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Development an Online Workshop in Developing AI-Driven Mobile Application: Design and Analysis of Aidea Workshop 2021

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Abstract: Technology literacy is one of the most important skills of the 21st century. Artificial Intelligence (AI) plays a vital role in today's life. It deliberately and unintentionally infiltrates a part of every human life on Earth. Understanding its essence is not only a challenge for computer scientists or software engineers, but also for every world citizen who does not wish to be left behind in the past world. In addition, many AI developers are mired in models that are elegant but not feasible to implement in the real world. In this study, we introduce an end-to-end process of an online workshop in developing AI-Driven mobile application for solving real problems that participants encountered in daily life through the lens of design thinking that is entirely inspired by Green oak! application. This ranges from teaching them a basic understanding of artificial intelligence, essential algorithms to building model architecture with a ready-made platform (Microsoft Azure and PerceptiLabs), and how to brainstorm with team members in order to work together effectively. In addition to opening up participants' worldview towards AI, this workshop model also develops their soft skills by practicing logic, discussing issues, and interacting within and between teams. We brought the developed workshop model to experiment with a sample of Generation Z people in Thailand who attended the "Aidea Workshop 2021" event. In summary, we found that 100% of workshop participants understand basic knowledge about AI, be able to develop a simple model from an assigned database, 4 out of 5 participants can pass a quiz (get 6 of 8 marks) we created to assess the effectiveness of each activity, 98% want to pass on the knowledge from the activity to the people around them and want this activity to happen again, and over 90.9% are interested in learning more about AI and the mathematics behind it. All of this was done in response to our research team's ultimate goal of being a middleman to transfer technology knowledge to people in society to make the digital ecosystem a reality.

Keywords: Online workshop, design thinking, artificial intelligence, mobile application

1. Introduction

COVID-19 pandemic has had a huge impact on human society. It has inevitably affected many aspects of people's daily lives, especially in education. City lockdowns, school closures, social distancing policies, and economic recession directly affect the learning process.

In Thailand, Data from Equitable Education Research Institute (EEFI) found that 10% of students drop out of the education system, the study from Oxford policy management and United Nations (UN) says that as a result of children missing three to four months of school due to a shock, they are likely to be the learning equivalent of 1–1.5 years behind where they would have been with no shock (Andrabi et al., 2020; Kaffenberger 2020). It is important to note that this is an estimate of the

average long-term impact. Children belonging to the most vulnerable groups, such as those already in the bottom quantile in terms of academic performance or socio-economic class, are likely to have an even greater long-term negative impact on their learning. In Thailand, as schools were closed for just over three months. Generation Z have been particularly hit in the coronavirus crisis in terms of school access and learning. However, this generation are digital native (Antony Turner, 2015) and they are going to face an era that Artificial Intelligence will be one of the most influential infrastructure in the world. To get generation z being prepared for the era, when many factors are considered, including the pandemic situation, the generation z people that are digital native, organizing an online artificial intelligence workshop is the well-fitting manner.

Therefore, our research aims to organize online workshops in Developing AI-Driven Mobile Application and to put all the AI knowledge into a short course for an online workshop.

2. Related Studies

2.1 AI Image Classification & Application

Recently, image classification is growing and becoming a trend among technology developers especially with the growth of data in different parts of industry such as e-commerce, automotive, healthcare, and gaming (Mohd Azlan Abu & Nurul Hazirah Indra & Abdul Halim Abd Rahman & Nor Amalia Sapiee & Izanoordina Ahmad, 2019). The fundamental task of image classification is to make sure, all the images are categorized according to its specific sectors or groups (Lingxi Xie & Richang Hong & Bo Zhang & Qi Tian, 2015). The image classification is achieved by differentiating the image into the prescribed category based on the content of the vision (M Manoj Krishna & M Neelima & M Harshali & M Venu Gopala Rao, 2018).

