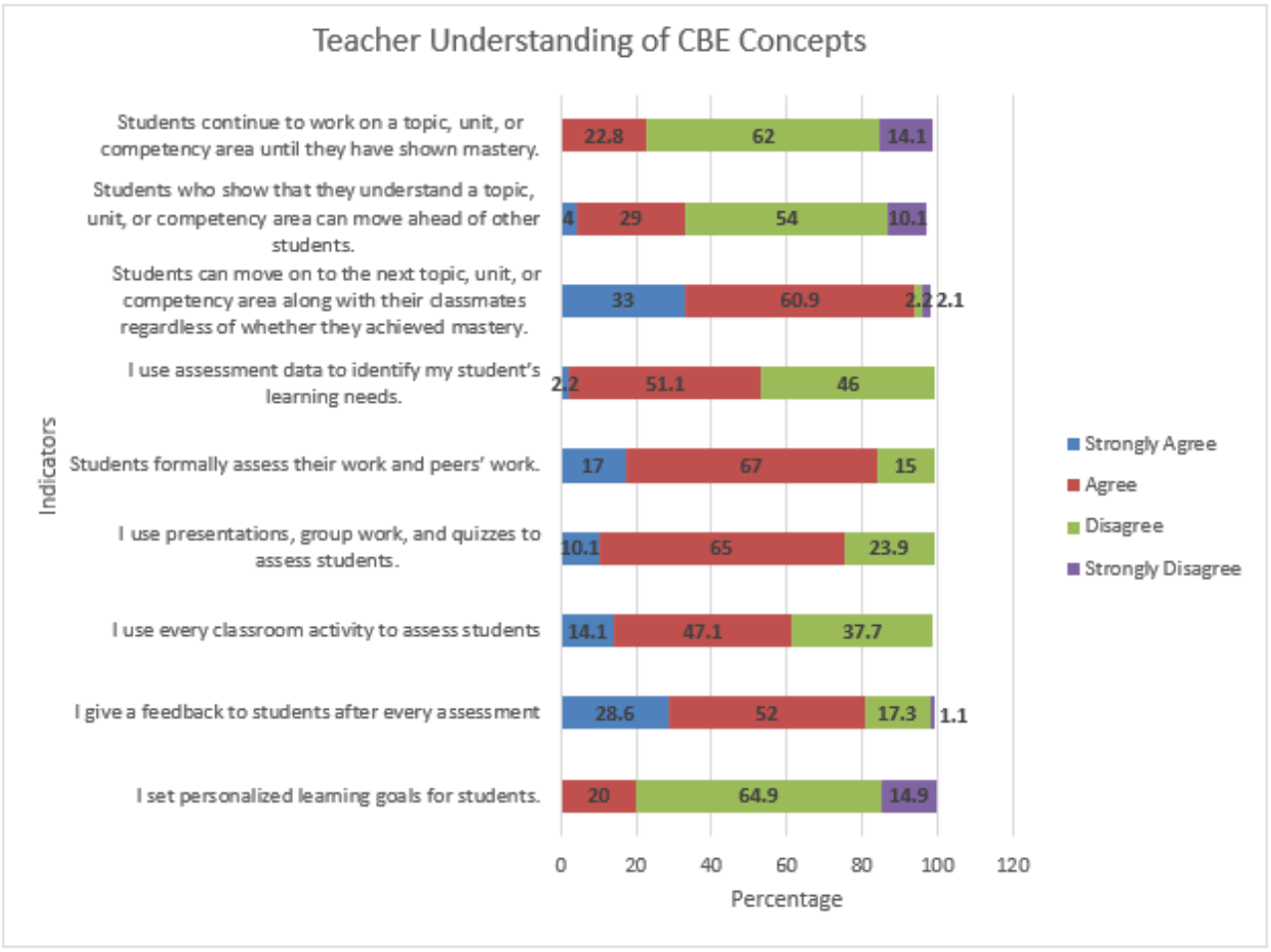

Figure 5: Teacher Understanding of CBE Assessment Concepts

Availability of Resources

According to Figure 6, around 79% disagreed or strongly disagreed that they had adequate time to assess students during the teaching-learning process. Similarly, around 75% disagreed or strongly disagreed that they have adequate qualified human resources, and 45%–76% disagreed that they have financial resources for the application of CBE. Also, 43% disagreed with the large class size and the availability of web-based resources.

