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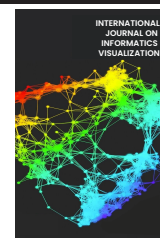
A Visual-Based Project Production Package for Design and Technology Subject Based on Computational Thinking Skills Across-STEM

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Abstract— **Computational Thinking (CT) is a concept introduced in the problem-solving process and is a systematic way of thinking in computer science and various other disciplines. Awareness to apply CT into education at different curricular levels has started from the beginning of schooling via various contexts and directions. The development of a Visual-Based Project Production Package Model (KHP4) across STEM, using computational thinking skills, in the Reservoir Crop System (ST2) project production process for the Design and Technology (RBT) subject in primary schools aims to improve students' problem-solving and thinking skills by making them be more critical, creative and innovative. The KHP4 also includes the development of RBT learning model and modules. The life cycle model is adapted from the ADDIE l model, which integrates the concept of 'prototyping' based on five (5) main phases: analysis, design, development, implementation, and evaluation with appropriate iteration. This model is based on the COMEL learning model with the practice of interactivity, fun learning, and interesting and motivating learning for students, adding new components and elements. Thus, this paper highlights the evaluation of the Visual-Based Project Production Package Development (KHP4) model in Project Production, which can improve thinking and problem-solving skills based on CT to prepare students for 21st-century learning and instill sustainable development practices in students facing energy transition that is experienced nationally and globally.**

Keywords— **Computational thinking; design and technology; learning model; sustainable development; visual-based project production.**

I. INTRODUCTION

Effective teaching and learning allow students to explore and obtain a fun experience while being able to equip them with a variety of important skills for the future needs of the Energy Transition, the Industrial Revolution 4.0 era, and the advancement of digital technology. The ability of students to solve a problem systematically, creatively, and innovatively requires a proactive and effective strategy. The ability of students to think critically using high-level thinking intelligently and consistently will position them as students who can face the challenges of the 21st century. Future generations must master various skills to make them relevant to future needs. 21st-century learning requires a shift to more dynamic and creative methods and being in line with today's technological developments. This matter is a priority in the Malaysian Education Development Plan (PPPM) 2015-2025 in producing students who can communicate confidently, work collaboratively, use critical thinking as well as creativity, practice positive values, and be competitive.

The education that is built must produce students who master various skills that are not only excellent from the academic aspect alone but must also have critical and systematic thinking skills where it gives an advantage to the student. The ability to think creatively and solve problems systematically is able to lead students towards more positive development. Yet, from the studies conducted, today's students are still weak in thinking and solving problems systematically, creatively and critically. Although various efforts have been made by the government in addressing this problem, the results are still not promising. Many students who excel in academic are not necessarily able to solve a given problem systematically and effectively [1]. Many studies showed that many students are less capable in solving open-ended problems because they lack creativity and innovative thinking skills.

Creativity is an important domain in teaching RBT subjects in the primary school curriculum in Malaysia in 2014. Creativity encompasses creative and imaginative thinking [2], [3]. KSSR RBT has been improved to provide students with the knowledge, skills, and values relevant to the challenges of the 21st century and the 4th Industrial Revolution era [4]. The RBT curriculum emphasizes knowledge, skills, and working steps to produce a project. Students must generate ideas creatively to produce a project to ensure that the product design is productive and meaningful. Creativity is a very important skill in generating various ideas to solve new and old problems [5]. Creativity is the decision or the ability to use imagination to collect, digest and generate ideas to create something new or original through inspiration or a combination of ideas [4], [3]. Thus, teachers must produce students who can generate original ideas creatively and solve problems using many different systematic, creative, imaginative, and innovative methods.

CT is needed by everyone and is an essential skill to be taught to every student in a variety of fields [6]–[10]. This is because CT has the advantage of solving problems critically and creatively, and CT skills can also help students think analytically and innovatively to solve complex problems. However, to this day, there is no final definition that explains the true meaning of CT. From previous studies, CT has been elucidated based on the concepts used. Table 1 displays the concept of CT based on previous research.

TABLE I
CONCEPT OF CT BASED ON PREVIOUS RESEARCHERS

No	CT Concept/Elements	[6]	[11]	[38]	[32]	[13]	[39]	[40]	[17]	[10]	[41]	[18]	[42]	[43]	[8]	[9]	Total
1.	Decomposition		/	/		/	/		/	/	/	/	/	/		/	11
2.	Abstraction	/	/	/	/	/	/	/	/	/	/	/	/	/		/	14
3.	Algorithm		/	/	/	/	/	/	/	/	/	/	/	/		/	13
4.	Visualization		/						/	/					/		4
5.	Evaluation			/		/			/	/	/	/					6
6.	Logic					/	/		/		/					/	5
7.	Patterns Recognition					/			/	/			/		/		5
8.	Parallelism	/		/													2
9.	Generalization							/	/					/			3
10.	Debugging												/			/	2
11.	Representation Data			/													1
12.	Simulation			/													1
13.	Formulation			/													1
14.	Communication	/															1
15.	Interactive	/															1
16.	Modeling		/														1
17.	Mathematical reasoning	/															1
18.	Conception	/															1
19.	Computational problem solution	/	/														2
20.	Designing systems														/		1