Microsoft Azure, formerly known as Windows Azure, is Microsoft's public cloud computing platform. It provides a range of cloud services, including compute, analytics, storage, and networking. Users can pick and choose from these services to develop and scale new applications, or run existing applications in the public cloud (Stephen J. Bigelow, 2020). Once you've trained the algorithm, you can test, retrain, and eventually use it in your image recognition app to classify new images. You can also export the model itself for offline use (Microsoft, 2021).

PerceptiLabs is a visual modelling tool for machine learning built on top of TensorFlow. It provides a rich user interface to edit, manage, and monitor your machine learning models while designing and training them. In PerceptiLabs, you drag and drop components on a workspace for each layer you want to include in your model and connect them together. To complete and run the model, a Training component is connected at the end of the model's graph. It's designed in a similar way to Keras, where the user writes one-liners of code for each layer, they want their model to include, and to wrap up and train the model (PerceptiLabs, 2021).

2.2 Online Workshop

The online workshop is a workshop equivalent to the face-to-face event, and this can be divided into synchronous (real-time) and asynchronous (not real-time) activities. There are many advantages online professional development. First, it fits with teacher schedules and draws good resources (Chris Dede & Diane Jass Ketelhut & Pamela Whitehouse & Lisa Breit & Erin McCloskey, 2008). Furthermore, it supports more personalized teacher professional development (Maxwell Yurkofsky & Sarah Blum-Smith & Karen Brennan, 2016). The online workshop allows the participants the time and opportunity that otherwise is impossible during the offline session (Laura Baecher & Shiao-Chuan Kung, 2011). Most online workshop members appreciate the online workshop despite the technical issues they faced in dealing with the new technological tools. They also reported that the online workshop would succeed when the participants have access to the tools and internet, have time and plan the time, are willing to collaborate and communicate, have prior knowledge and experience (Shu Ching Yang & Shu Fang Liu, 2004).

Technology, online education, and students continue to change. As technological innovation occurs involving the Internet and computer software, we need to think of new progressions for online

education (Catherine W. Cook & Christian Sonnenberg, 2014). Concerning the technical issue, the main challenge experienced by teachers was that discussions could not be conducted face-to-face. It was only through the WhatsApp group, so there was no direct interaction. And the communication that did not run well between team members as they did not know each other well and were reluctant to interact with the facilitator. Other obstacles were noted, such as delays in discussion due to the participant's or facilitator's late response, and teachers were not accustomed to using technologies, such as Zoom and WhatsApp for highly academic discussions. However, teachers can only work on concept maps, and they did not complete the design of the learning trajectory in the form of icebergs (R Johar & E Elizar & D Annisa & M Mailizar, 2020).

Design thinking has been defined as a fundamental premise to approach solving a problem in an innovative way. It borrows tools, methods and mindsets from the disciplines of design to foster innovation in multiple sectors and has gained wide recognition in the business environment (Tim Brown, 2008). It offers an integrating process and toolkit that incorporates both creative and analytic approaches to problem solving, and that has the potential to significantly improve innovation outcomes (Jeanne Liedtka, 2018). For undergraduate students in the university, the methods introduced in the design thinking course allowed them to understand possibilities for innovation in framing problems and in "discovering" through iterating concepts (Carolina GILL & Merce GRAELL, 2016).

3. Prototype

3.1 Microsoft Azure: Green Oak! Application

The popularity in growing green oak in households has been increasing slightly, but the main problem is the limited knowledge in growing this vegetable. Especially, The lack of knowledge about leaf spot disease. This problem makes us interested in creating an application to detect the leaf spot and suggest the better treatment to solve planting disease issues. An application combines with 2 parts. The first part is Auto ML (Auto Machine Learning) from Microsoft Azure. The classification category of Auto ML was used to identify and classify the photograph data. The second part is UI (User interface) which was developed by using thunkable.com. The application "Green oak!" will help suggest by identifying the symptoms of unhealthy leaves and inform the type of disease occurring in green oak. The objective of this study was to develop the application for detecting leaf spot disease by identifying the photo of sample leaves, then reported back the result to the application user.