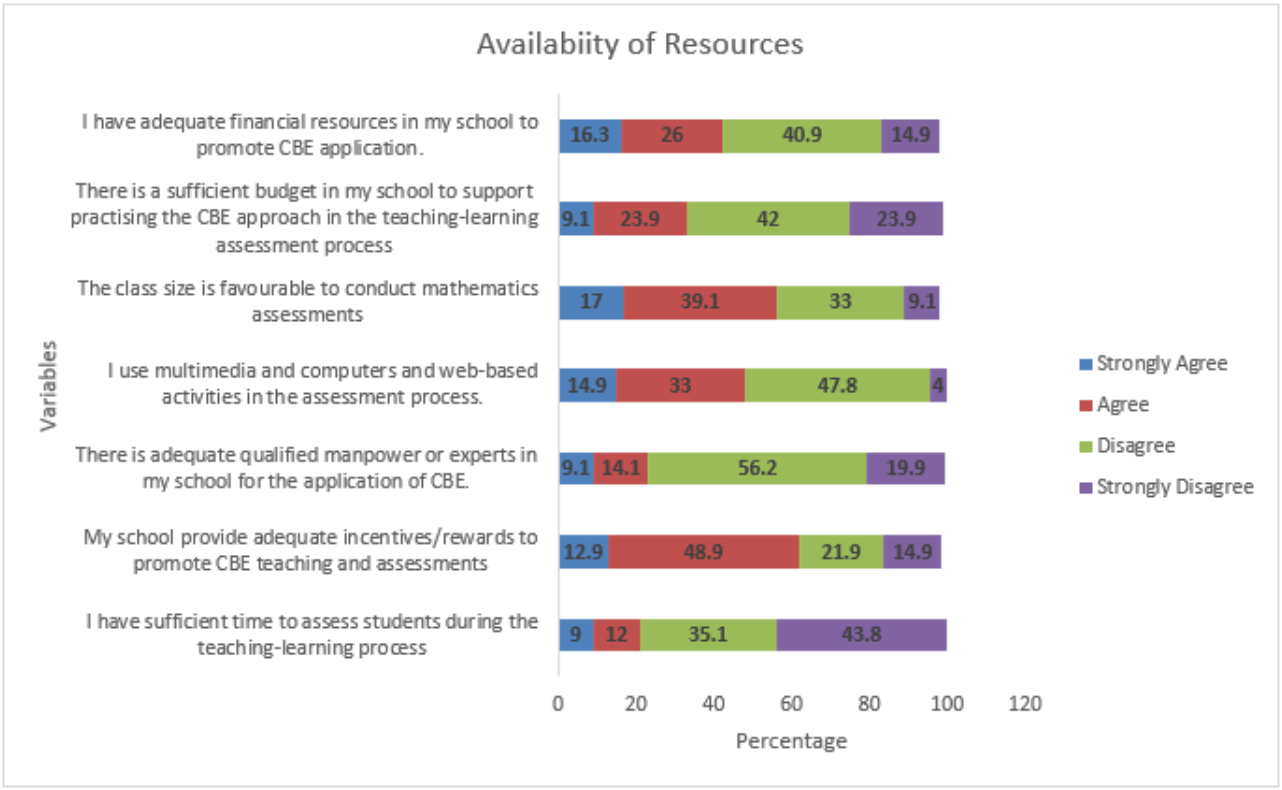

Figure 6: Availability of Resources

Student Cooperation Attitude

According to Figure 7, 26%–31% disagreed and strongly disagreed that they include real-world application and problem-solving in their assessment and that the students actively participate in the process. 69%–86% of the participants agree that their students cooperate in the assessment process.

