

Obstacles to Using Computers in Teaching Mathematics in Libya

Maryam Mohammed Alsoudani *

Department of Mathematics, Faculty of Education, University of Bani Waleed, Libya

mhmdalzwb838@gmail.com

عوائق توظيف الحاسوب في تعليم الرياضيات في ليبيا

مريم محمد السوداني اغنيه
قسم الرياضيات، كلية التربية، جامعة بني وليد، ليبيا

Received: 17-05-2026; Accepted: 14-06-2026; Published: 24-06-2026

Abstract:

Computer use in mathematics teaching depends on conditions that extend beyond owning devices. This paper examines these conditions in Libya through a critical literature review. It brings together Libyan education studies, international mathematics research, and established explanations of technology use. Twelve publications were selected through focused searches and reference checking. The review separates direct Libyan mathematics evidence from broader national studies and international comparisons. It also examines a published Libyan teaching pilot and a Malaysian classroom experiment. The retrieved evidence identifies equipment access, teacher preparation, institutional support, and available teaching time as recurring concerns. Language and suitable learning materials also require attention. However, these concerns cannot be ranked nationally because the studies cover different populations and periods. A recent Zliten study provides direct mathematics context, but it does not establish national computer-use barriers. The international experiment shows possible learning benefits, although its short duration limits wider conclusions. The Libyan pilot demonstrates practical implementation while exposing support and workload concerns. The paper proposes a school-level response combining equipment checks, mathematics-specific training, shared lesson preparation, and fair student access. It also presents an evaluation plan using classroom observations, student explanations, and records of interrupted lessons. The central argument concerns dependable teaching conditions. Computers become educationally useful when teachers can connect available tools with mathematical reasoning and curriculum goals. Further Libyan research should test these relationships through sustained classroom studies rather than attitude surveys alone.

Keywords: Libya; mathematics teaching; computers; teacher preparation; technology barriers; critical literature review.

المخلص

يعتمد استخدام الحاسوب في تدريس الرياضيات على مجموعة من الظروف التي تتجاوز مجرد امتلاك الأجهزة. وتتناول هذه الورقة هذه الظروف في ليبيا من خلال مراجعة نقدية للأدبيات العلمية. كما تجمع بين الدراسات الليبية في مجال التعليم، والبحوث الدولية المتعلقة بتعليم الرياضيات، والتفسيرات العلمية الراسخة لاستخدام التكنولوجيا. تم اختيار اثني عشر منشورًا من خلال عمليات بحث موجهة والتحقق من قوائم المراجع. وتفصل المراجعة بين الأدلة الليبية المباشرة الخاصة بتعليم الرياضيات، والدراسات الوطنية الأوسع نطاقًا، والمقارنات الدولية. كما تتناول تجربة تعليمية ليبية منشورة وتجربة صفية أجريت في

ماليزيا. تحدد الأدلة المستخلصة مجموعة من القضايا المتكررة، من أبرزها توفر المعدات، وإعداد المعلمين، والدعم المؤسسي، والوقت المتاح للتدريس. كما تستدعي اللغة وتوفر المواد التعليمية الملائمة اهتمامًا خاصًا. ومع ذلك، لا يمكن ترتيب هذه العوامل على المستوى الوطني، لأن الدراسات تناولت مجتمعات بحثية مختلفة وفترات زمنية متباينة. توفر دراسة حديثة في زليتن سياقًا مباشرًا يتعلق بتعليم الرياضيات، لكنها لا تثبت وجود معوقات استخدام الحاسوب على المستوى الوطني. كما تشير التجربة الدولية إلى وجود فوائد تعليمية محتملة، إلا أن قصر مدتها الزمنية يحد من إمكانية استخلاص استنتاجات أوسع. أما التجربة الليبية فتوضح إمكانية التطبيق العملي، مع الكشف في الوقت ذاته عن تحديات مرتبطة بالدعم المؤسسي وعبء العمل. تقترح الورقة استجابة على مستوى المدرسة تجمع بين فحص توفر الأجهزة، والتدريب المتخصص في مجال الرياضيات، وإعداد الدروس بصورة مشتركة، وضمان وصول عادل للطلبة إلى الموارد التقنية. كما تقدم خطة تقييم تعتمد على ملاحظات الصفوف الدراسية، وتفسيرات الطلبة، وسجلات الدروس التي تعرضت للانقطاع. ويتمحور الطرح الرئيس حول ضرورة توفير ظروف تدريس مستقرة وموثوقة. إذ تصبح الحواشيب ذات قيمة تعليمية عندما يتمكن المعلمون من ربط الأدوات المتاحة بالاستدلال الرياضي وأهداف المنهج الدراسي. وينبغي أن تختبر الدراسات الليبية المستقبلية هذه العلاقات من خلال دراسات صافية ممتدة، بدلاً من الاقتصار على استطلاعات الاتجاهات والآراء فقط.

الكلمات المفتاحية: ليبيا؛ تدريس الرياضيات؛ الحواشيب؛ إعداد المعلمين؛ معوقات التكنولوجيا؛ مراجعة نقدية للأدبيات.

1 Introduction

A mathematics lesson can contain computers without giving students better opportunities to reason. Students might copy a displayed solution without understanding its steps. They might also change a graph and explain why its shape changes. These activities use similar equipment but demand different teaching decisions.

The research problem therefore concerns purposeful classroom use. Computer ownership provides only a partial measure of educational capacity. A working device must be available when the teacher needs it. The teacher must also choose a task that serves a mathematical goal. Students need opportunities to interpret the resulting representations.

In Libya, this problem requires careful treatment of the available evidence. Studies differ in subject, location, education level, and publication date. A university survey cannot describe every secondary mathematics classroom. An English teaching study can identify institutional concerns without proving their prevalence among mathematics teachers.

Al-Fazzani et al. (2026) provide recent mathematics evidence from Zliten. Their survey involved 99 secondary mathematics teachers. Reported difficulties included extensive curriculum content, weak connections between units, limited resources, and weaknesses in students' basic skills. These findings establish relevant teaching pressures. They do not directly measure the national prevalence of computer-use obstacles.

Broader Libyan evidence helps frame questions that mathematics research should investigate. Salem and Mohammadzadeh (2018) examined technology adoption among English teachers. Their mixed-method study identified problems at teacher, student, school, and system levels. This classification supports examination of interacting conditions. Its findings should remain attached to its language-teaching setting.

The present paper asks which obstacles have support within the retrieved literature. It also asks how these obstacles could affect mathematics lessons. A further question concerns responses that schools could test with limited resources. These questions guide an interpretive review, rather than a new survey or classroom experiment.