Figure 3. Green oak! application development process.

3.1.1 Methodology

Image pre-processing & Image processing: Take 60 normal leaf images (Negative) and 60 images of damaged leaf by pest (Leaf miner fly) & Collect 180 infected leaves by funguses from internet (60 images in each funguses species consisting of Septoria lactucae, Cercospora lactucae-sativae and Alternaria brassicae)

Auto ML training: Use 150 collected images from internet and 100 images from hydroponic green oak leaves to train image classification Auto ML from Microsoft Azure platform: Iteration 1 using food domain; Iteration 2 using retail domain; Iteration 3 using general domain. Use 30 collected images from internet and 20 images from hydroponic to test Auto ML prediction and determine prediction accuracy and precision by using a confusion matrix process, because the researcher's aim is to achieve the highest AI efficiency.

Table 1. *Accuracy and Macro Average Precision of the Model*

	Accuracy	**Precision**
Iteration 1 (Food Domain)	0.7800	0.7774
Iteration 2 (Retail Domain)	0.6800	0.6900
Iteration 3 (General Domain)	0.6600	0.6694

According to the table, Iteration 1 (Food Domain) got both highest accuracy and macro average precision at 78% and 77.74% respectively, thus it was used as a model for web service that communicates with the Green Oak! application via Microsoft Azure's API.

3.1.2 User Interface

Figure 4. user interface of green oak! application.

The user interface of Green Oak! application is divided into two zones including viewing zone to show necessary contents such as Scan now! banner and uploaded image. The second zone is interacting zone positioning at user-reachable area e.g. bottom area of the screen containing frequently used components ex. green oak's leaf image inputting buttons. The concept of dividing user interface is invented to get

rid of user frustrating experiences on up-to-date large screen smartphone models that reduce user reach ability to reach upper screen area.

3.2 PerceptiLabs

Physical classification of mushrooms genera is so difficult. In this model, we use PerceptiLabs to create an automatic classification for mushrooms genera in Northern European with the dataset from: https://www.kaggle.com/maysee/mushrooms-classification-common-genuss-images. The result found the model has up to 90% scores and we use this as a sample model for the workshop.

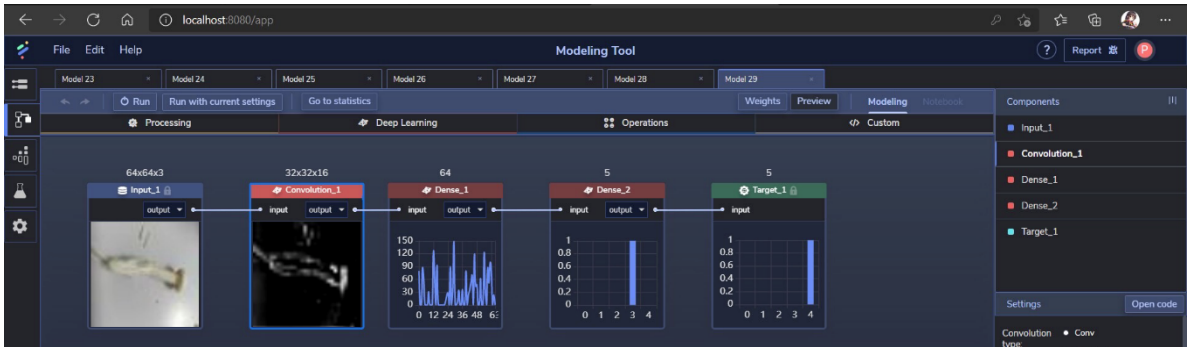

Figure 5. Model Architecture Diagram.

Table 2. *Efficiency of the model*

	Accuracy	Precision	Recall
Categorical	0.9286	0.9826	0.9826
Top K Categorical	1.0000	0.9826	0.9826

4. Workshop Design

The pre-workshop process is promoted through Facebook, Instagram, and camphub.in.th. Registration for the event is made through the website we have created. After selecting and announcing the results of the workshop's eligibility, we invited them to join the LINE group as the main communication channel for all activities.

