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TECHNIQUES FOR ENHANCING READING COMPETENCE ON THE CBI/STEM DOMAIN

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CBI/STEM DOMENIDA O'QISH KOMPETENSIYASINI TAKOMILLASHTIRISH USULLARI

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МЕТОДЫ СОВЕРШЕНСТВОВАНИЯ ЧИТАТЕЛЬСКОЙ КОМПЕТЕНЦИИ В ОБЛАСТИ CBI/STEM

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Abstract. The article reports on the experience obtained through teaching reading strategies in the CBI domain at Urgench State University (Uzbekistan) that demonstrated the importance of scaffolding techniques in teaching both General English and CBI. Effective approaches to scaffolding implemented in the teaching process that provided easier immersion in the academic content and boosted students' language acquisition are presented. It is advisable to pay particular attention to enhancing students' reading proficiency as part of the development of their academic learning abilities since reading constitutes the majority of the cognitive load in academic studies. In Central Asia, educators require their students to have a strong foundation in STEM literacy from an early age. This mandate forces colleges and institutions to give students the skills they need to be open to collaboration, integration, innovation, and lifelong learning. A multidimensional and inter-disciplinary approach is crucial from the students' point of view following work placement as it adds more value to local and global issues. Project-based learning tasks, real-world problem-solving tasks, team-based collaborative learning activities, and fostering leadership are all 21st century soft skills that can enhance and help to promote excellence in both learning and teaching STEM education.

Keywords: STEM; CBI domain; cognitive load; reading skills; academic reading; authentic materials; scaffolding; effective techniques; think aloud; pre-teaching vocabulary; think-pair-share.

Annotatsiya. Maqolada Urganch davlat universitetida (O‘zbekiston) CBI domenida o‘qish strategiyalarini o‘rgatish orqali olingan tajriba haqida ma’lumot berilgan, bu umumiy ingliz tili va chet til o‘qitishning CBI texnologiyasining havoza uslubi ahamiyatini ko‘rsatib beradi. O‘qitish jarayonida tatbiq etiladigan havoza uslubining samarali yondashuvlari taqdim etilgan bo‘lib, ular akademik kontentga osonroq singishini ta’minlaydi va talabalarning til o‘zlashtirish kompetensiyasini kuchaytiradi. O‘qish akademik tadqiqotlardagi kognitiv yuklamaning ko‘p qismini tashkil qilganligi uchun talabalarning o‘qish qobiliyatini rivojlantirishni uning bir qismi sifatida qabul qilib, ularning o‘qish qobiliyatini oshirishga alohida e’tibor berish tavsiya etiladi. Markaziy Osiyoda o‘qituvchilar kichik yoshdanoq o‘z talabalaridan STEM savodxonligi bo‘yicha mustahkam poydevorga ega bo‘lishni talab qiladilar. Ushbu natija amalga oshishi uchun kollej va muassasalar talabalari hamkorlik, integratsiya, innovatsiyalar va uzluksiz ta’lim olish uchun ko‘nikmalarni egallashga tayyor bo‘lishlari kerak. Ko‘p tarmoqli va fanlararo integratsiya talabalarning mahalliy va global miqiyosdagi mehnat bozorida o‘z o‘rnini egallashni ta’minlaydi. Loyihaga asoslangan o‘quv vazifalari, real muammolarni hal qilish bo‘yicha vazifalar, jamoaviy hamkorlikdagi ta’lim olish va liderlik qobiliyatini rivojlantirish XXI asrning ta’lim ko‘nikmalari bo‘lib, ular STEM ta’limini o‘rganish va o‘qitishda mukammallikni oshiradi.
Kalit so‘zlar: STEM, CBI domeni; kognitiv yuklama; o‘qish ko’nikmalari; akademik o‘qish; autentik materiallar; havoza uslubi; samarali usullar; o‘qitishdan oldin lug‘at.