The paper contributes a distinction between access, teaching capability, and continued classroom use. It also connects each proposed response with observable evidence. This

approach avoids treating equipment purchases or favourable attitudes as proof of better mathematics learning.

2 Scope and conceptual basis

2.1 Meaning of computer use

Computer use here includes teacher demonstrations and student activities involving desktops or laptops. Relevant tasks include graphing, geometric construction, numerical exploration, spreadsheets, and mathematical feedback. Online delivery is included when it supports these teaching activities. Administrative recordkeeping alone falls outside the definition.

Computers and internet access should be examined separately. Some mathematical activities can use locally stored software and files. Other activities require a connection for participation or feedback. A lesson can therefore face a connectivity obstacle without losing every possible computer-supported activity.

Likewise, access has several meanings. A device might exist within a school but remain unavailable during mathematics periods. Students might share equipment without receiving equal operating time. A personal computer at home does not establish access to a suitable classroom activity.

These distinctions shape the review's interpretation. The relevant question concerns what teachers and students can actually do. Counting devices without checking availability, usability, and participation can conceal the teaching problem.

2.2 External conditions and teacher beliefs

Ertmer (1999) distinguishes external barriers from barriers involving teachers' beliefs and established practices. External barriers include conditions such as resources and support. Internal barriers concern how teachers understand teaching and judge technology's value. The distinction helps explain why equipment provision may leave classroom practice unchanged. The categories should not become labels for blaming teachers. A teacher may avoid a task after repeated technical failures. That decision could reflect a reasonable response to unreliable conditions. Beliefs and working conditions should therefore be investigated together.

Hew and Brush (2007) describe barriers involving resources, institutions, subject culture, attitudes, knowledge, and assessment. Their review broadens the explanation beyond individual willingness. It also supports examining whether school expectations reward the teaching practices that computer activities require.

2.3 Knowledge needed for mathematics teaching

Mishra and Koehler (2006) connect technological, pedagogical, and subject knowledge within their teacher knowledge framework. This framework is commonly called TPACK. It directs attention to the relationship between a tool, a teaching approach, and specific content.

For example, drawing a parabola requires some software knowledge. Teaching its turning point requires mathematical knowledge and carefully chosen questions. Combining both demands decisions about examples, student predictions, and explanations. A general computer course may leave these decisions unaddressed.

Figure 1 identifies the knowledge areas used within this review. The figure provides a conceptual reference, rather than evidence about Libyan teachers. Its purpose is to clarify why subject-specific preparation deserves separate attention.

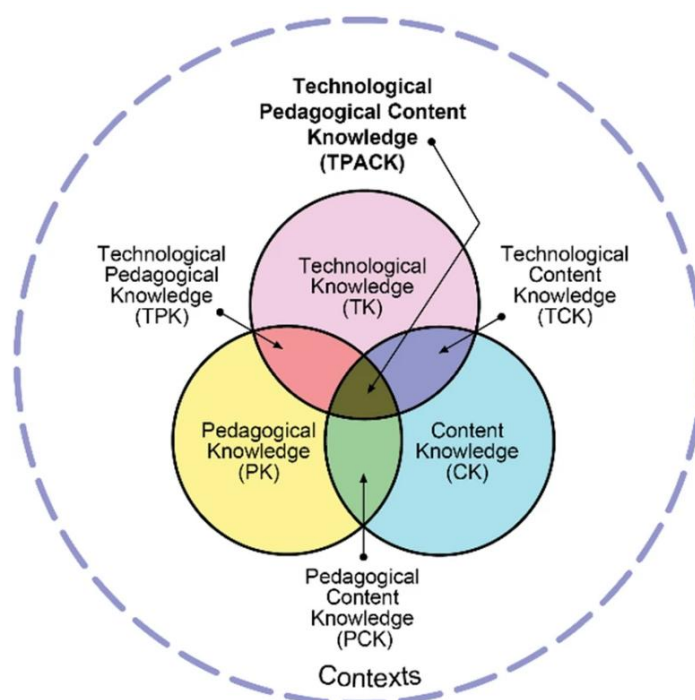


Figure 1 Knowledge areas involved in teaching with technology. Source: Zunica (2023).

3 Review method

3.1 Review design and retrieval

This paper uses a focused critical literature review. Searches were conducted on 30 September 2026 through two web search engines. Publisher websites, ERIC, university repositories, and arXiv supplied source material. Searches combined Libya, mathematics teachers, computers, ICT, barriers, obstacles, and GeoGebra. Further searches examined teacher knowledge, implementation trials, and mathematics technology outcomes.

Reference checking helped locate earlier studies and conceptual publications. Arabic-language publication pages were considered when they directly addressed Libyan mathematics teaching. The Zliten paper was assessed through its publisher abstract and metadata. Its full methods and measurement instrument were not available for detailed assessment here.

The review retained twelve publications for the manuscript's argument. It did not use a registered protocol or independent duplicate screening. Search-engine ranking and accessible records influenced selection. Consequently, it should not be described as an exhaustive systematic review.

3.2 Selection and evidence categories

Sources were selected when their methods, context, or concepts addressed the review questions. Priority went to Libyan empirical evidence and mathematics-specific classroom research. Conceptual works were retained where they explained the connection between teaching and technology. Commercial promotion, stock-image websites, and unsupported commentary were excluded.

The final set contains five Libyan studies and four international mathematics publications. It also contains three general conceptual or review publications. These categories describe the retained set, rather than the entire research field. Publication dates range from 1999 to 2026.

Libyan mathematics evidence received priority for local subject context. Libyan studies from other subjects informed possible institutional explanations. International mathematics studies informed subject-specific mechanisms and practical examples. They were not treated as estimates of Libyan conditions.

3.3 Extraction and interpretation

Extraction focused on setting, participants, study design, reported findings, and limits. Numerical results were retained only when their source and meaning were identifiable. Descriptive findings were compared across contexts without pooling percentages. Different survey populations cannot provide a defensible combined national barrier rate.

The review also distinguished observation from interpretation. Statements about published participants describe source findings. Classroom examples explain possible mechanisms. Proposed actions and evaluation measures represent this paper's recommendations, requiring future testing.

Quality appraisal was qualitative rather than a numerical scoring exercise. Attention focused on sampling, self-report measures, study duration, and comparison design. Limited access to some full texts restricted appraisal. No unreported reliability values, participant characteristics, or significance tests were supplied.