The workshop activities lasted for approximately 2 weeks divided into online and offline formats as shown in Figure 6 To enable participants to understand both theory and practice. According to our participants are students, so the online activities need to be organized during public holidays through the Zoom application to ensure that participants are able to participate in the activities. There are also offline activities, where participants can allocate their own time, consist of "Aidea101" an introduction to artificial intelligence and the installation of AI modeling tools via YouTube: https://youtube.com/playlist?list=PLOBEBdbuWv8GyrBekYJh82e--MUApFU3u to prepare for the next online activities which the Green Oak! protype application is introduced to the participants to give a case-study how AI they're going to build can be applied into real-life scenario project. Finally, participant teams need to prepare for their design thinking based mini-project which consisting of the AI models results to be presented at the last day of workshop in an online activity session.

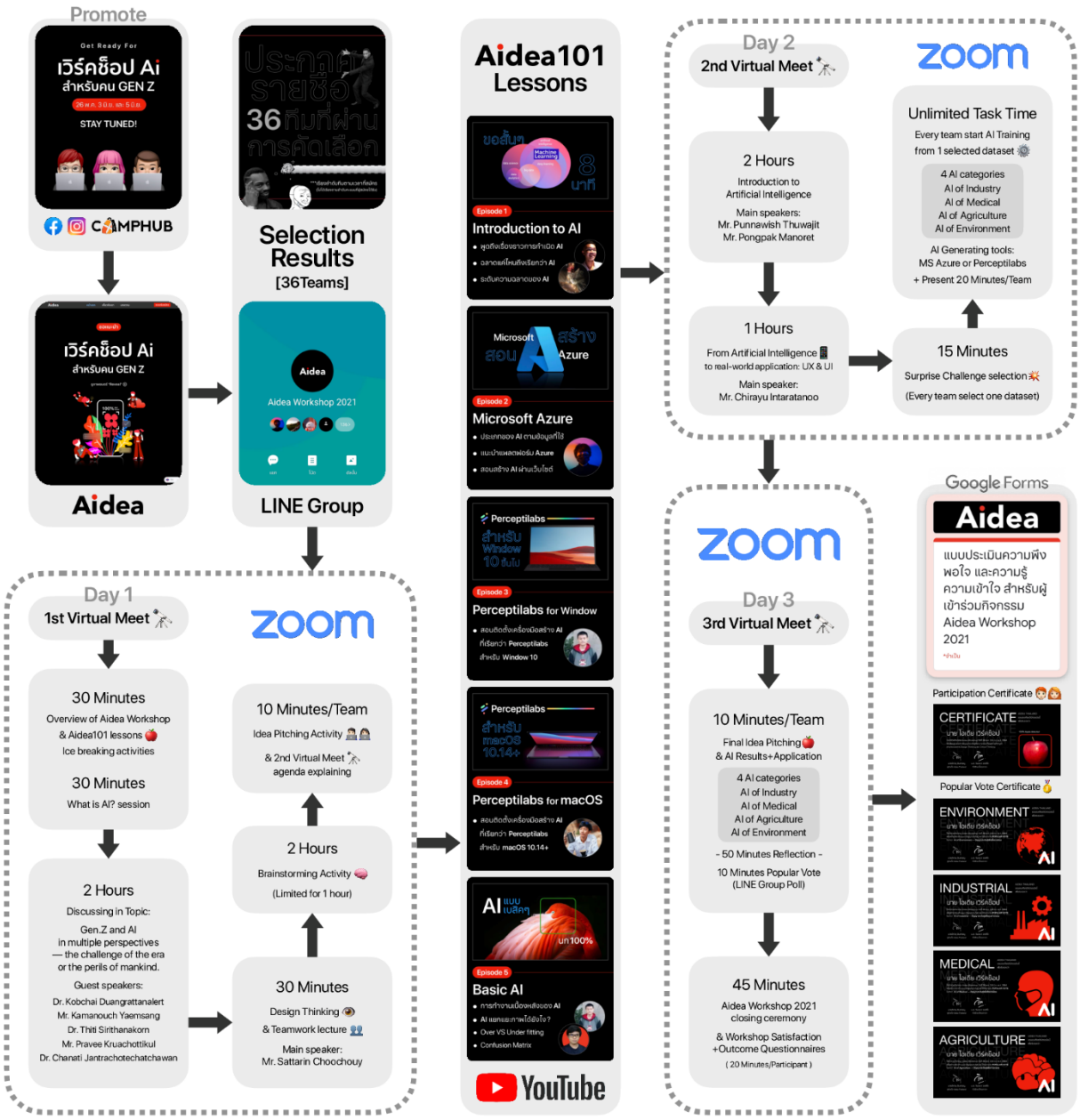

Figure 6. Workshop design diagram.

Table 3. *Activity in Day 1 of a Workshop*

Activity	Description
Introduction (30 min.)	1) Introduce an overview of activities 2) Ice breaking in workshop participants 3) Q&A session
What is AI? (30 min.)	1) Basic understanding of AI part I
Discussion (2 hrs.)	1) Discuss about AI in the lens of participants, AI developers, guest speakers who are specialists in 4 fields (Environment, Healthcare, Industry, and Agriculture), and philosophers
Lecture on “design thinking” (30 min.)	1) Basic understanding of design thinking 2) Recommend & choose database categories

Brainstorm (2 hrs.)	1) Look for everyday problems that the team wants to solve with AI and arrange them according to design thinking process
Idea Pitching and Feedback (10 min./team)	1) Pitch an idea from a brainstorm 2) Get comments and advices

Table 4. *Activity during Day 1 and 2 of a Workshop*