Аннотация. В статье сообщается об опыте, полученном при обучении стратегиям чтения в области CBI в Ургенчском государственном университете (Узбекистан), который продемонстрировал важность скаффолдинговых техник в обучении как общему английскому языку, так и CBI. Представлены эффективные подходы к скаффолдингу, реализованные в учебном процессе, которые обеспечили более легкое погружение в учебный контент и ускорили усвоение языка учащимися. Целесообразно уделять особое внимание совершенствованию навыков чтения учащихся в рамках развития их способностей к академическому обучению, поскольку чтение составляет большую часть познавательной нагрузки в академических исследованиях. В Центральной Азии педагоги требуют, чтобы их ученики с раннего возраста имели прочную основу для грамотности в области STEM. Этот мандат заставляет колледжи и другие учебные заведения давать учащимся навыки, которые им необходимы, чтобы быть открытыми для сотрудничества, интеграции, инноваций и обучения на протяжении всей жизни. Многофункциональный и междисциплинарный подход имеет решающее значение с точки зрения студентов после трудоустройства, поскольку он повышает ценность местных и глобальных проблем. Учебные задачи на основе проектов, задачи по решению реальных проблем, совместная учебная деятельность в команде и развитие лидерских качеств — все это социальные навыки XXI века, которые могут улучшить и способствовать совершенствованию как обучения, так и преподавания STEM.
Ключевые слова: STEM; домен CBI; когнитивная нагрузка; навыки чтения; академическое чтение; аутентичные материалы; скаффолдинг; эффективные техники; предварительная лексика.

Introduction. One of the most well-liked and difficult ideas in our world now is STEM education. STEM mania (22, 26) is a phenomenon that has grown up to the State level program (3) and today remains in the focus of attention of nearly all educators throughout the world. STEM mania was pushed after the launch of Sputnik by USSR professionals in 1957 (26, 1; 8). STEM program qualities (8, 258), STEM program structure (7, 11), STEM program assessments (11, 21), (21), STEM program problems (23), and STEM research continue to be hot topics of discussion.

STEM education initiatives are being established in many nations throughout the world, but concerns concerning the efficient development of STEM education have been highlighted in scientific conferences and journals (6). According to the authors' opinions gathered during the Almaty CATEC Conference 2018, STEM education has already been implemented in Kazakh schools that thrive and are competitive among secondary schools in Central Asia. For instance, it was noted that Almaty-based SMART Point, a private educational institution, offers a variety of activities with cutting-edge methods to STEM education.

As the urgent necessity of developing science for the economic growth of the country is being recognized, the positive changes in the educational reforms in Uzbekistan help us to pursue that goal. Having been enriched by the achievements of our world-famous ancestors-polymaths, such as Muhammad ibn Musa al-Khwarizmi (creator of Algebra and Algorithm, who also worked in astronomy and geography), Abu Rayhan al-Biruni (father of modern geodesy) and Avicenna (Ibn Sina-father of early modern medicine), our nation is moving towards its great future. According to the latest information from the news agency, more than 10 million people in our country (40 % of the whole population) are under 18 years old, and 17 million people (65 %) are under 30 years old (30).

Due to this fact, the closest attention is now paid to the problem of growing them into competitive professionals on a global level. The development of Uzbekistan's educational system through the “introduction of international standards of training and assessment” (30) forms the foundation of the Strategic Actions planned for the current five-year country development program. In accordance with the Presidential decree # 2909 from 20.04.2017, some of the most important tasks of our higher education system are to establish “close perspective partnerships with leading specialized foreign scientific and educational institutions”, to introduce “advanced pedagogical technologies, educational programs, and teaching materials based on international educational standards into the educational process”, and to attract “foreign highly qualified teachers to the scientific and pedagogical activity” (30). All educators in Uzbekistan nowadays endeavor to provide better learning opportunities to our students.

Urgench State University has been successfully collaborating with foreign universities over the years. With the support of Erasmus and ZEF/UNESCO projects, many of our teachers obtained their Masters’, PhD and post-doctorate degrees from leading European

universities such as the University of Bonn and Weihenstephan-Triesdorf University of Applied Sciences Germany), the University of Santiago de Compostella (Spain), Adam Mickiewicz University, Poznan (Poland) and the University of Porto (Portugal). Urgench University has collaborated with California State University, Fullerton (USA) for over ten years, and it has collaborated with the US Embassy in Tashkent for over ten years. During this period, some of our English teachers became alumni of such programs as TEA, JFDP, and Fulbright Visiting Scholar projects, and many seminars and projects were arranged and held to improve the studying conditions and environment for our students. The English for STEM project that is running now with the support of the US Embassy in six universities in our country is one of them.