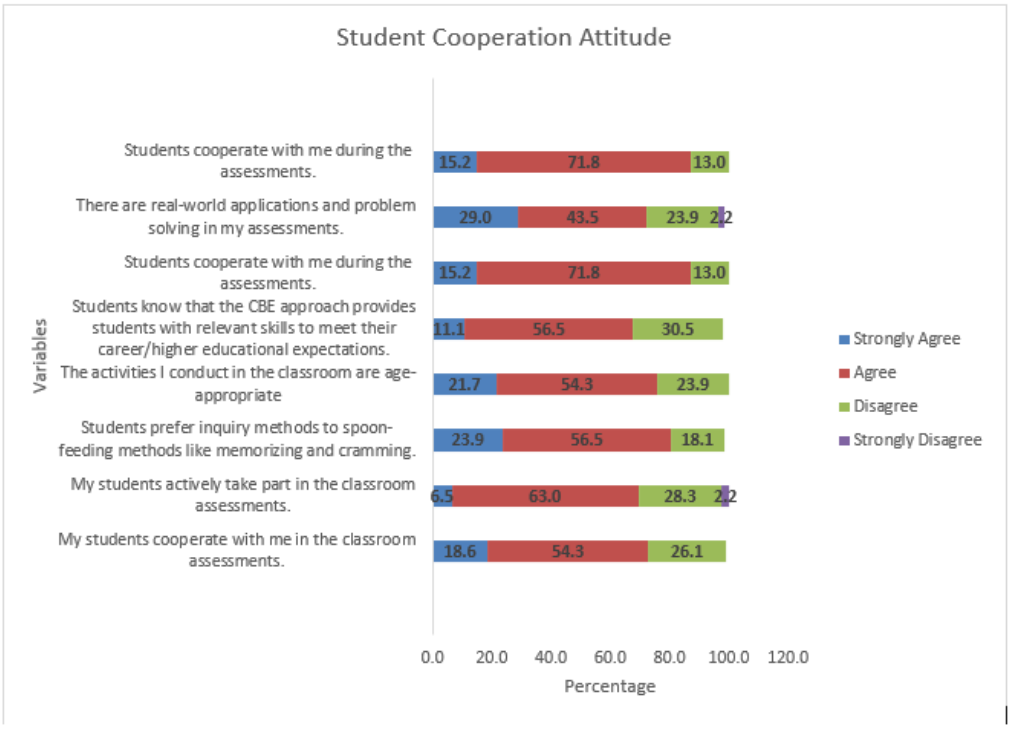

Figure 7: Student Cooperation Attitude Towards the Assessment Process

What types of training and support are given by the authorities for applying CBE-based mathematics assessments at the senior secondary level?

Pre-Service Teacher Education

According to Figure 8, 26%–31.5% strongly disagreed or disagreed that they were trained to identify real-world context in preparing assessments and carry out action research when encountering a problem in the class. 30.5% disagreed that the training received was sufficient to carry on the assessment process, and 26.1% used the training received in the assessment process.