3.4 Evidence boundaries

The Al Ghawail et al. manuscript was read through its 2021 arXiv deposit. It is cited as that version, without assuming a verified journal publication. Other sources include historical studies that cannot establish current national conditions.

No new interviews, observations, or experiments were conducted for this review. The paper contains no original participant dataset. Its conclusions concern patterns and research priorities within the selected literature. The recommendations remain proposals rather than demonstrated improvements.

Table 1 summarises the main empirical sources. Each row preserves the boundary between its setting and the present topic.

Table 1 Selected empirical evidence and its limits.

Study	Setting and design	Relevant evidence	Main limit
Al-Fazzani et al. (2026)	Zliten; survey of 99 mathematics teachers	Curriculum, resources, and student preparation	Publisher abstract assessed; not a computer-use survey
Salem and Mohammadzadeh (2018)	Libya; mixed-method English teaching study	Obstacles across several educational levels	Different teaching subject; availability sampling
Al Ghawail et al. (2021)	Al Asmarya; 30 teachers and students	Infrastructure, knowledge, and funding concerns	Small mixed population; arXiv version
Rhema and Miliszewska (2014)	Two Libyan universities; 348 engineering students	Attitudes and technology access	Historical self-report data; not school mathematics
Rhema and Miliszewska (2011)	Libyan university; 60-day teaching pilot	Practical delivery and support demands	Computing course; no causal mathematics comparison
Shadaan and Leong (2013)	Malaysia; 53 pupils in two classes	GeoGebra circle-learning comparison	One week; intact classes
De Freitas and Spangenberg (2019)	South Africa; 93 teachers and 10 interviews	Mathematics knowledge and integration barriers	Self-report evidence outside Libya
Zunica (2023)	Australia; four mathematics teacher cases	Preparation, curriculum, and assessment pressures	Small contextual study

4 Findings and interpretation

4.1 Equipment access and dependable lessons

Al Ghawail et al. (2021) identify infrastructure, knowledge, and funding concerns at Al Asmarya Islamic University. Their study involved 30 teachers and students. The findings support investigating whether teaching facilities meet practical needs. They cannot establish how many Libyan mathematics classrooms lack functioning computers.

Figure 2 presents their published barrier chart as contextual evidence. Its categories should not be relabelled as mathematics-teacher responses. The percentages should also remain within the original study's population and reporting conventions.

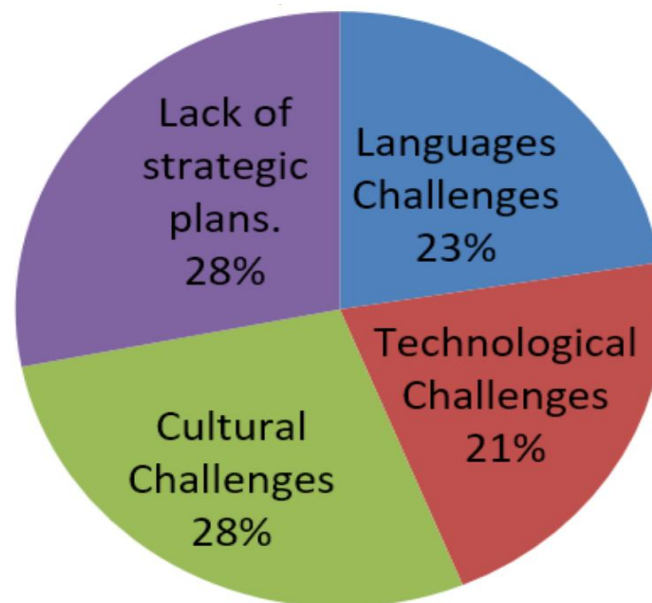


Figure 2 Reported obstacles within a Libyan university study. Source: Al Ghawail et al. (2021).

For mathematics teaching, an access audit should test the intended activity. A machine that opens a presentation may struggle with another application. A projector might display a graph without making its axis labels readable. The audit should therefore include the software, room, and task together.

These are proposed audit requirements, rather than measured conditions across Libya. They matter because each can prevent participation despite nominal equipment availability. A practical audit should record working devices, booking arrangements, start-up time, and common failures. It should also record whether students can save and reopen their work.

Electricity and connectivity deserve separate records wherever they interrupt planned lessons. Their local importance should be measured, rather than assumed from general accounts. Schools could record the duration and teaching consequences of each interruption. This would distinguish minor inconvenience from repeated cancellation of mathematical activities.

Repair arrangements also affect usable access. An equipment inventory should identify who receives fault reports and checks repairs. Replacement parts and technical visits belong within the teaching budget. Otherwise, a purchased device can remain present but educationally unavailable.

4.2 Preparation that connects software with mathematics

De Freitas and Spangenberg (2019) examined 93 South African mathematics teachers, including interviews with ten participants. Teachers reported stronger subject and pedagogical knowledge than several technology-related knowledge areas. Interview findings included time

constraints, infrastructure, professional development, beliefs, leadership, and concerns about learning.

These findings help identify questions for Libya. They do not prove equivalent knowledge levels among Libyan teachers. A local assessment should ask teachers to demonstrate a mathematics task. Confidence ratings alone cannot show whether a teacher can design useful questions.

The proposed assessment should use familiar curriculum content. A teacher might construct a graph, change a parameter, and explain the resulting change. The assessor could then examine how the teacher handles a likely misconception. This makes the evidence closer to classroom work.

Training should begin with such tasks. Teachers could first experience an activity as learners. They could then discuss its mathematics and adapt its questions. A final stage could involve teaching the activity and examining students' written explanations.

Success should mean more than completing software instructions. A teacher should be able to explain why the computer supports that particular lesson. Training should also include a workable response when the intended activity fails. This protects teaching time while allowing experimentation.

4.3 Curriculum demands and available time

Zunica (2023) studied four Australian secondary mathematics teachers through interviews, planning documents, and lesson observations. Preparation time, extensive syllabuses, and traditional assessment demands restricted technology use. These cases show how time pressures can make computer activities impractical.

The Zliten findings make curriculum pressure locally relevant, although the studies measure different problems (Al-Fazzani et al., 2026). They should be read together as grounds for investigation. Their combination does not establish that curriculum load causes low computer use in Libya.

A useful local question concerns the time required for one complete activity. Preparation includes selecting examples, checking files, and anticipating student difficulties. Classroom time includes opening software, interpreting displays, discussing findings, and closing the lesson. These demands should be compared with the lesson's learning value.