CT skills can also help students think analytically and innovatively to solve complex problems and problems in everyday life [11], [13]. Based on the education in Malaysia, CT is considered a 21st-century skill that is already inculcated in every existing curriculum since 2017 [14], [15]. National education is still working on disseminating CT among teachers and school children in Malaysia to improve problem-solving skills systematically. Many studies on CT skills have also found that CT can foster creativity to build tools that can hugely impact The results from Scopus data analysis based on the previous 10 years of data starting from 2011 to 2021 clearly showed that the studies related to CT in primary schools have been conducted and every year, there is an increasing trend in such studies.

Table 2 lists the data obtained through the Scopus database on CT-related documents from 2011 to 2021. There were more than 1300 documents found, and the highest number of CT-related documents within the past 10 years was 301 documents in the year 2020.

TABLE III
COMPUTATIONAL THINKING DOCUMENT BY 2011-2021

Year	Frequency (n)	Percentage (%) (N: 1371)	Cumulative Percent
2011	30	2.18	2.18
2012	18	1.31	3.49
2013	35	2.55	6.04
2014	52	3.70	9.74
2015	57	3.79	13.53
2016	92	6.71	20.24
2017	143	10.43	30.67
2018	201	14.66	45.35
2019	288	21.00	66.34
2020	301	21.95	88.29
2021	154	11.23	100.00
Total	**1.371**	**100**	

Students who experience the process of CT from the beginning to the end while solving a problem will easily remember the experience and be able to apply this knowledge

to solving problems in the future [20], [21]. Additionally, Malaysia is the pioneer country in the Association of Southeast Asian Nations (ASEAN) that integrates CT and computer science into the official curriculum in schools starting in 2017 [22]. Moreover, in the 11th Malaysia Plan (RMK-11), the emphasis on thinking and problem-solving skills are the main agenda discussed and needs to be mastered by students as we approach the 21st-century. Moreover, based on the search using the keyword "computational thinking" in the Scopus database and analyzed through Network Visualization using VOSviewer software on CT-related studies and documents, different text mining characteristics for CT are depicted in Figure 1.

Fig. 1 Network Visualization of Keyword "Computational Thinking" from Scopus database

Figure 1 visualized the text mining approach of the keyword "Computational Thinking" through the Scopus network and analyzed it via Network Visualization using VOSviewer software. To obtain accurate and reliable data, the use of keywords that match the study is highly preferred. In RBT learning for the visual-based project production process, CT skills involve problem-solving processes that require students to try to generate ideas creatively. Through logic, this study produces sketches (or drawings) that match the given problem solution, solve problems into smaller components (decomposition), and formulate ideas or information based on sketches (or drawings). The projects produced (abstraction) and pattern recognition (pattern recognition) for important or less important information allows the final evaluation to be done on the selected sketches (or drawings), to meet the requirements of the problem to be solved. In addition, students need to identify important information and arrange solution steps according to a logical sequence (algorithm), visualize the results of the project (visualization) built, and dare to evaluate and decide the final result of the project to meet and be able to solve the necessary problems (evaluation) until completion.

II. MATERIALS AND METHOD

This study aims to evaluate the applicability of a Visual-based Project Production Package Development (KHP4) model based on the primary school Design and Technology learning model. It is based on Computational Thinking skills

across-STEM (RBT^sr-CTSCOMEL) developed jointly in KHP4, Design and Technology learning module using Computational Thinking skills-based Across-STEM development (ProRBT-CTSTEM) for Year 5 RBT Project Production for Reservoir Crop System (ST2). The methodology used during the usability assessment of the RBT^sr-CTSCOMEL model is based on the usability of the ProRBT-CTSTEM Learning Module developed, encompassing the components and elements of the model. Formative and summative assessments were used, involving observational assessments and interviews of students and teachers. The formative assessment included assessment conducted throughout the teaching and learning activities of RBT, which involved the production process of the project implemented. Whilst the summative assessment covered the production process of the ST2 project by concentrating on the ability of students to solve problems using the Design and Technology Learning Module based on Computational Thinking skills across-STEM (ProRBT-CTSTEM) either through the hardcopy or digital form modules. This phase was implemented using the hybrid learning approach that involved face-to-face and online learning and teaching using the Google Meet application.