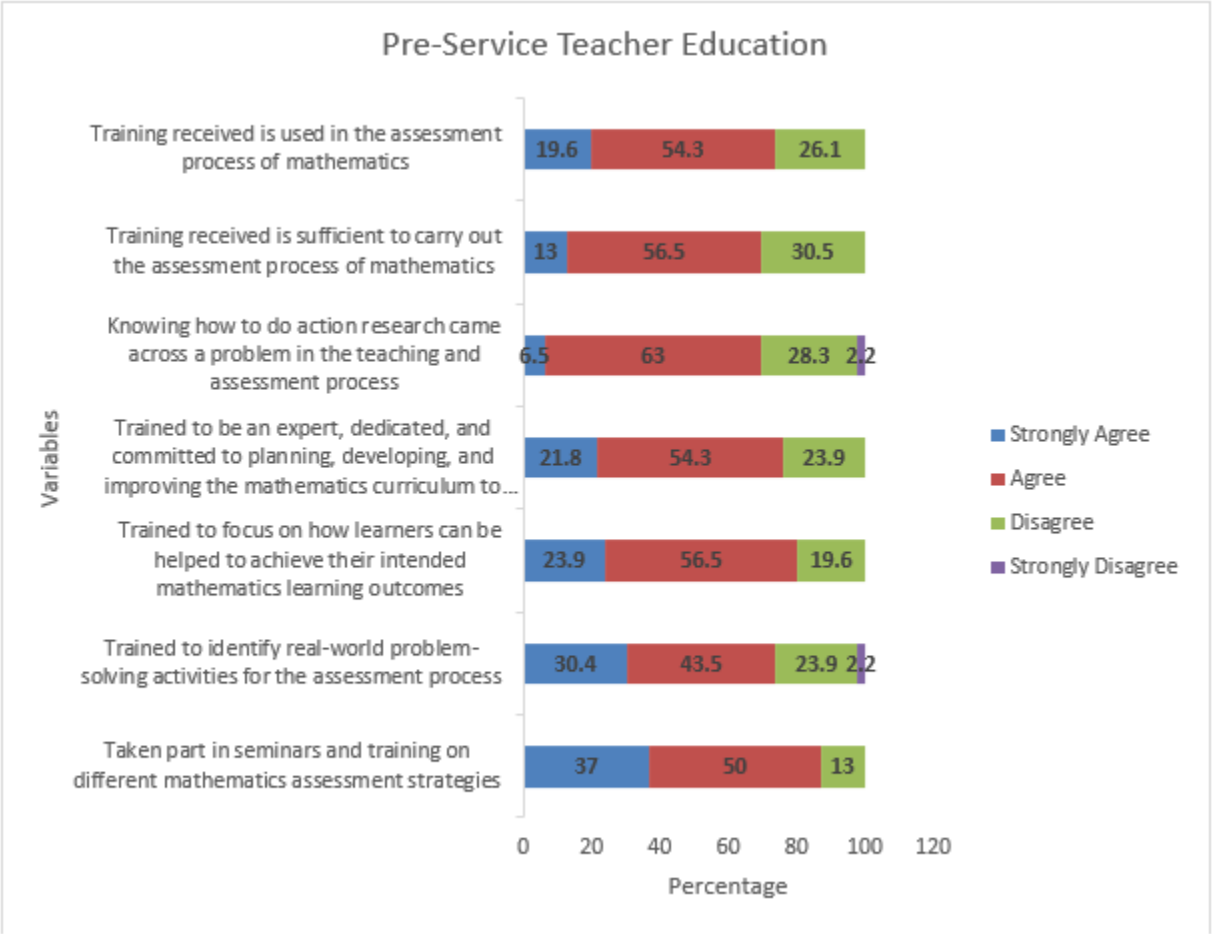

Figure 8: Pre-Service Teacher Education

In-Service Teacher Education

According to Figure 9, 19%–26% disagreed that they collaborated with a small group of teachers to discuss learning goals and plan assessments. Around 43%–47% disagreed or strongly disagreed with the rest of the variables related to in-service training.