Activity	Description
Introduction to AI (10 min.) *Video content	1) Basic understanding of AI part II 2) History of AI, Biological vs Artificial Intelligence, AI in daily life, and where is AI in the world of computer science? 3) Basic technical term about AI
Microsoft Azure/ PerceptiLabs (20 min.) *Video content	1) Installation and basic features of the program
Basic AI (30 min.) *Video content	1) Activation function, Dense layer, and concept of convolutional neural network 2) Loss, Train Test Val split, overfitting/underfitting, dropout, and score

Table 5. *Activity in Day 2 of a Workshop*

Activity	Description
Lecture on "basic artificial intelligence development" (2 hrs.)	1) Teach how to use the program to develop an AI 2) Basic guideline about a high-efficiency model 3) Q&A session
Lecture on "UX/UI and application development" (1 hr.)	1) What is UX/UI? 2) Basic knowledge for create UX/UI design
Develop an AI with assigned database	1) Use the knowledge from both lectures to develop an AI and create a UX/UI design of an application
Present (20 min./team)	1) Present team works in Day 2 (by category)

Table 6. *Activity in Day 3 of a Workshop*

Activity	Description
Present overall work (10 min./team)	1) Present overall work each team done throughout the duration of the workshop to all participants
Reflect (50 min.)	1) Reflect the gains gained from participating in the workshop with each team participant
Vote popular work (10 min.)	1) Participants vote popular work in each category
Take a quiz and questionnaire (20 min./participant)	1) Take a quiz we created to assess the effectiveness of each activity 2) Take a questionnaire to assess the satisfaction of participating in the activities.

5. Results

After completing the workshop, all participants took a quiz we created to assess the effectiveness of each activity and a questionnaire to assess the satisfaction of participating in the activities. We analyzed both qualitative and quantitative data as shown below.