A. Sample

To evaluate the applicability of the Visual-based Project Production Development Package (KHP4) (Model RBT^sr-CTSCOMEL) developed, a total of 18 primary school students were selected through purposeful sampling that met the criteria that have been set. Nielsen [23] stated that the number of samples to be selected for the usability test is sufficient between three (3) to five (5) people because 80% of usability problems can be detected by testing only three (3) users. The usability testing does not require a large sample because the number of users to test more than three (3) people, does not affect the discovery of usability errors of an application. Increasing the number of samples increases the cost and prolongs an application's testing time. However, from the studies conducted by Neilsen [23] and Halimah [24], usability tests can have better results of about 95% - 98% of problems detected with more than twelve (12) to fifteen (15) users.

Thus, the sample involved in this usability test involved 18 Year 5 students in the implementation phase, four (4) students, and two (2) teachers in the evaluation phase. The students involved met the sample criteria where the students had followed the teaching and learning of RBT since Year 4 and were not involved with important examinations. The sample had also received written consent from parents and approval from the school involved to become samples of this study. While an RBT teacher was also selected as the informant of the study who was fully involved in the teaching and learning conducted and acted as an observer throughout the study.

B. Instruments

During the usability test, which involved the implementation phase, two (2) instruments were used, namely a semi-structured interview schedule/ tool and an observation checklist. Before this instrument was fully used in the study, validation and reliability procedures of the instruments were conducted and content, language and design validity were

obtained from a panel of experts. The validity and reliability of the instruments were very important to make a more meaningful contribution to this study [25]. According to Pallant [26], validity in the context of research means measuring what should be measured. While reliability is related to the degree of stability, consistency, prediction, and accuracy [27]. The interview schedule or tool used was adapted from the study of Norlidah Alias [28] involving 23 question items. While a structured observation checklist was adapted from Merriam [29] and Halimah Badioze Zaman [12]. All these instruments have gained the validity and reliability of their items by a panel of qualified experts

B. Project Visual-based Production Development Package Life Cycle (KHP4)

The Life Cycle of the Visual-based Project Production Package Development Module (KHP4) in this study focused on the usability test of the Design and Technology Learning Module integrating Computational Thinking Skills Across-STEM (ProRBT-CTSTEM). It was developed based on the Design and Technology Learning Model of primary school based on Computational Thinking Skills Across-STEM (RBT^{sr}-CTSCOMEL), adopted from the COMEL learning model [12], [30], and digital worksheets called e-Sheets. These modules and e-Sheets were developed specifically for teaching and learning RBT subjects to implement Visual-Based Project Production activities creatively, imaginatively, and innovatively through a systematic process. This module was developed based on the components and elements contained in the RBT^{sr}-CTSCOMEL Learning Model, namely basic theory, teaching and learning strategies, planned learning, computational thinking approach, inquiry, and imaginative thinking and learning assessment

Figure 2 depicts the learning modules used throughout the project production activities conducted face-to-face or online. The e-module that was digitally generated using Google Document was uploaded into the Google Classroom Kelas 5 Pintar.
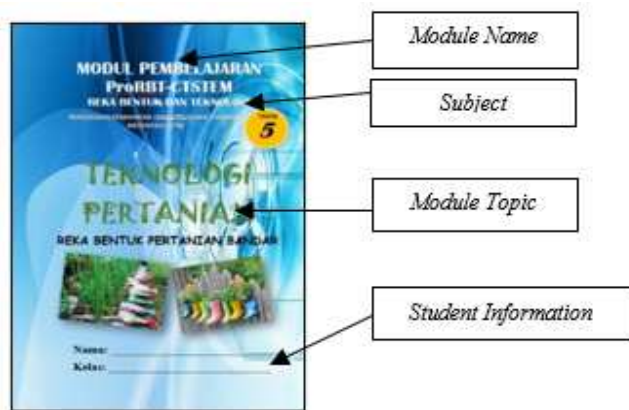
Fig. 2 Learning Module of Visual-Based Production Package

Figure 3 shows the learning e-Module. Each student can access this document using the MOE email given to each student. This module (both the conventional and digital form) had gone through the process of validity and reliability from the module development experts and discussions with RBT teachers to ensure that this module met its production objectives. As the implementation of teaching and learning

activities was implemented during the Covid-19 Pandemic and bound by various Movement Control Orders (MCO - SOP), this module was produced in two (2) versions, namely the conventional (printed modules) as well as the digital e-Modules to facilitate teachers and students to use them through hybrid learning approach.
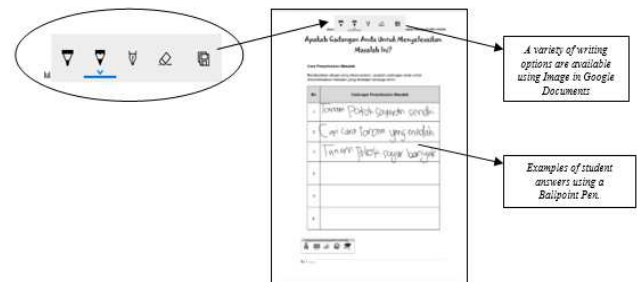
Fig. 3 Learning e-Module of Visual-based Production Package