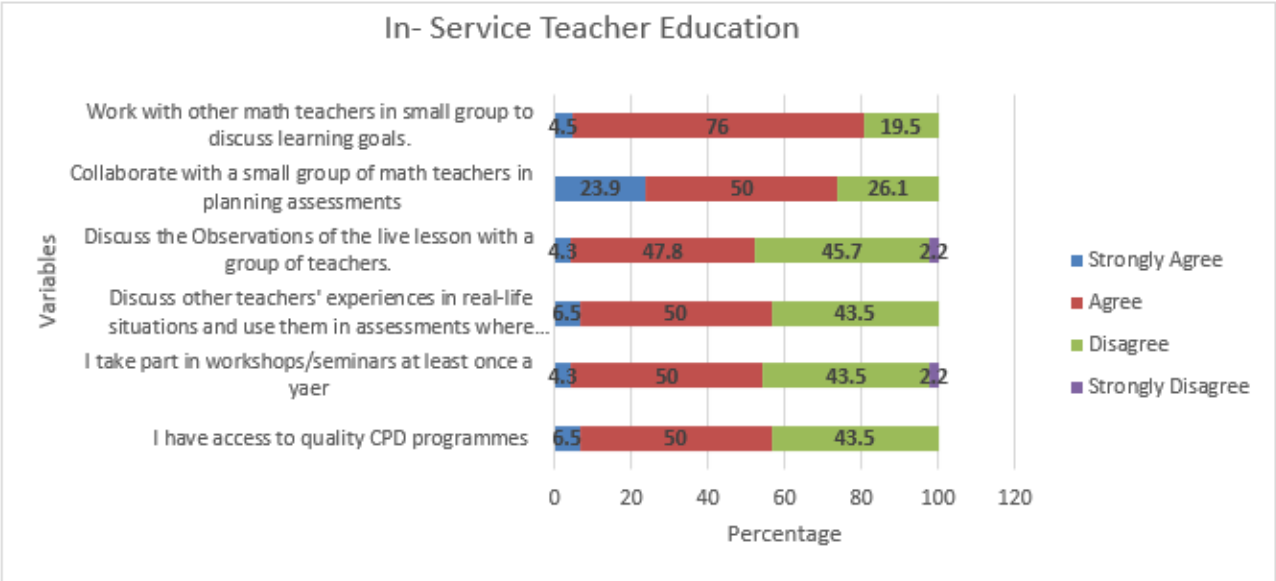

Figure 9: In-Service Teacher Education

Monitoring and Support by Authorities

According to Figure 10, around 43%–54% disagreed with all the variables related to monitoring and support facilities given by the authorities.