Main part. Materials and Methods. Since the English language is the only globally accepted language (lingua franca) to transfer global knowledge from one country to another, it functions as a "bridge" to achieve higher professional STEM literacy. The purpose of the English for STEM project is to help our students acquire the English level suitable for obtaining a STEM education and enable them to engage, actively explore, and understand core science and technology concepts in English, thus facilitating productive collaboration with international institutions and businesses working in these areas. Sixty students from ten different departments of our university, such as Applied Mathematics and Information Technology, Physics, Mathematics, Mechanics, Biology, Chemistry, Geography, Automobile and Tractor Industry, Overground Transportation and Exploitation, Chemistry Technology, and Bio Technology, were enrolled to study in the English for STEM. The project is planned for 2 academic years with 580 hours of English classes to be taught, including lessons in General English and CBI. More than ten teachers who obtained their degrees from foreign universities are involved as subject teachers, and four language teachers from the Interdisciplinary Department are working as General English teachers in this project. The teachers have experience of studying and practicing with foreign universities; they deliver student-centered classes, creating better learning conditions. The students chosen for the project were among the best ones in their departments, with a level of English defined as early beginners. However, during the first year of the project, they managed to grow up to the intermediate level.

Based on the teaching materials created for the English for STEM project and implemented during the English classes at Urgench State University, this study analyzes the phenomena of STEM education and the importance of developing the reading competence of its students. It explores effective scaffolding techniques through comparing and contrasting approaches that have been implemented in the process of teaching General English and CBI in the first year of the English for STEM Project at Urgench State University (Uzbekistan). A descriptive method is used to report

the main teaching strategies, and the result of the survey on the perception of the analyzed techniques is provided.

Results. In the English for STEM project, we tried to develop students' language competences (listening, speaking, reading, and writing skills) and introduce them to 21st century skills, such as critical thinking, problem solving, and analytical thinking. Throughout the process, it became clear that speaking skills cannot be taught directly, but must be developed through comprehensible input (10). If the global literature is referred to, integration of science and language in ELL is being highly advocated. Teaching the language with a scientific approach provides higher efficiency compared with general teaching (5). In teaching Content-Based Instruction (CBI) to students who are familiar with the content better than they are with the language, the role of the content becomes crucial. When the learner receives related academic material, when he understands it, he or she automatically reviews and learns the grammar that is necessary to assimilate it. Understanding the grammar and combining the language units in order to formulate the ideas boosts students' productive skills, so developing speaking and further writing skills is directly dependent on improving their reading competence. Scaffolding techniques implemented in the CBI classroom on different phases of learning help to improve reading skills and prepare students to perceive and adequately interpret studies in the academic setting.

Discussion. The English for STEM project has been designed specifically for students at the beginner level, and English classes for it were designed in accordance with the aims of the project. It affected the distribution of learning materials in the course, as well as its scope and sequence in general. The following charts show the difference between the amount of information planned for different aspects of learning in percentage for English courses (chart 1) and the same for English for STEM projects (chart 2).