Apart from that, the learning modules are also produced in a digital form called e-Sheet as a measure to facilitate students to undergo hybrid learning. This e-Sheet is generated using the LiveWorkSheet (LWS) application. Figure 4 shows the digital e-Sheet used by students during implementing the Reservoir Crop System (ST2) visual-based project production activities.
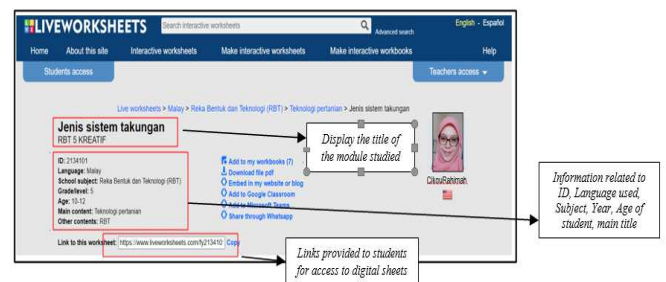
Fig. 4 E-Sheet using LiveWorkSheet Application

The app provides an interactive and fun learning resource. Students can access this application at home or wherever they are. Figure 5 shows that e-Sheet developed using LWS apps provided various attractive color options to engage and motivate students to use them.
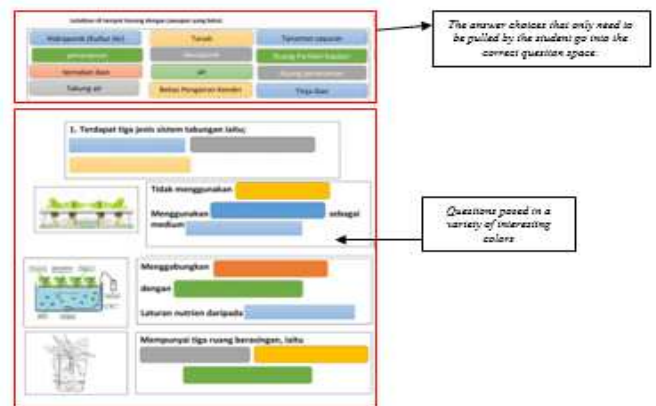
Fig. 5 E-Sheet Example in Learning Module

This application is a technological interactive sheet for today's world of education and is very flexible and used in hybrid learning approach.

Fig. 6 E-Sheets Through LiveWorkSheet Application

Figure 6 demonstrated that using *e*-Sheet through the LWS apps can increase the ability of students to complete tasks in a short period because the display of marks is given as soon as the finish button is pressed. This can attract students to use it because they can get immediate responses to the answers given. This helps in their confidence and efficacy levels in problem-solving. Solving skills is the main agenda in the education system today and needs to be mastered by the 21st-century students.
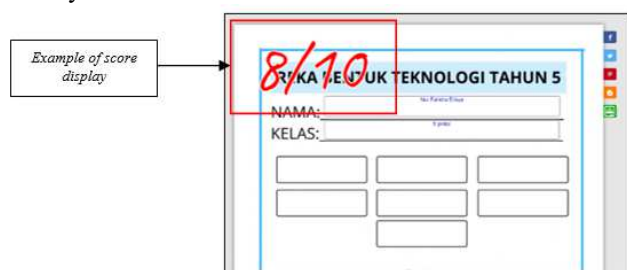
Fig. 7 Score Display Through LiveWorkSheet Application

III. RESULT AND DISCUSSION

A. Assessment Based on Observational Assessment

This formative evaluation is conducted based on the observations throughout the activities of the Visual-Based Project Production process in the Reservoir Crop System (ST2) design. Observations were performed by RBT teachers who were appointed as study informants and by the researchers themselves using an observation checklist. Based on the checklist of observations used, the findings are summarized into five (5) constructs, namely:

1) Existing Experience and Knowledge: Students were guided to apply existing experience and knowledge in agriculture through an induction set based on the basic theoretical components applied in the modules developed. This can be seen through the observation of student conversations below. Table 3 showed the observation of students 'statements based on their existing experience and knowledge.