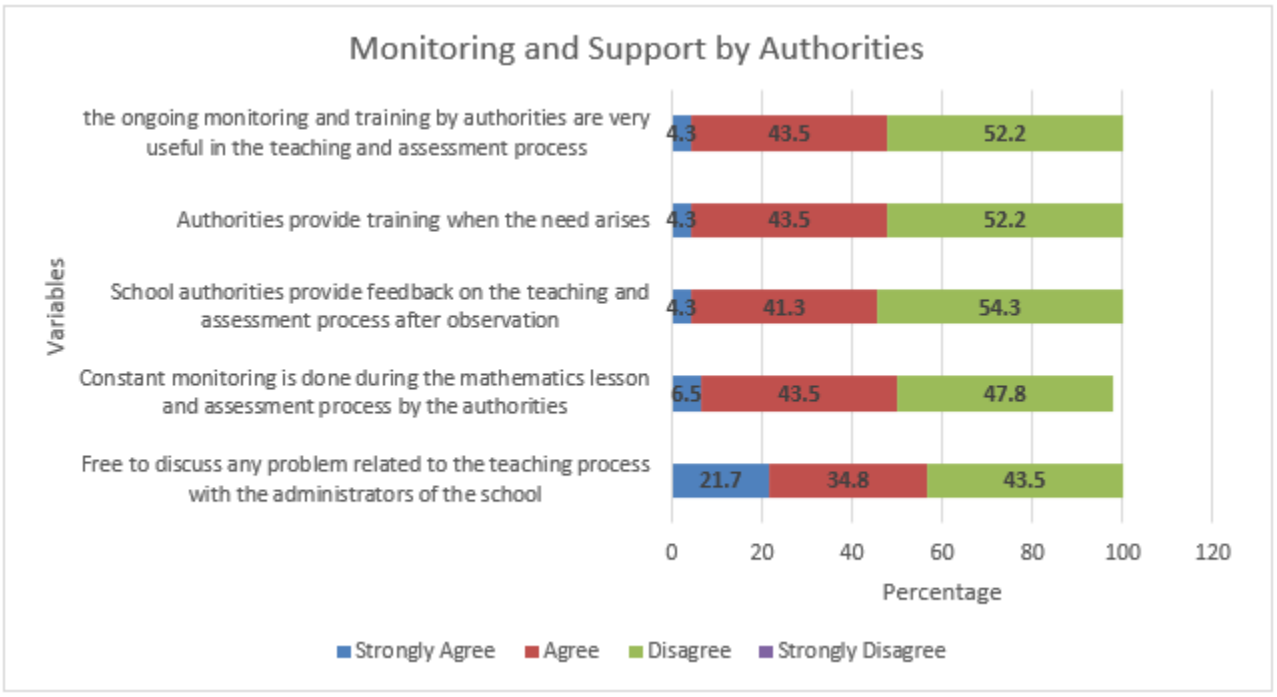

Figure 10: Monitoring and Support Given by Authorities.

Discussion

What assessment methods are used in the CBE-based assessment at the senior secondary level?

In line with Haris *et al*., (2021), more than 88.4% of the teachers indicated using various assessment methods to evaluate student performance. Further, around 83% of the teachers indicated that their assessments mainly built motivation to develop their potential, evaluated students' understanding, and challenged the students with the assessments they provided. At the same time, only 49%–54% agreed on the above variables (Suurtamm *et al*., 2016). Further, around 82% of the teachers indicated that their primary assessment method is questioning after the lesson (Sedere *et al*., 2016). In contrast to Lukindo (2016), 65.2% also mentioned using role-play, group work, quizzes, puzzles, presentations, and other assessment methods. Around 58% of the teachers mentioned that their teaching mainly targeted the term-end and year-end tests (Sedere *et al*., 2016).

Around 84% of the teachers indicated that their students had a clear idea of what is expected of them, and more than 50% agreed that the students self-evaluate their level of achievement through the assessment process (Haris *et al*., 2021; Bingham, Adams & Stewart, 2021). Around 87%–94% of the teachers agreed that they used assessments to evaluate the learning achieved by students and to get a clear idea of what had been achieved by the students (Haris *et al*., 2021; Wongnaa & Boachie, 2018). In contrast, around 50% disagreed that they mapped all stages of students' achievement until they reached the expected competency levels.

What challenges do teachers face in applying CBE-based assessments at the senior secondary level?

64%–79% disagreed that they set personalised goals and worked on a topic till the student reached the expected achievement level. When they reached the expected level, they could move to the following competency ahead of others (Peiris *et al*., 2022). In contrast to Peiris *et al*., (2022), more than 50% indicated that they assessed students using various methods. 84% agreed they used remedial action for slow achievers. In contrast to (Sedere *et al*., 2016), around 50% of the teachers agreed that they practised CBE assessment concepts in their assessment process.

In line with Makunja (2016), Tambwe (2019), and (Amukowa *et al*., 2020), more than 50% of teachers mentioned they did not have sufficient physical as well as financial resources to support the assessment process. In the current study, around 42% disagreed that the class size is favourable to conducting CBE-based assessments (Amukowa, 2020; Wijesundera *et al*., 2023; Makunja, 2016). Around 52% indicated they did not have sufficient multimedia and technology to use in the assessment process (Egodawatte, 2013). Around 76% disagreed that they have adequate qualified human resources to apply CBE-based activities (Sedere *et al*., 2016).