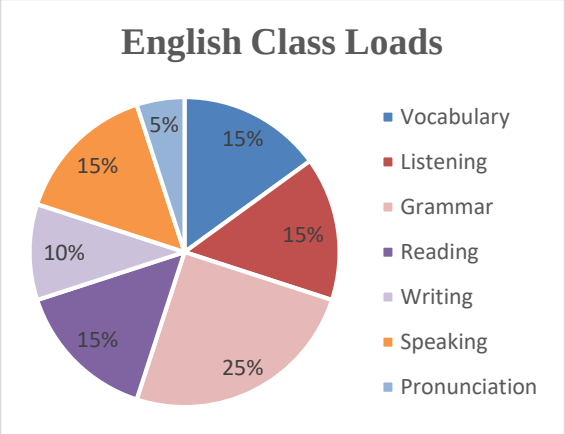

Chart 1. Distribution of learning materials in the English Department classes

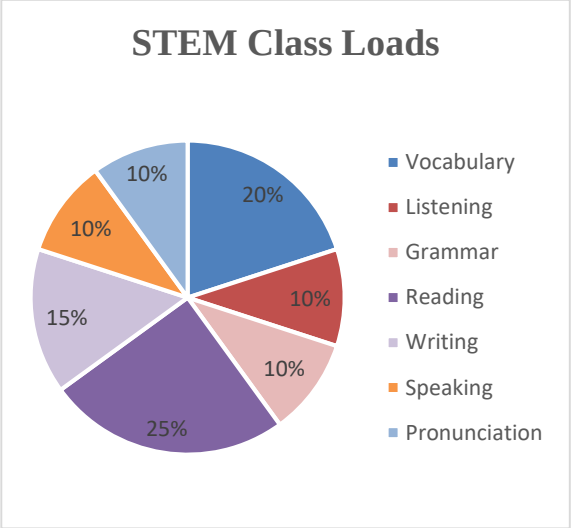

Chart 2. Distribution of learning materials in the English for STEM classes

Developing the receptive and productive skills of students is equally important, and in planning English classes, the balance between different sections of learning is essential. Thus, it can be seen that in the English courses designed for our students, we plan an equal amount of class load for working with vocabulary, reading, listening, and speaking. For improving students' writing skills, we spent less time, so that only learning the pronunciation of words and phrases combined with it can create the equation, while attention to grammar topics and exercises in these classes remains dominated. However, in English for STEM, for working with vocabulary and reading, we devote almost half of the total class load, while all the other sections of the course are presented equally with the slight superiority of writing.

This is due to the fact that in an academic setting, reading and writing skills are of primary importance, and while our students are still in the earliest phase of learning, we focus our attention on their receptive skills. To fulfil the expectations of the project, we strive to improve the reading competence and vocabulary awareness of our students on the basis of authentic materials.

Over the years, the American English website (AE, web) of the United States Department of State has served as a reliable source of information for English teachers in our country, and the English Teaching Forum issues share "innovative, practical ideas" (Forum, web), enriching our experience and making our classes more meaningful and productive. Valuable authentic and adopted materials for English classes are provided by the British Council in Uzbekistan website with educational divisions such as Teaching English (BC, web) and Learning English (BC, web) with separated English for Kids (BC, web) and Teenagers (BC, web) parts. Information stored on the National Geographic (NG, web) website enriches the minds and outlooks of our students, presenting them with up-to-date information about the world.

Attending the American English E-Teacher Course "Content Based Instruction" in Spring 2020 equipped us with such open educational resources as the public digital library OER Commons (18), the Merlot system (16), Curriki (4) and Khan Academy (9)—all intended to lighten the online teaching burden during the period of pandemic. Overall, information provided by the sources mentioned creates favorable conditions for improving the reading skills of our STEM students.

The peculiarities of the teaching challenges in the English for STEM project are attributable to the fact that our students needed to improve both their BICS (Basic Interpersonal Communication Skills) and CALP (Cognitive Academic Language Proficiency) (27) during the same relatively short period of time. In order to help students do well while going through the ZPD (Zone of Proximal Development) (World Learning), lesson plans created following general teaching principle # 1 (28) had clear objectives and an understanding of how students' prior knowledge can be connected to the new concept of the class. Several techniques of scaffolding (29), such as think aloud, pre-teaching vocabulary, think-pair-share, and using visual aids, helped to organize student-centered classes and to achieve noticeable progress in students' learning. Following the Scaffolding rules, teachers during the classes tried to diminish cognitive load and to "use simple vocabulary and syntax", to "reduce the speed of the messages" and to "give a generous amount of time for students to think" (29).

Here we analyze the most effective approaches successfully implemented while developing the reading skills of our students. In the analysis, we concentrate on the implementation of the technique and its effectiveness.

Table 1

Technique	Think – Pair - Share
Definition	TPS is a collaborative learning strategy, that makes students work together to solve a problem or answer a question. In the Think part, students think individually about a topic or a question. In the pair part, they exchange their findings with a partner, then they share ideas with their group mates. Think-Pair-Share considered a Scaffolding technique and it is useful for improving students' reading comprehension.
Phase to use	Pre-reading activity
Expected outcomes	It engages students with the activity and boosts their thinking and speaking skills.
Activities used	Before reading Energy, Health , Climate change topics.
Effectiveness	It facilitates thought-provoking questions, helps students think individually and encourages them to share, to exchange ideas, opinions and makes learners active in class and stimulates better performance.