TABLE III
OBSERVATION ON STUDENTS' CONVERSATIONS

Source	Statement
Teacher	*What did you think about the video earlier?*
Student 1	*On...Cultivating, teacher.*
Student 2	*Farming at home. My house also has a lot...My mother likes to plant.*

Teacher	*Did your mother plant?*
Student 2	*My mother grows lemongrass, spinach ... all kinds of things, teacher. I don't remember very much ...*
Teacher	*Cuba do you think, in that video, where do people plant trees?*
Student 2	*Houses without land, teacher.*
Student 3	*Like me ... I'm sitting in the teacher's apartment ... mom planted a tree in a pot ...*
Student 1	*It's the same as me ... my mother also planted it in a pot.*
Teacher	*So, do you think it's appropriate to plant a tree this way?*
Student 3	*A house that has no land ... my mother must like ...no choice teacher....*

2) Classroom Atmosphere: Through the use of learning modules, student learning was more focused and the classroom atmosphere was more in control. Students were more engaged in their learning and worked together to ensure the successful implementation of the project. Students discussed with each other through collaborative learning and used the inquiry approach and imaging techniques to generate ideas related to the activities carried out. Students were observed to apply CT skills in every ST2 project production process. Students were active and seemed to have fun in the noisy classroom atmosphere with the voices of discussions and laughter amongst themselves. In fact, through online learning, students were excited to complete their assignments using the *e*-Sheets through the LWS application.

3) Learning Preparation: Findings show that the construct of learning preparation had successfully achieved the objectives and learning outcomes through the activities based on the structured and systematic modules of the *Curriculum and Assessment Standards Document* (DSKP) RBT Year 5. Selection of the Agricultural Technology with the entitled theme: *Reservoir Crop System for Urban Agriculture*, stimulated students' interests and motivation, as it was related to their real life. Through the use of the learning modules, students became more confident in solving the given problem creatively and systematically. The time taken by the students to complete the assignments was shorter compared to before this learning module was introduced.

4) Application of CT and Creative Skills in Teaching & Learning: From the in-depth observations made, students fully applied CT skills throughout the visual-based project production process. This can be seen in every design sequence implemented. The analysis of the findings can be seen through the activity of producing informative visual sketches (or drawings) before the project's production using the concepts of imagining, logic, and pattern recognition. Each student strives to produce an informative visual sketch by assessing and analyzing what information needs to be included and, importantly, retained in the visual sketch based on the concept of abstraction. The implementation measures to ensure that the algorithm is implemented through the distribution of tasks in groups so that the tasks performed are completed within a given period. During the presentation, each group tried to visualize the project so that it could be easily understood by the other groups and easy to evaluate. Overall, the results of

the observations made on CT skills showed that students successfully implemented the concept of CT in every project production process based on the use of learning modules developed.

5) Practice and Evaluation: The observations made during the visual-based project production process discovered that the students always practice work safety measures while performing project production activities. The involvement and commitment of every group member were assessed and nurtured throughout the activity. Overall, it was found that the students applied practices and values learned earlier in the previous project production activities and also showed that they strive to think creatively and imaginatively when carrying out project production activities. Thus, an assessment was also made on the practice of thinking creatively and imaginatively while using the ProRBT-CTSTEM module.

B. Assessment Based on in-Depth Interviews with Students

The usability evaluation of this model was conducted based on the consumerism evaluation model [31] using user and evaluator retrospectives. Findings were analyzed based on teacher and student retrospectives through in-depth interviews conducted once the project production activities were completed based on the constructs, namely: (i) digital resource support, (ii) teaching and learning strategies, (iii) learning activities, (iv) training and assessment; and (v) the strengths and weaknesses of the module.

1) Digital Resource Support: Digital resources refer to the applications used in module production activities. The digital source used is the e-Sheet through the LiveWorkSheet (LWS) application. Analysis of the interview data showed that almost all the students interviewed were very satisfied with the digital application used in their learning modules. Students expressed their excitement, fun, and satisfaction with using the e-Sheets through the LWS application in support of digital resources through a hybrid learning approach, as displayed in Table 4.

TABLE IV
STUDENT STATEMENTS ON DIGITAL RESOURCE SUPPORT

Source (Student)	Statement
M1	*"I like ... because I can study at school and home ... hrmm ... I like both. When I don't have time to do it at school, I can do this exercise at home "*
M2	*"It's fun ... but when there is a choice, at home you can, at school you can. I like..."*
M3	*"I am very happy. When there is digital as well, I can choose. I always open back the video that the teacher shared at home "*
M4	*"I like to use the modules that the teacher gives in class. So I can continue the training that the teacher did for that. But that's it, I also like the digital module. The reason is I have a choice. I can do it over and over again"*

2) Teaching and Learning Strategies: Findings from the teaching and learning strategies showed that all students were satisfied and enjoyed doing the visual-based project production activities. The production of projects conducted in groups made it easier for them to carry out the activities.