Schools could test short activities before adopting entire digital units. For example, a brief graph comparison might replace repeated board drawing. Students would still explain the mathematical relationship in writing. The aim would be to improve a defined teaching task within available time.

Shared preparation could reduce repeated effort. Teachers could retain a tested file, a short lesson guide, and examples of common errors. However, a shared file should include its mathematical purpose. A collection of attractive displays alone would leave teachers to rebuild the lesson.

4.4 Beliefs about reasoning and calculation

Teachers may reasonably question whether software encourages understanding or answer copying. This concern should be investigated through actual task design. A task that requests only a final numerical answer differs from one requiring a prediction and explanation.

For example, students could predict how a line changes when its slope increases. They could then test their prediction and explain any disagreement. The teacher could ask students to connect the graph with an equation. The computer would support comparison while the explanation remained the student's responsibility.

Ertmer's (1999) distinction helps frame this issue without reducing it to reluctance. Teachers' judgements about learning belong within the explanation of use. They should be examined alongside reliability and available support.

The review therefore proposes observing how teachers question students during computer activities. Do they ask for descriptions, reasons, or verification? Do students explain results beyond reading the screen? These observations would offer stronger evidence than a general statement that computers are useful.

4.5 Language and suitable materials

Al Ghawail et al. (2021) also identify language and policy concerns. These findings justify examining the language demands of selected mathematics software and teaching materials. They do not justify assuming that every Libyan teacher has the same language difficulties.

The practical issue includes more than translating menu labels. Mathematical notation, instructions, examples, and feedback must work together. A student might understand a displayed graph while misunderstanding the task instructions. Conversely, clear instructions might accompany an incorrect or confusing representation.

Materials should therefore be checked through a real lesson before wider use. A mathematics teacher should review content and terminology. Students should explain what they believe each instruction asks them to do. Their responses can reveal difficulties that a technical inspection misses.

An Arabic teaching guide could accompany software that retains some English commands. The guide should identify essential commands without turning the lesson into vocabulary memorisation. Examples should use consistent symbols and readable labels. These are proposed design measures, requiring local classroom testing.

4.6 Student access and participation

Rhema and Miliszewska (2014) surveyed 348 engineering students at two Libyan universities. Their data were collected during 2011 and 2012. Students generally reported positive attitudes towards technology-supported learning. Access and skills were associated with attitudes, but the survey did not establish causation.

Figures 3 and 4 preserve the distinction between attitudes and access. These historical university results cannot describe present secondary students. They nevertheless show why willingness and practical opportunity should be measured separately.

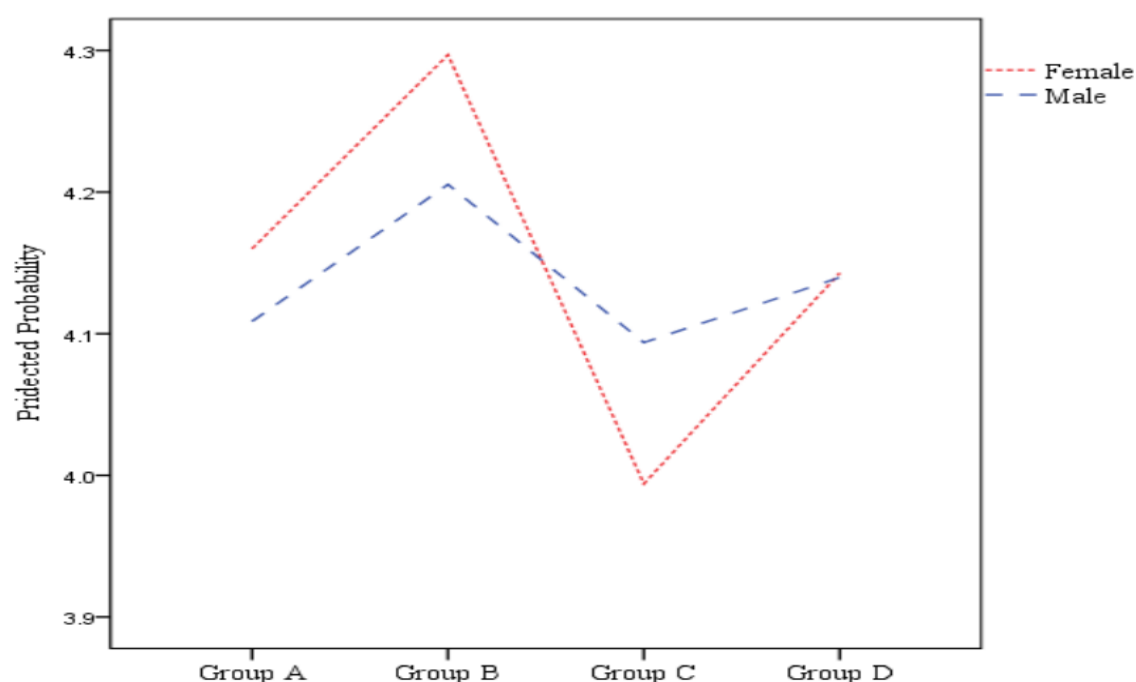


Figure 3 Student attitudes across groups within two Libyan universities. Source: Rhema and Miliszewska (2014).

Within a mathematics classroom, participation requires more than being near a computer. One student may control the device while others copy the result. A proposed observation sheet should record who operates, predicts, explains, and checks. These roles can rotate during paired work.

Homework access should also be examined before assigning computer-dependent tasks. A school could offer supervised practice or an equivalent non-digital route. Equivalent work should address the same mathematical goal. It should not reduce disadvantaged students' opportunity to learn the central concept.

Accessibility requires attention to readable text, clear contrast, and alternatives to visually dense instructions. Students should have ways to communicate their reasoning without unnecessary technical obstacles. These measures are proposed inclusion practices, not findings about their current availability in Libyan schools.

4.7 Leadership and continuing support

Salem and Mohammadzadeh (2018) show why technology adoption deserves examination beyond the individual classroom. Their categories direct attention towards responsibilities distributed across educational levels. For this review, the practical question concerns who makes classroom use possible over time.

A school plan should name responsibility for equipment access, repair, and shared materials. It should also provide teachers with protected preparation time. These arrangements can be evaluated through records rather than statements of general support.

Support should not depend entirely on one enthusiastic teacher. If that teacher leaves, files, passwords, and practical knowledge should remain accessible to authorised staff. Schools could maintain a short guide explaining storage, booking, and fault reporting. The guide should support teaching without adding unnecessary paperwork.

Table 2 translates the interpretation into questions for school investigation. It presents a proposed diagnostic tool, rather than a validated national instrument.