TPS activates students' prior knowledge, also referred to as "Schema" (27), which is essential in introducing a new topic by relating it to what students already know and/or can do. It also boosts

students' speaking skills while lowering the anxiety of learners engaged in team work. The Think-pair-share technique expands students' mindsets and, according to Bloom's taxonomy, it develops their higher-level thinking skills, incorporating critical thinking.

Table 2

Technique	Think aloud
Definition	TA is an individual learning strategy directed by a series of questions to think about and answer while reading. It helps students to monitor their thinking while reading any text and reveals how much of the content they have understood.
Phase to use	While-reading activity
Expected outcomes	TA improves such skills as questioning, thinking, relating the information to the experience acquired, analyzing and evaluating the situation.
Activities used	Connecting readings to student's life experience while reading, for instance, "The Scholarship Jacket "by Marta Salinas.
Effectiveness	TA enhanced students' abilities to re-read and clarify the issues using context clues and developed their thinking skills in guided, controlled practice activities.

The TA strategy activates students' engagement in reading. The set of provoking questions makes them realize that some information could be missed and lets them return to the context. It also develops students' problem-solving skills and predicts outcomes as well. In the Bloom's taxonomy, it is referred to as remembering and applying, strengthening the basic skills of students.

Table 3

Technique	Using Visual Aids
Definition	VA is a tool that helps teachers to represent ideas and concepts visually, organize information, and show the relationships among various concepts.
Phase to use	Depending on the lesson plan it can be used as a pre- while- or post- reading activity
Expected outcomes	It boosts students' imagination, helps them to realize the main points of the topic and to identify specific features such as similarities and differences, proportions and relations.
Activities used	YouTube and OER videos while learning, for instance, " Animal Classification: Vertebrates and Invertebrates," "The Life Cycle of Frogs"
Effectiveness	VA helped students to grab the concepts quickly and pulled out their active participation in the learning process.

The VA strategy is visible and feasible, and it reduces the pressure of the teacher's job. Since most people, to some degree, are visual learners, power point presentations, handouts, pictures, and videos as a great tool of language acquisition remain the great resource of scaffolding. It was noticed that STEM students, unlike the students from the English Department, mostly prefer info-graphics and graphic organizers. It can be found on all levels of the Bloom's taxonomy, from remembering to creating, ensuring students' basic abilities.

Table 4

Technique	Pre-Teaching vocabulary
Definition	PTV is a strategy for introducing new vocabulary to students before they begin reading a text. It is a selection of new words from the text chosen.
Phase to use	Pre-reading: before reading the text. While-reading: activities such as guessing words.
Expected outcomes	It provides students with sufficient vocabulary and helps learners move towards more complicated concepts and topics. It enhances students' receptive and productive learning skills.
Activities used	Every lesson before starting to read the lesson texts.
Effectiveness	PTV effectively increased students' assimilation of words, it helped students to realize the importance of words and taught them to associate selected words with the context. It guaranteed the development of all four skills of students, having been integrated with them.

PTV strategy is essential since vocabulary is a milestone of the language acquisition. Vocabulary-building activities are recommended to be implemented as a daily routine. However, over time, it is more effective to move from simple work with a dictionary to more complicated activities, such as guessing the words' meaning, creating sentences with new words, while introducing new vocabulary in class. It will not only empower the productive skills of students but also lead the learning process towards the higher levels of Bloom's taxonomy.

Table 5

Technique	Formulating thinking questions
Definition	Formulating thinking questions is an effective strategy to generate communication on the assigned topic or content.
Phase to use	Suitable for every step: pre-, while- and post- reading activity.
Expected outcomes	It promotes collaboration and improves the team-building skills of students and encourages their active participation in class. Moreover, students become more confident while formulating questions. It boosts their speaking skills and gets them involved in active communication.
Activities used	Pair works with the use of pictures. When student A asks questions of student B, and vice versa, The questions start with easy ones and get more complicated on the way. The pictures generate the speaking skills of students and help to expand their mindset.
Effectiveness	Formulating thinking questions helped students to increase their grammar and vocabulary awareness; it helped them to realize content depth and concentrate on the meaningful details. It also improved their communication and critical-thinking skills..