Students stated that they worked together and collaborated to complete the project. The findings of the interviews conducted on four (4) students are as indicated in Table 5.

TABLE V
STUDENTS' STATEMENTS ON TEACHING AND LEARNING TECHNIQUES

Source (Student)	Statement
M1	*"I like when the teacher is for the group. Because sometimes I'm not sure what to do ... what should I do first ... so if I learn this way, I think he can also talk (communicate), for opinions, before doing a project "*
M2	*"I enjoy doing group work. When I have no idea, we can talk together. The activities that the teacher gives, the easier it is to complete ... it's the best "*
M3	*"During the sketching or drawing activity, I had no idea what to do ... but Aina and Qaisara helped a lot. We talked together. He draws himself, I also draw what I have ... my work is fast "*
M4	*"It's best to do it together. Our work is so fast. Each of you, please share an idea ... please do it together. One more thing, we are happy to do this crop project activity. "*

3) Learning Activity: Learning activities in this study was referring to the Reservoir System Project Production activities (ST2) for the topic of Agricultural Technology for RBT Year 5 subject. Results of the interviews with four (4) students demonstrated that all students felt happy and excited to follow the ST2 project production activities implemented. The findings can be seen in Table 6.

TABLE VI
STUDENTS' STATEMENTS ON LEARNING ACTIVITIES

Source (Student)	Statement
M1	*"Before this, I never planted a tree myself. The learning activities in this module are very interesting...I am excited...best "*
M2	*"I think it's the best. The reason is that I have never planted a tree before. I don't know and it's hard. But when I use the teacher's module for that, I feel happy...I follow all the steps available...my friends also help a lot "*
M3	*"I have been wanting to plant my trees for a long time. Always the mother who planted at home. I learned how to plant new trees. After this, I want to teach my mother how to plant a pulak reservoir ...she must like it .... "*
M4	*"At first, I was not very interested in planting trees. But when I join this activity, I feel excited and have fun. The module that I used ... the teacher for that, is very interesting. Help us a lot ..."*

4) Training and Assessment (e-Sheet): Exercises are implemented based on worksheets that need to be completed by students after learningt. The e-Sheet provided must be answered by the student online using the LiveWorkSheet (LWS) application. Students need to complete the sheets at home within the allotted time. This aims to train students to be more focused and responsible for their learning or to encourage self-learning. The findings from the students interviews can be seen in Table 7. The results depicted that all students are satisfied with the implementation of the training

using the e-Sheet through the LWS interactive application because it is easier and fun to complete without any stress.

TABLE VII
STUDENT STATEMENTS ON TRAINING (E-SHEETS)

Source (Student)	Statement
M1	"I like the training provided in LWS using e-Sheets. Easy and interesting...and what I like the most, is when I can continue to see the marks given. Very interesting..."
M2	"Hmmm...I like it best when I can continue to know the marks I get. I'm free to practice at home ...I can also repeat...it's fun... "
M3	"I enjoy doing the training that the teacher gives ...for example, I study at school and do the training at home. The LWS application is easy to use..."
M4	"Yes teacher...I'm excited to practice. Use LWS, easy and interesting...one more thing, I keep getting marks. That is the best ..."

5) Strengths and Weaknesses of the ProRBT-CTSTEM Module: The strength of the ProRBT- CTSTEM module is obvious. The students were satisfied with the module built because it is simpler and easier to understand and use than the prior method. Each activity provided in the module-improved the students' skills in solving a given problem. In addition, they were able to handle it more systematically and improve their thinking skills when conducting the ST2 project. The findings are summarised based on the interviews in Table 8.

TABLE VIII
STUDENT STATEMENTS ON THE STRENGTHS OF LEARNING MODULES

Source (Student)	Statement
M1	"I had fun using this module...actually in the beginning I didn't know what to do. But when I look at this module, I only know what to do. The activities available, make me think abaout what I need to do...it's the best..."
M2	"When there is a module, it's easy for me and my friends to learn...the same when doing this project ...so it's easy. Every step is there, I just have to think a lot...let's talk to my friends...I ... "
M3	"...it helps a lot...I follow every instruction in it...discuss and think together...do it together...until our project is ready..."
M4	"Your module? Interesting laaa...simple but made me think...help me and the group a lot to complete the project...we are more ... "

Meanwhile, the interview found that all four (4) students stated aspects of the weakness of the learning modules from different angles but with almost the same meaning. Students (M1-M3) stated that the pictures in the modules were not clear and needed to be improved. Student M1 and Student M3 stated that there should be enough space to make sketches or drawings because there is no space to sketch or draw in the current learning module. Providing space or adding pages for sketching or drawing can prevent sketches and drawings from being lost or misplaced. Meanwhile, two (2) students, namely Student M1 and Student M4 stated that the module used was very good, and they enjoyed using it. The findings of the interviews can be seen in Table 9.