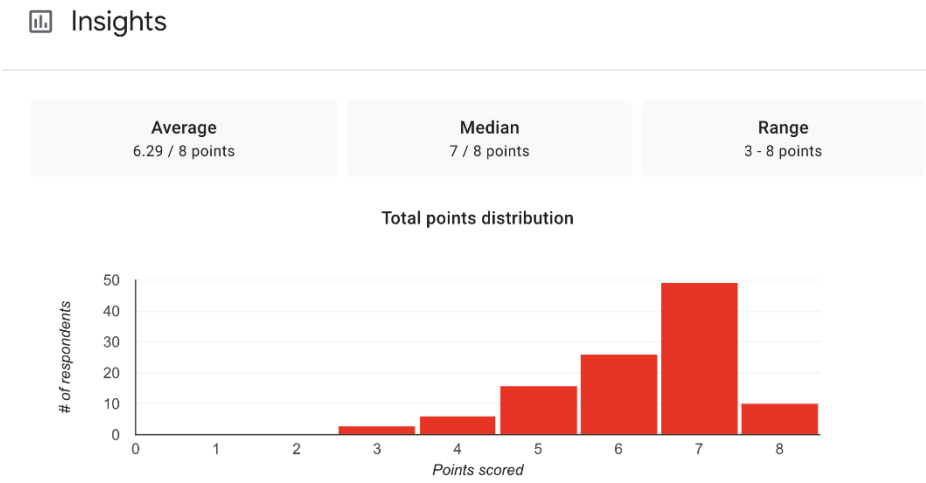

Figure 7. Quiz mark distribution chart and analyzed statistic.

It was shown that 100% of workshop participants understand basic knowledge about AI, be able to develop a simple model from an assigned database, 4 out of 5 can pass a quiz (get 6 of 8 marks) we created to assess the effectiveness of each activity, 98% want to pass on the knowledge from the activity to the people around them and want this activity to happen again, and over 90.9% are interested in learning more about AI and the mathematics behind it. According to the workshop which exclusively organized for Gen Z, the results claim that Gen Z can use their digital natives to learn and understand AI well.

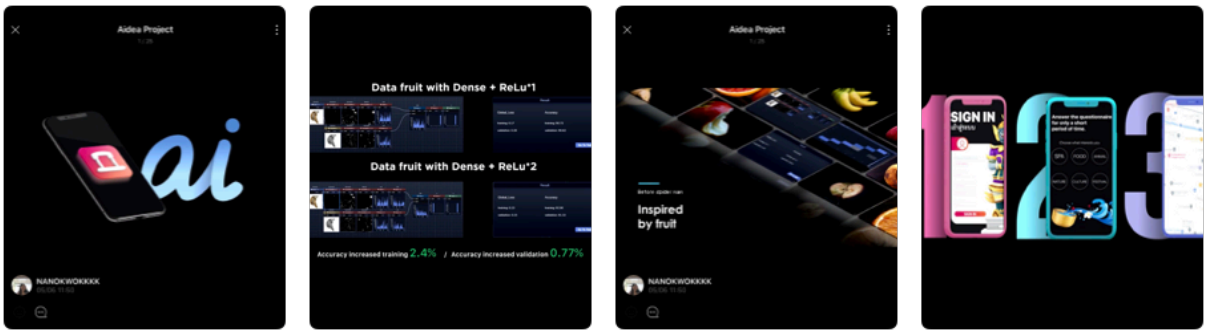

Figure 8. Examples of works from workshop participants.

We also extracted keywords from the workshop participants' subjective questions and analyzed them and weighted the number of responses (10) on the data.

Table 7. *Keyword Groups of Answers in a Questionnaire (Subjective Part)*

Question	Keyword	Weight (n of 10)
1) After attending the workshop, how has your perspective on AI changed?	Know more	4.5
	Complicated	2
	Get inspired	2

	Easy to understand	1
	Not change	0.5
2) What will you do with the knowledge gained from the workshop?	Share to community	4
	Develop work	3.5
	Learn more	2.5
3) What improvements would you like to make in this workshop	Weight of content	4
	Management	4
	Delectation	2

Figure 9. Group photo of (virtual) aidea workshop 2021.