Tambwe, (2019), Mkonongwa (2018), and Wijesundera, *et al*., (2023) identified student cooperation attitudes as a primary challenge faced by teachers in implementing CBE in their teaching process of mathematics. In contrast, the current study revealed that 75% of the teachers were happy with the cooperation received from the students. According to the study, 31% mentioned that their students did not know the CBE approach provided them with relevant skills to meet their career and higher education expectations. Rameli & Kosnin (2017) highlighted that learners would be motivated to learn if they knew the value of skills in their daily lives. Around 30% agreed that students' low cooperation attitude was mainly due to student factors. According to Wijesundera, *et al*., (2023), teachers believed that student factors such as students' interests, attitudes, and motivation, prior knowledge, and language ability stayed at the top of the list. According to the results, 70% were happy with the cooperative attitude of the student toward them and 87% with their peers. Although the cooperative attitude of students in the teaching process was commendable, it still needed attention and improvement.

What types of training and support are given by the authorities for applying CBE-based mathematics assessments at the senior secondary level?

87% of the teachers had participated in pre-service training (Seneviratne, 2018). According to Peiris, *et al*., (2022) and Sedere *et al*., (2016), only approximately 70% of the teachers received training to implement the CBE-based assessment process in the classroom. Also, around 70% of the teachers knew how to conduct action research when there was a problem in the teaching-learning and assessment process (Wijesundera *et al*., 2023).

In contrast to Wijesundera, *et al*., (2023), around 57% of the teachers had access to quality CPD programs, and 57%–80% worked with other teachers as a group to discuss, plan assessments, observe live lessons, and discuss the experiences of other teachers. This is in line with Nawastheen (202), Sedere *et al*., (2016), and Aturupane & Little (2020). In contrast to MOE (2014), around 50% of the teachers mentioned that they did not receive monitoring and support from the school authorities.

Conclusion

The study analyzed the CBE-based assessment in senior secondary mathematics in Sri Lanka, revealing challenges in teacher training, resources, examinations, and student cooperation from teachers' classroom perspectives.

Limitations and Future Work Direction

The study aimed to collect data from all nine provinces of Sri Lanka but was restricted to the Western Province due to government school closures and high costs. Permission issues with private schools limited data collection to one private school in this province. Future research should include a broader range of government and private schools to avoid skewed results. Data collection instruments in this study did not delve deeply into preparing teachers for CBE implementation, and a mixed-method approach might offer better insights into teacher preparation and program improvements. The study focused on teachers' perspectives; future research should also include school administrators and authorities.

Education quality hinges on the teaching-learning process. The Sri Lankan government, school administrators, and stakeholders must overcome assessment barriers. A comprehensive teacher development program is needed to improve math assessment skills, supported by awareness programs and a monitoring system. Diverse assessment methods and school-based programs should be encouraged, with a focus on identifying knowledge gaps, providing feedback, maintaining favorable teacher-student ratios, and equipping schools with modern IT resources.

The author analysed the prevailing CBE-based mathematics assessment process at the senior secondary level from three perspectives:

1. To identify the types of assessments used in the senior secondary mathematics assessment process.
2. To identify the challenges teachers, face in applying CBE-based mathematics assessment
3. To identify training and support received for applying CBE-based mathematics assessment at the lower secondary level.

The findings will directly benefit the authorities, school administration, policymakers, teachers, and future researchers in enhancing the quality of CBE applications in education.

Declarations

Ethics Approval & Consent to Participate: Not applicable.

Conflict of Interests: Not applicable.

Acknowledgement: All the authors are acknowledged, and all the required details are mentioned.

References

Haris, I., Pulukadang, W. T., Husain, R., Ilham, A., & Abdullah, G. (2021). Improving the Quality of Competency-Based Assessment through a Classroom Training Activity. *MEXTESOL Journal*, *45*(2), n2.

Bingham, A. J., Adams, M., & Stewart, R. L. (2021). Competency-based education: Examining educators' experiences. *The Qualitative Report*, *26*(3), 674-695.

Barrett, A., Ali, S., Clegg, J., Hinostroza, J. E., Lowe, J., Nikel, J., ... & Yu, G. (2007). Initiatives to improve the quality of teaching and learning A review of recent literature.