TABLE IX
STUDENT STATEMENTS ON THE WEAKNESSES OF THE LEARNING MODULE

Source (Student)	Statement
M1	"I like to use this module...easy to understand. I think everything is ok, teacher. "
M2	"For me, this module is very good. Ok jer. It's just... I think I need to make room to draw. If you make another paper, you are afraid of being lost or left behind..."
M3	"I like this module, teacher...I like the planting activity ...everything is ok for me"
M4	"Everything is ok...I'm ok because teacher. But when I think back, one jer I see ...there is no room to make sketches or drawings...we use foreign paper...it's nice if in the module there is still room to draw .... oooo another one...what a picture...a very small sketch example. If I can grow up again, I like it..."

C. Assessment Based on in-Depth Interviews with The Teachers

1) Digital Resource Support: Based on the interviews with the teachers as evaluators on the usability of the modules, findings showed that both teachers (G1 and G2) are satisfied with the digital resources used in the learning modules (see Table 10).

TABLE X
TEACHER STATEMENTS ON DIGITAL RESOURCE SUPPORT

Source (Teacher)	Statement
G1	"From what I see here, the students are very happy to go through the ST2 project production activities. With a learning module like this ... it makes it easier for students to focus on learning. The use of digital modules using Google Doc also seems very good to me ... "
G2	"I think this module is good. Simple and interesting ...the description is clear...I'm sure students enjoy using this module while doing activities...students easily understand the steps to do a project...another thing I like, when the description of CT skills is included. That good element is actually taught to students at the lower level. This digital method can give students a choice...whether they want to print or continue to use the digital jer. Because now most of the boys have their phones ..."

Teacher 1 (G1), who was fully involved in teaching and learning throughout the implementation study, stated that using digital resources could attract students' interest in learning RBT project production activities.

2) Teaching and Learning Techniques: Findings from the interviews with the teachers related to teaching and learning techniques demonstrated that both teachers (G1 and G2) had the same opinions. They agreed with the student-centered learning approach and group activities used throughout the project production activities. This technique encourages students to adopt a collaborative attitude, cooperation, brainstorming, and scaffolding during the activities carried out. In addition, the content of the modules practiced problem-based learning and projects that can improve students' thinking skills creatively, innovatively,

imaginatively and systematically in producing products to solve a given problem. The analysis of the interview findings was shown in Table 11.

TABLE XI
TEACHER STATEMENTS ON TEACHING AND LEARNING TECHNIQUES

Source (Teacher)	Statement
G1	*"...it is good when students work in groups...this module I seem to encourage students to solve problems systematically. Each step in the module, trains students to think to produce a project...this module is a guide..."* *"...this module guides students to produce projects systematically...at the same time students think critically and creatively to produce good projects...it's like healthy competition..."*
G2	*This module is good teacher...this module encourages students to solve problems systematically...I see students being guided in the outcome of the project...and at the same time, encourages students to help each other (scaffolding), exchange ideas (brainstorming) and students try to prepare the project well* *"I am satisfied with this module...all student - centered activities..."* *"...I see this module is good...students will think deeply ... to solve a given problem...students have fun doing projects in groups..."*

3) Learning activity: Based on the findings for the learning activities, both teachers (G1 and G2) were satisfied with the learning activities carried out. Table 12 listed the teachers statements in which both teachers agreed with the learning activities related to urban agriculture featured in this module.

TABLE XII
TEACHER STATEMENTS ON LEARNING ACTIVITIES

Source (Teacher)	Statement
G1	*"The activities carried out are very suitable for students...especially Putrajaya students...very close to their lives ..."* *"...most of the students here live in apartments. There is no land to plant...so these people are used to seeing their parents planting trees in empty pots or containers...Only when this module reveals them about planting in reservoirs...they are excited again...a new way...that's good..."*
G2	*"I strongly agree that the production of reservoir planting projects is carried out...very close to the lives of students here ...* *"...apart from meeting the needs of DSKP, the activities carried out based on this module, I find very interesting and the students are free to produce projects according to their ideas...good teacher. We can't block students' creativity..."*

This is because, urban agriculture is very synonymous with the people of Putrajaya. The proposed problems encourage students to relate to their real lives. Existing knowledge helps students to implement reservoir cropping system projects

better. This is linked to the theory of cognitivism and the constructivist approach that underlies the study, in addition to encouragingstudents'e cognitive, affective, and psychomotor domains throughout the project's production process.

4) Training and Assessment: Findings related to training and evaluation found different opinions between the two teachers. They stated that training should be more critical and test students' thinking skills, and they argued that the training provided should be upgraded. However, they did not state that the training in the module is unnecessary, only that it needs to be upgraded to better test the student's ability and capability in problem-solving and thinking skills more creatively, imaginatively and innovatively.