Table 2 Proposed school questions for identifying obstacles

Area	Question for investigation	Evidence to collect
Equipment	Can the planned activity run during the lesson?	Task-based equipment check
Teacher preparation	Can the teacher connect the tool with a mathematical explanation?	Observed teaching task
Time	Which preparation or classroom steps cause delay?	Preparation and lesson records
Materials	Do students understand the instructions and representations?	Student explanations and work
Participation	Who operates the device and explains the result?	Short classroom observations
Support	Who resolves faults and how long do repairs take?	Fault and repair records
Assessment	Do tasks assess reasoning beyond screen output?	Review of student assessment

5 Published practical evidence

5.1 A mathematics classroom experiment

Shadaan and Leong (2013) compared two intact Year 9 classes in Malaysia. The study involved 53 students learning circle concepts. Twenty-eight students used GeoGebra, while 25 received conventional instruction. The intervention lasted one week, and the researcher taught both groups.

Reported post-test means were 16.46 and 12.24, respectively. Table 3 presents the published descriptive values. The comparison supports possible benefits within that setting. It does not establish an expected improvement for Libyan classrooms.

Table 3 Published circle-learning scores from the Malaysian comparison.

Group	Students	Pre-test mean	Post-test mean	Post-test SD
GeoGebra	28	6.96	16.46	3.28
Comparison	25	7.88	12.24	4.40

The short duration and intact classes limit causal interpretation and wider transfer. A non-significant pre-test difference does not prove that groups were equivalent. The descriptive results are reported without recalculating uncertain within-group statistics.

Figure 5 presents the study's conceptual model. Its value here concerns the connection between technology, interaction, and understanding. A Libyan replication would need suitable tasks, reliable access, and independent assessment of mathematical reasoning.

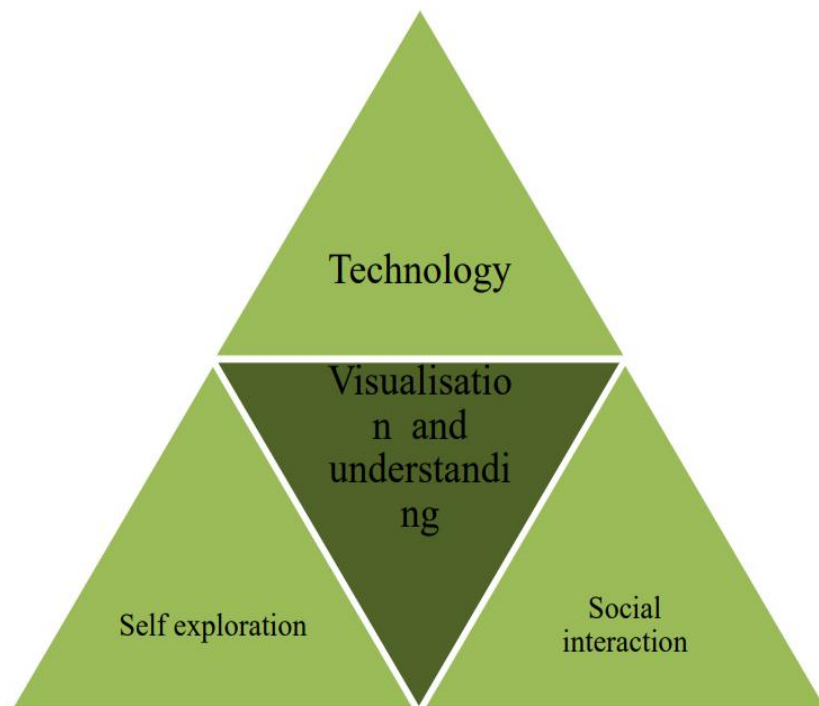


Figure 4 Learning processes in the published circle-learning experiment. Source: Shadaan and Leong (2013).

5.2 A Libyan implementation trial

Rhema and Miliszewska (2011) describe a 60-day Blackboard pilot at Aljabal Algharbi University in Gharian. The selected course was Introduction to Computing. Activities connected preparation before class, classroom work, and follow-up tasks. Students completed three assignments within the trial.

The report describes favourable experiences alongside inadequate technical support and substantial instructor workload. It provides practical implementation evidence, rather than a controlled mathematics achievement experiment. Its historical software arrangement should not be treated as a current product recommendation.

Figures 6 and 7 show published course pages from this implementation. The screenshots document actual teaching organisation. Their relevance concerns how materials and communication were arranged. They do not demonstrate that the same platform would meet current school needs.