6. Conclusion and Discussion

We introduce a new perspective for organizing an online workshop including: Prototype, Workshop Design, and Results. Workshop model we created can build technology skills and soft skills which participants are obtained during the workshop such as “Team work”: time management, collaboration, communication Discussion Presentation Q&A: communication, emotional intelligence, critical thinking and decision making Create AI: complex problem solving, Creativity. At the end of our

workshop, all participant teams can present their finished project and also can fill the questionnaire that can evaluate their knowledge about AI, Design Thinking and UX/UI design thus claimed that our workshop is effective.

The challenges for organizing an online workshop are divided into four main areas: difficult management, speakers do not know the appropriate speed of teaching by topic, different equipment used by participants, and a lack of interaction in participants. However, having an online workshop has its advantages such as not having to worry about location, distance, and time constraints.

Developing an online workshop should take into accounts all the factors such as participant internet, teaching style, ice breaking activity, and creating fun unlike a typical workshop. Researcher hope this study will be a good guide for workshop organizers, AI developers, and interested parties as well as expand the boundary of research about online events.

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References

Antony, T. (2015). Generation Z: Technology and Social Interest. *The Journal of Individual Psychology*, 103-113.

Brown, T. (2008). Design Thinking: Thinking like a designer can transform the way you develop products, services, processes and even strategy. *Harvard Business Review.*

Brown, T. (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. Markets*, Globalization & Development Review.*

Catherine, W. C. & Christian, S. (2014). Technology And Online Education: Models For Change. *Contemporary Issues In Education Research* – Third Quarter 2014.

Chris, D., Diane, J. K., Pamela W., Lisa, B. & Erin, M. M. (2008). A Research Agenda for Online Teacher Professional Development. *Journal of Teacher Education.*

Dana, F. & David, M. E. (2021). PerceptiLabs: https://docs.perceptilabs.com/perceptilabs/

Jeanne, L., (2018). Exploration the Impact of Design Thinking in Action. Darden Working Paper Series.

Johar, R., Elizar, E., Annisa, D. & Mailizar, M. (2020). The challenges experienced by teachers in online workshop during the COVID-19 pandemic. *Journal of Physics: Conference Series.*

Laura , B. & Shiao-Chuan, K. (2011). Jumpstarting Novice Teachers' Ability to Analyze Classroom Video: Affordances of an Online Workshop.

Lingxi, X., Richang, H., Bo, Z. & Qi T. (2015). Image Classification and Retrieval are ONE.

M Manoj, K., M Neelima, M Harshali, M Venu, G. R. (2018). Image classification using Deep learning. *International Journal of Engineering & Technology 7*(2.7), 614.

Maxwell, Y., Sarah, B. S. & Karen, B. (2016). Expanding Outcomes: Exploring Varied Forms of Teacher Learning in an Online Professional Development Experience. *ICLS 2016 Proceedings.*

Mohd, A. A., Nurul, H. I., Abdul H. A. R., Nor, A. S. & Izanoordina A. (2019). A study on Image Classification based on Deep Learning and Tensorflow. *International Journal of Engineering Research and Technology*, 563-569.

Norman, D. (2010). Design Thinking: A Useful Myth.

Paravee, S., Chalisa, P. & Chirayu, I. (2021). Smart Farming: Leaf spot Detecting Application for Hydroponic Green oak.

Patrick, F. & David, C. (2021). What is Custom Vision?: Microsoft Azure: https://docs.microsoft.com/en-us/azure/cognitive-services/custom-vision-service/overview.

Pumsaran, T., Maheen & Ying, Y. (2020). Social Impact Assessment of COVID-19 in Thailand: 4 Education.

Shu, C. Y. & Shu, F. L. (2004). Case study of online workshop for the professional development of teachers. *Computers in Human Behavior 20* (2004), 733–761.

Stephen, J. B. (2020). Microsoft Azure: https://searchcloudcomputing.techtarget.com/definition/Windows-Azure.