However, both teachers (G1 and G2) were satisfied and agreed with the thorough evaluation carried out throughout the project production process. The assessment involving the student assessment rubric form in the module is very relevant and interesting. The assessment encourages all students involved to be more motivated to work together and help each other produce products that are not only creative, unique, and interesting but also effective, meet customer needs, and solve a given problem. The findings based on interviews with Teacher 1 and Teacher 2 are as follows in Table 13.

TABLE XIII
TEACHER STATEMENTS ON TEACHING AND LEARNING TECHNIQUES

Source (Teacher)	Statement
G1	*"I find the training and assessment in the module interesting...it's fun for students to do...ok...but it's quite easy..it's less challenging for students' thinking and creativity...can add a little high-level training..."* *"...I don't mean the training is not good...It's just less challenging"* *"Training using the LiveWorkSheet application is very good and interesting...because it is easy for students to do. Students also have fun...because the application is very user-friendly...other modules should also use this application to do exercises or activities for students..."*
G2	*"I see there are five exercises/ worksheets in the module... good and interesting...as an exercise when I finish PdP... for me, it's enough...there is no need for too much, I'll get tired later"* *"...for me, the training in the module needs to be raised to the level of the question...cam from a low level to a higher level"* *"I like when this module uses the LiveWorkSheet application for digital sheets...or now people call it e-sheets...the age of technology. Students now have more fun doing online training...but teachers have to set a time..."*

IV. CONCLUSION

In conclusion, this study discussed the life cycle development of the Visual-based Project Production Package Development model, which involves developing ProRBT-CTSTEM learning modules built based on the components and elements found in the RBT^{sr}-CTSCOMEL model in

primary school RBT subjects. This module was developed and used to test the model's applicability in the production activities of the Reservoir Crop System (ST2) project, which involves the title of Agricultural Technology Year 5 themed Urban Agriculture. The six (6) main components of the RBT[sr-]CTSCOMEL Model are Basic Theory, Teaching and Learning Strategies, Planned Learning, Computational Thinking Approach, Inquiry Thinking and Imagination, and Learning Assessment. The usability evaluation of this module is seen throughout the ST2 Visual-based Project Production activities based on the formative and summative evaluation. The applicability of this module is assessed based on the ability of students to produce a systematic plant system design through the use of this module as a learning aid and be able to improve students' problem-solving and thinking skills in a more systematic, creative, imaginative and innovative manner.

Systematic and effective problem-solving skills are very important in producing RBT projects because usually students and teachers face time constraints and limited materials and resources to produce product designs that can solve the given problems. Such constraints restricted the students' creativity and confidence in producing productive and meaningful product designs. Thus, the development of this module which applies six main components is seen to be able to improve thinking & creative skills and problem-solving skills given in a shorter period than before. Using the two versions of modules and e-Modules also helps increase students' confidence and motivation in RBT subjects, which are often considered difficult to implement. Students were given the option to choose printed modules or *e*-Modules, according to their convenience, although usually, conventional modules are used when learning in a face-to-face classroom, and digital modules are used when learning is conducted online. *E*-modules allow students to interact with learning materials and be active in their learning process rather than just watching without interacting with their learning. In fact, through *e*-Modules as well, students can be more proficient in using technology in learning. In fact, through the implementation of student-centered activities, this module is also seen to be able to form students' inquiry and imaginative thinking when they collaborate and discuss critically in solving given problems systematically. The implementation of hybrid learning is also seen to be able to increase students' interest and enjoyment in learning.

In addition, the interactive application LiveWookSheets in the form of e-Sheet provides makes it easier for students to use it and increases their motivation to complete the exercises given by the teacher quickly as scoring continues to be obtained when the *Finish button* is pressed. This encourages students to complete exercises and assignments quickly, and the quick display of marks makes students more enthusiastic and motivated to complete the assigned tasks. Students are also motivated to repeat the exercises given repeatedly as this app allows students to repeat existing exercises. This statement is supported by Lee [32], who mentioned that students learn faster when technology-assisted learning is used.

The production of the ProRBT-CTSTEM module based on cross-STEM CT with the theme of urban agriculture in the production design of the Reservoir Crop System (ST2) project can inculcate environmental sustainability and green technology in students' lives from the early beginning of their school [33], [34], [35]. This practice of sustainability should be nurtured and sown from the beginning of their time in school so that in the future, students can appreciate the importance of caring for the environment and the earth [36], [37]. The production of a reservoir planting project successfully inculcates the practice of sustainability in students' minds and further fosters STEM interest among primary school students based on sustainable environment and green technology.

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