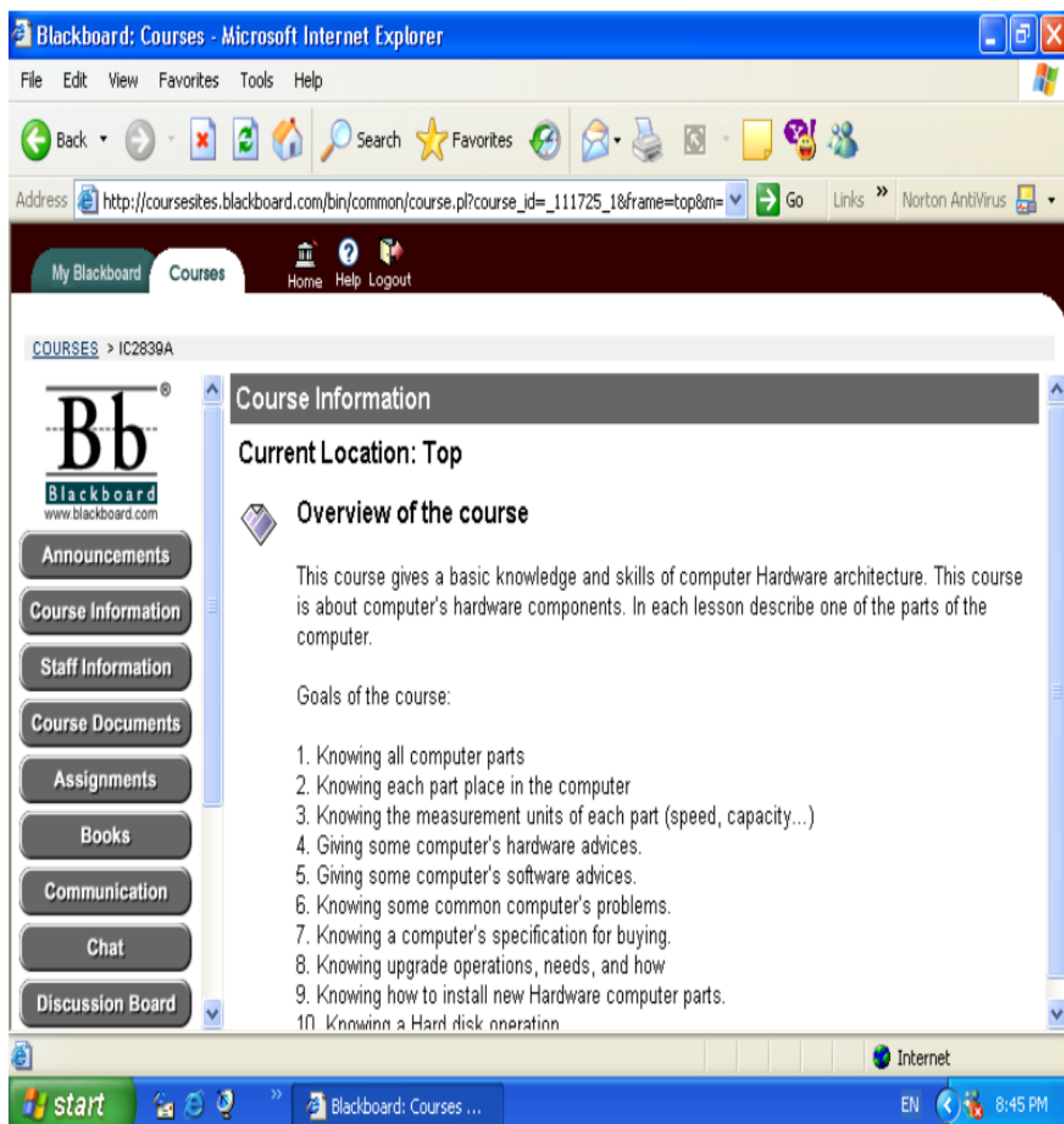


Figure 5 Course information within a published Libyan teaching pilot. Source: Rhema and Miliszewska (2011).

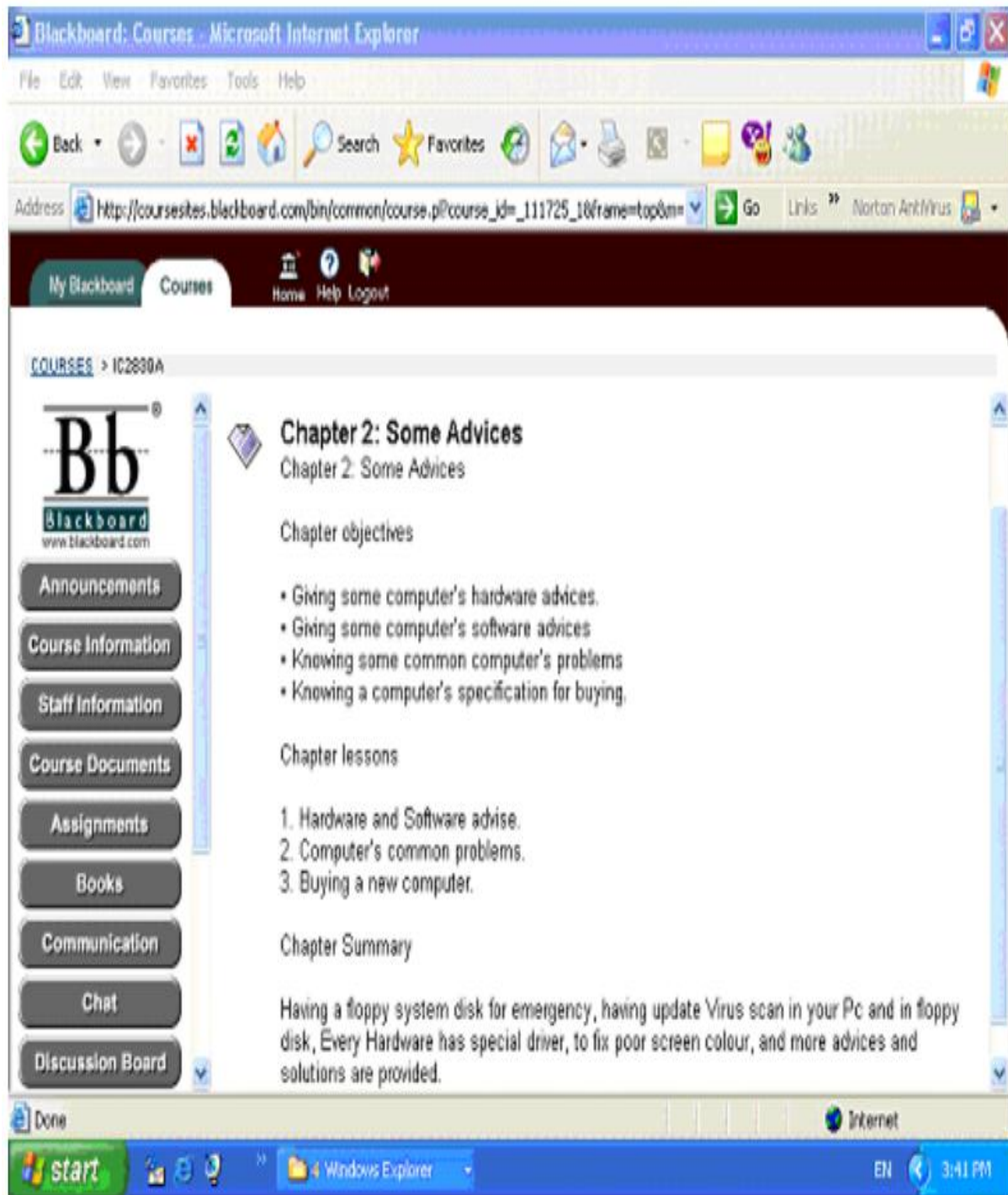


Figure 6 Lecture materials within the same Libyan teaching pilot. Source: Rhema and Miliszewska (2011).

For mathematics, the practical implication is a question of teaching organisation. Could students receive a short problem before class and explain a tested conjecture afterwards? The arrangement would need manageable feedback demands and fair access. This proposal follows the pilot's organisational example without claiming a replicated learning effect.

5.3 Evidence beyond one classroom

Cheung and Slavin (2013) reviewed 74 studies involving 56,886 school students. Their reported overall effect size was positive but small, at 0.16. This broader result helps place small

classroom studies in perspective. Educational technology cannot be expected to produce large gains merely through installation.