Formulating thinking questions is an effective strategy for revealing the core content of Bloom's taxonomy. Depending on the level of question complexity, it can refer to its every level, starting from the ground one-remembering and ending with the highest-creating. Here it expands the creative and critical thinking of

students, which plays a crucial role in becoming proficient users of the target language.

Implementing the above mentioned scaffolding techniques in the English for STEM project provided our students with excellent opportunities to improve as language learners and to enhance their language awareness and competence development. To further analyze the effectiveness of the strategies, a survey was conducted, in which students and teachers were asked to evaluate every technique out of 100 points in total. Four general English teachers and sixty students from the English for STEM project took part in this survey.

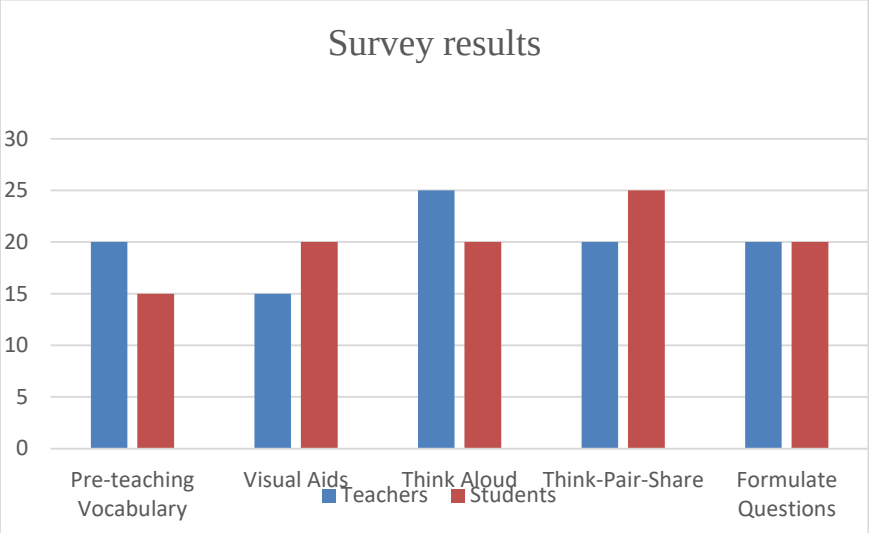

Chart 3. Teachers and students perception of scaffolding techniques

It is essential that each of these techniques be almost equally appreciated by both students and teachers, since the scale of the points they gave fluctuates from 15 to 25, which is approximately one fifth of one hundred, the total number of points they could distribute. It is also significant that students and teachers agreed on the effectiveness of the strategy of formulating thinking questions, evaluating it with 20 points. Judging from the chart, students found working with vocabulary less interesting. However, they enjoyed the TPS technique, while teachers emphasized the effectiveness of the TA strategy, slightly diminishing the importance of using VA. For all other strategies, they expressed stable acceptance, which proves the importance and effectiveness of the techniques evaluated.

Conclusion. The 21st century arrived with a promise of even greater advancement in technology, leaving behind all previous discoveries of mankind. It provided people with stunning opportunities for new technology to create, new science to learn and put forward its demand for a new generation to grow. Since the latest is inevitably on the teachers' list of concerns, we are responsible for creating, supporting, and implementing innovative teaching strategies to help our students prepare for life in the new technological era.

Today, language teachers around the world realize that transferable skills, considered the 21st century's soft skills, have received first priority. The abovementioned experience gained during the work with the English for STEM project at Urgench State University (Uzbekistan) helped to prove that scaffolding strategies are the best to be implemented in the Content Based Instruction domain. Wisely designed to lead students to become DOers, it concentrates on helping them to learn how to DO certain activities and encourages teachers to provide goal-oriented, student-centered classes.

Even with the limited objectives, such as, in our case, improving reading skills only, scaffolding techniques effect a greater scale of teaching outcomes, helping to improve the receptive and productive skills of students and their language acquisition in general. The advantage of using scaffolding in the CBI domain is that, while being engrossed in the content, students improve their language awareness without being aware of it. This reduces the stress of learning and prepares students to perceive familiar content in a familiar language, making the latest more accessible and less alien.

Thus, more scaffolding strategies implemented at various stages of learning promote learners' autonomy, foster students' 21st century soft skills, and boost their mindset, preparing them for further independent study and providing them with the academic confidence required to continue with the world of STEM education.

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