Aturupane, H., Dissanayake, V., Jayewardene, R., Shojo, M., & Sonnadara, U. (2011). Strengthening mathematics education in Sri Lanka.

Aturupane, H., & Little, A. W. (2021). General education in Sri Lanka. In *Handbook of Education Systems in South Asia* (pp. 695-732). Singapore: Springer Singapore.

Peiris, T. C., Abd Hamid, J., Khatibi, A., Azam, S. F., & Tham, J. (2022). IMPACT OF TEACHERS'PROFESSIONAL SKILLS ON STUDENT ACHIEVEMENT WHILE LEARNING ENGLISH AS A SECOND LANGUAGE IN SRI LANKA. *European Journal of Social Sciences Studies*, *8*(1). https://doi.org/10.46827/ejsss.v8i1.1329

Widanapathirana, S., Mampitiya, U., Jayawardena, R. C., & Chandratilleke, K. L. (2016). Study on curriculum development in general education in Sri Lanka. *National Education Commission, Accessed June 3*.

Egodawatte, G. (2014). An analysis of the competency-based secondary mathematics curriculum in Sri Lanka. *Educational Research for Policy and Practice*, *13*, 45-63.

Rameli, M. R. M., & Kosnin, A. M. (2017). Development and validation of math anxiety scale for secondary school students (MAS-SS): Application of Rasch analysis. Man in India, 97(19), 161-172.

Sedere, U. M., Karunaratne, S., Karunanithy, M., & Jayasinghe-Mudalige, U. K. (2016). Study on evaluation & the assessment system in general education in Sri Lanka. *Nugegoda: National Education Commission*.

Suurtamm, C., Thompson, D. R., Kim, R. Y., Moreno, L. D., Sayac, N., Schukajlow, S., ... & Vos, P. (2016). *Assessment in mathematics education: Large-scale assessment and classroom assessment*. Springer Nature. https://doi.org/10.1007/978-3-319-32394-7

Lukindo, J. J. (2016). Exploring Competence Based Education (CBE) in Rural Secondary Schools in Tanzania: English Language Teachers' Conceptions and Experiences. *Journal of Education and Practice*, *7*(29), 62-67.

Makunja, G. (2016). Challenges facing teachers in implementing competence-based curriculum in Tanzania: the case of community secondary schools in Morogoro municipality. International Journal of Education and Social Science, 3(5), 30-37.

Mkonongwa, L. M. (2018). Competency-based teaching and learning approach towards quality education. *Tanzania, Miburani: Dar es salaam University College of Education (DUCE), 12*.

Nawastheen, F. M. (2019). Educational and curriculum changes in Sri Lanka: in light of literature. *Muallim Journal of Social Sciences and Humanities*, 342-361.

Bandara, S. (2016). A Study on in-Service Teacher Education (ISTE) Opportunities in Sri Lanka. International Journal of Science and Research, 7(8), 1335-1338.

Tambwe, M.A. (2019). Challenges Facing the Implementation of a Competency-Based Education and Training (CBET) System in Tanzanian Technical Institutions. *Education in Tanzania in the Era of Globalisation*.

Wijesundera, S., Yatigammana, S., Senevirathne, W., Sethunga, P., Wijethunga, K., Herath, D., ... & Bandara, K. Y. S. C. IMPROVING TEACHING AND LEARNING IN MATHEMATICS AND 21ST CENTURY COMPETENCIES AMONG MATHEMATICS LEARNERS IN THE JUNIOR SECONDARY CLASSROOMS.

Wijesundera, S. (2021). Mathematics Teachers' Beliefs on Students' Low Achievements at Junior Secondary Level of Education in Sri Lanka and Their Implications for School Based Teacher Development (SBTD).

Wongnaa, C. A., & Boachie, W. K. (2018). Perception and adoption of competency-based training by academics in Ghana. *International journal of STEM education*, *5*, 1-13. https://link.springer.com/article/10.1186/s40594-018-0148-x