The implication concerns evaluation standards. Schools should compare learning outcomes with the resources and time required. They should also examine whether improvements continue after initial excitement fades. A promising trial should justify further investigation, rather than immediate claims of national effectiveness.

6 Discussion

6.1 Obstacles operate together

The selected evidence supports a connected explanation of computer use. Equipment, knowledge, time, and support appear across different settings. However, their presence within several publications does not measure their relative importance in Libya. The review therefore offers explanatory propositions for local testing.

The first proposition concerns reliability. Teachers may reduce computer use when preparation repeatedly ends in interrupted lessons. The second concerns task design. Reliable equipment may have limited educational value when activities require little mathematical thought.

The third proposition concerns time. Even capable teachers may avoid activities that exceed available preparation and lesson time. The fourth concerns continuity. Initial use may decline when repairs, shared materials, or staff support disappear.

These propositions describe possible relationships rather than proven causal paths. They should guide observation and interviews together. Teachers' accounts can explain decisions, while classroom records can test whether the reported conditions occur.

A useful comparison would examine schools with similar equipment but different teaching routines. Another would examine teachers with similar training but different access arrangements. Such comparisons could reveal why the same resource produces different patterns of use.

6.2 What is distinctive about mathematics

Mathematics adds demands that general technology surveys can overlook. Students must connect symbolic expressions, numerical values, diagrams, and verbal explanations. A computer may produce each representation quickly. The teaching challenge concerns helping students explain their connections.

Visual accuracy also deserves attention. A graph's viewing window can hide relevant behaviour. A geometric sketch can appear correct without satisfying the intended construction. Students need questions that distinguish appearance from mathematical justification.

These examples explain why generic computer competence cannot fully describe readiness. Teachers should recognise when a display may mislead. They should also ask students to verify results through another representation or a written argument.

Assessment should preserve this requirement. A saved image may show successful software operation while revealing little understanding. A short explanation can ask what changed, what remained fixed, and why. The response provides evidence that the image alone cannot supply.

6.3 Interpreting resistance with care

The term resistance can obscure several different problems. A teacher may reject an unsuitable activity while accepting another. A teacher may support computer use but lack dependable access. A teacher may also need practice with a specific mathematical tool.

These situations require different responses. Additional devices cannot repair a poorly designed lesson. A motivational workshop cannot resolve a locked laboratory. An advanced software course may be premature when basic classroom arrangements remain uncertain.

Hew and Brush (2007) support examining institutional and assessment conditions alongside knowledge and attitudes. The present review extends that distinction into a practical diagnosis. Schools should identify the blocked teaching activity before selecting a response.

6.4 National claims and local variation

Libya should not be treated as one uniform classroom setting. The selected studies cover particular institutions and teaching contexts. Their dates also span considerable educational and technological change. A finding from an earlier university cohort may remain informative without remaining representative.

The Zliten study offers useful local mathematics context, but its geographical reach is limited. The present review found no basis for estimating national barrier percentages. It also found no basis for ranking municipalities or declaring one cause dominant.

Future work should report setting and timing clearly. School type, education level, subject topic, and available facilities should accompany each claim. This would support more meaningful comparisons between studies and avoid unsupported generalization.

7 Proposed response for Libyan schools

7.1 Begin with one teachable activity

The following programme is an original proposal informed by the review. It has not been implemented or tested for this paper. Its starting point is one curriculum-linked activity within participating schools.

The school should select a mathematical goal before selecting software. A suitable first goal might involve comparing linear graphs or testing a geometric relationship. The activity should be brief enough for the existing timetable. Teachers should be able to explain its added learning value.

Next, the intended activity should be tested on available equipment. This check should include file access, display quality, and saving procedures. A printed alternative should preserve the central mathematical question if a technical interruption occurs.

7.2 Build teacher preparation around lesson work

Preparation should use the chosen activity throughout. Teachers should practise the software and discuss likely student errors. They should write questions that require prediction, explanation, and checking. Colleagues should then examine whether those questions reveal understanding.

A supported lesson should follow the preparation session. An observer could record student participation and moments of confusion. Afterwards, the teacher and observer should inspect several examples of student work. Changes should respond to observed difficulties rather than general impressions.

This process should produce a small reusable teaching package. It should contain the activity file, learning goal, questions, and technical instructions. It should also record limitations discovered during teaching. Other teachers could then adapt it without repeating every preparation step.

7.3 Organise access and support

The school should schedule access around actual teaching needs. Equipment booking should identify both the room and the required application. Fault reports should record the affected activity and the expected repair response.

Paired student work may be useful where devices are limited. Each pair should alternate operating and explaining roles. Teachers should verify that both students can describe the mathematics. Shared equipment should not become an excuse for passive participation.

Costs should include staff time and maintenance. A free application can still require preparation, technical assistance, and replacement equipment. Schools should compare complete activity costs rather than software prices alone. Table 4 outlines the proposed responsibilities and checks.

Table 4 Proposed implementation sequence and review measures.

Stage	Main responsibility	Evidence before moving forward
Check readiness	School leader and technical staff	Activity runs on available equipment
Prepare teaching	Mathematics teachers	Questions connect software output with reasoning
Teach a small trial	Teacher and observer	Student participation and explanations recorded
Review the lesson	Mathematics teaching team	Problems identified through student work
Continue or revise	School leader and teachers	Learning value compared with time and cost

7.4 Expand only after reviewing learning

Expansion should follow evidence of workable teaching. More lessons should not be added simply because the first session appeared enjoyable. Review should examine mathematical explanations, access difficulties, and teacher preparation demands.

A school may decide to retain one activity while revising another. Such decisions should be documented with examples of student work. This would create a practical record of what succeeds under particular conditions.

Wider programmes should permit local adjustment. Schools with different equipment may need different activity arrangements. However, they should retain common learning goals and evaluation questions. This balance would allow comparison without assuming identical teaching conditions.

8 Future research design

8.1 A local study of barriers

A future study should combine a teacher survey, classroom observation, and equipment inspection. Sampling should include clearly described schools and locations. Mathematics teachers should be identified separately from other teaching staff.

Survey items should describe observable situations. For example, an item could ask whether equipment was unavailable during a planned mathematics lesson. Another could ask whether the teacher had time to prepare the required activity. Responses should refer to a defined period. A single agreement score should not combine unrelated barriers. Equipment failure, confidence, and assessment pressure deserve separate measures. Open questions should allow teachers to describe obstacles omitted from the initial instrument.

Pilot interviews should check how teachers understand each question. Teachers could explain their chosen responses and identify unclear terms. Revisions should preserve the intended meaning across language versions.

Researchers should also examine non-participation. Teachers without regular computer access may be less likely to complete an online survey. Offering a paper version could reduce that particular selection problem. The response rate and missing answers should be reported.

8.2 A classroom intervention

A separate study could test a supported mathematics activity against usual instruction. The topic, lesson time, and learning objectives should be comparable across groups. Allocation should occur at a level that limits sharing between intervention and comparison classes.

Where random allocation is possible, schools or classes could be assigned before teaching begins. Where it is impossible, researchers should document how groups were chosen. Baseline

knowledge should be measured without assuming that similar averages remove every difference.

The study should continue beyond a single introductory session. It should include a later assessment of retained understanding. Student tasks should test explanation and transfer, alongside accurate answers. Marking should use clear criteria established before outcomes are examined.

If classes receive the intervention together, analysis should account for that grouping. Sample size should follow the expected design and meaningful learning difference. It should not be chosen solely because a convenient number of pupils is available.

8.3 Measuring implementation and learning together

Researchers should record whether planned activities actually occurred. A weak outcome may reflect poor task design or repeated technical interruption. Without implementation records, these explanations remain difficult to distinguish.

Preparation time, interrupted lessons, and support requests should accompany learning measures. Student work should show how learners interpreted representations and justified conclusions. Interviews could then explore why particular difficulties occurred.

Results should report uncertainty and missing data. Unsupported claims of improvement should not replace group comparisons. Positive attitudes should remain separate from demonstrated mathematical learning. Table 5 identifies proposed outcomes and their interpretation.

Table 5 Proposed measures for a future classroom study.

Measure	Collection method	What it can establish
Mathematical understanding	Common tasks with explanation scoring	Performance on defined learning goals
Retention	Delayed assessment	Whether measured learning persists
Classroom participation	Structured observation	Who operates, explains, and checks
Lesson reliability	Activity and interruption records	Whether intended teaching occurred
Teacher workload	Preparation and support logs	Time needed to maintain the activity
Student experience	Short survey and interviews	Perceptions and reported difficulties

Research involving pupils should follow institutional ethics procedures and appropriate consent requirements. Participation should not affect grades or access to teaching. Identifiable information should be limited to what the approved study requires.

9 Limitations of the review

The review uses a selected body of accessible literature. It does not provide comprehensive database coverage or independent screening. Additional Arabic publications, theses, and local reports may contain relevant findings.

Some sources address university teaching or subjects other than mathematics. These sources provide context, but their findings require careful transfer. Historical evidence also cannot establish present access or current teacher preparation.

The recent Zliten source was available through its publisher abstract and bibliographic record. This restricted detailed appraisal of its instrument and sampling. The paper therefore uses its broad findings without extending them into unreported computer-use results.

The international evidence involves different curricula and school arrangements. Even relevant mathematics studies cannot predict the size of a Libyan intervention effect. The proposed programme and evaluation plan require local testing before wider adoption.

The review's principal value is diagnostic. It identifies what should be measured and which interpretations should be avoided. It cannot determine national prevalence, causal rankings, or programme cost-effectiveness from the retrieved sources.

10 Conclusion

Obstacles to computer use in Libyan mathematics teaching require investigation at several connected levels. The retrieved literature identifies relevant concerns about resources, preparation, time, materials, and continuing support. Direct national evidence remains insufficient for ranking these concerns.

The practical response should begin with a defined mathematics task and dependable teaching conditions. Teachers need preparation that connects software use with explanation and reasoning. Schools need arrangements that sustain access, repair, and shared preparation.

Published practical studies show possibilities, alongside clear limits. A future Libyan study should combine classroom observation with measured learning and implementation records. This would move the discussion towards evidence about what students understand and what teachers can maintain.

References

- [1] Al-Fazzani, A. A., Hanafi, A. A., & Al-Walid, S. M. (2026). Su'ubat tadris maddat al-riyadiyyat min wijhat nazar mu'allimi al-marhalah al-thanawiyyah bi-madinat Zliten [Difficulties in teaching mathematics from secondary school teachers' perspectives in Zliten]. *Journal of Educational Sciences*, 7(1), 1–28. <https://doi.org/10.59743/jes.v7i1.163>
- [2] Al Ghawail, E. A., Ben Yahia, S., & Alrshah, M. A. (2021). *Challenges of applying e-learning in the Libyan higher education system* [Preprint]. arXiv. <https://doi.org/10.48550/arXiv.2102.08545>
- [3] Cheung, A. C. K., & Slavin, R. E. (2013). The effectiveness of educational technology applications for enhancing mathematics achievement in K-12 classrooms: A meta-analysis. *Educational Research Review*, 9, 88–113. <https://doi.org/10.1016/j.edurev.2013.01.001>
- [4] De Freitas, G., & Spangenberg, E. D. (2019). Mathematics teachers' levels of technological pedagogical content knowledge and information and communication technology integration barriers. *Pythagoras*, 40(1), Article a431. <https://doi.org/10.4102/pythagoras.v40i1.431>
- [5] Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, 47(4), 47–61. <https://doi.org/10.1007/BF02299597>
- [6] Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, 55, 223–252. <https://doi.org/10.1007/s11423-006-9022-5>
- [7] Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- [8] Rhema, A., & Miliszewska, I. (2011). Reflections on a trial implementation of an e-learning solution in a Libyan university. *Issues in Informing Science and Information Technology*, 8, 61–76. <https://vuir.vu.edu.au/7869/>
- [9] Rhema, A., & Miliszewska, I. (2014). Analysis of student attitudes towards e-learning: The case of engineering students in Libya. *Issues in Informing Science and Information Technology*, 11, 169–190. <https://doi.org/10.28945/1987>

- [10] Salem, N., & Mohammadzadeh, B. (2018). A study on the integration of ICT by EFL teachers in Libya. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(7), 2787–2801. <https://doi.org/10.29333/ejmste/90594>
- [11] Shadaan, P., & Leong, K. E. (2013). Effectiveness of using GeoGebra on students' understanding in learning circles. *Malaysian Online Journal of Educational Technology*, 1(4), 1–11. <https://doi.org/10.52380/mojet.2013.1.4.21>
- [12] Zunica, B. (2023). Technology everywhere! But who's got the time? The influence of time pressures on technology integration in Australian secondary mathematics. *Discover Education*, 2, Article 45. <https://doi.org/10.1007/s44217-023-00071-w>

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of **AJHAS** and/or the editor(s). **AJHAS** and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.