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Research Article

Development of Virtual Personal Learning Assistant to Enhance Inquiring Mind of Undergraduate Students

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Abstract

Skill development to keep up with the fast-moving evolution of knowledge is a vital key to human resource development today, especially undergraduate students who will be the most valuable force in the creative economy. An inquiring mind is the key factor in helping learners adapt to the world's movements. The researcher developed a personal virtual assistant, named AIME (Assistant for Inquiry Mind Enhancement), to enhance undergraduate students' inquiring mind. The research was conducted over seven weeks with 18 undergraduate students, employing an organized learning process based on the Connectivism approach and Python application development as the primary subject. In the 1st, 3rd and 7th weeks, the students' level of inquiry was measured using inquiry mind assessment. The paired-samples t-test results showed that after using AIME, students' inquiry mind increased significantly at the .05 level. Consistent with this finding, a one-way repeated-measures ANOVA indicated a change in students' inquiry mind across the three measurement periods: before, during and after using AIME. The students' inquiry mind also showed a statistically significant increase at the level .05. Moreover, the completion rate for learners' learning activities is also high. This reflects AIME's components can increase a level of inquiry mind in learners. This research presents a method for integrating AI into the learning management process, a key element that helps learners better understand their needs and stimulates a beneficial learning environment that increases learners' inquiring mind.

Keywords: learning assistant, inquiring mind, Connectivisim

Introduction

The world has changed rapidly to transform itself into the age of Industry 4.0. Also, One of the Thai government's missions is to reform the national economy, shifting from a middle-income trap to a value-based economy. Achieving a high quality of life and sustainability for Thai society requires skill development, which is essential to increasing equality among all citizens.

Human resources development plays an important role in the country's development. The Thai Ministry of Labour developed a human capital development strategy for the next 20 years (2017-2036) to support the development of STEM (Science, Technology, Engineering and Mathematics), which is very important for Labour in the industrial 4.0 era. Consequently, the job of supporting digital transformation is key to the future skills. But tools for building digital assets to drive the digital economy are changing rapidly. Anyone involved has to catch up and apply it to the change.

Connectivism is a learning style that emphasises access to learning resources aligned with learners' interests, enabling them to construct their knowledge in their own way. (Siemens, 2005). This is a learning approach that fits with learning to develop a skill, which has to adjust to changes in knowledge that occur every moment; also, the knowledge itself is spread out, not limited to a place. Connectivism is one of the best options for learning today.

Moreover, Connectivism is a learning concept that emphasises how learners can access learning resources that fit their interests and individual needs. The learning environment and media are also adjusted based on the learner's basic information, characteristics, interests, skills, and preferences. This means the entire learning environment, with this approach, will automatically adjust to the learner's needs and interests. That will make learners willing to develop themselves because the learning environment fits their learning needs with an inquiring mind, which is a vital factor for learning that supports lifelong learning (Reio et al., 2006).

Especially if the learning environment enables analytics based on learner behaviour and customises the learning environment to be personalised for learners. Analytics data can be used to adjust the learning environment. which provides a suitable learning environment for the learner, it can raise the learner's learning motivation. Reflect on the learner to develop themselves better with a high-inquiry mind, in line with the country's mission to develop people for the Industry 4.0 era.

For all these reasons, researchers would like to develop a virtual personal learning assistant, named AIME (Assistant for Inquiry Mind Enhancement), to enhance an inquiring mind. The result of this research would be that the researcher would gain knowledge of how to develop a learning environment that fosters the learner's inquiry mind, especially among undergraduate students, who will be a key to the creative economy. help the learner develop the skill for the future.

Objective

Develop AIME to create a personalised learning environment that uses a connectivist approach to enhance the inquiring minds of undergraduate students.

Literature Review

Connectivism

Connectivism is a learning theory proposed by Siemens (2005) that is well-suited to learners in the technological age (Manzoor & Atiq, 2026). Regarding the rapid change in disrupted knowledge, Connectivism is the learning theory that helps connect the spread of knowledge (Mukhlis et al., 2024). The results of implementing this approach indicated that learners are willing to apply what they have learned to real situations and appreciate its value. (Pandya et al., 2024). This approach is necessary for learning today, as the learning paradigm has changed to the digital world (Peter & Ogunlade, 2024). Connectivism consists of 8 principles: 1) knowledge for learning can be in a variety of opinions. 2) learning came from

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connecting the nodes of knowledge or learning resources together. 3) learning can go beyond human 4) capability for learning is more important than what the learner knows at present 5) maintaining connection between the knowledge nodes is the key skill 6) Skill for visualising the connection of knowledge is important. 7) Updated knowledge is the central part of the learning approach. 8) Learner's decision is a part of learning; the correctness of knowledge might be changed in the future.

Siemens (2008) mentioned that characteristics of a learning environment for Connectivism should consist of: 1) The learning environment should be informal , not tightly structured, but it should be flexible for learners to learn what they need. 2) The learning environment should provide a rich set of tools for connecting and exchanging among the learners. 3) The learning environment should provide regularly updated knowledge which the learner wants. 4) The learning environment should be a safe place for the learner to express their opinion and see their learning progress. 5) The tools in the learning environment should be easy to use. 6) The learning environment should be relevant to the experience of the learners.

Siemens also suggested establishing a learning environment for Connectivism. It should provide a set of components: 1) the component for learners and the experts to meet, 2) the component for expressing learner opinion like a blog, 3) the component for exchanging ideas and opinions between learners like forums, 4) the component for searching for new learning resources, 5) the component for studying from arranged learning resources. 6) the component that learners can exchange updates related to their study.

For setting up learning based on Connectivism, Downes (2012) has suggested it should combine with 4 steps: 1) Aggregation, the learning activities for Connectivism should provide a rich source of learning resources for learners. The learning activities should be designed so that learners can study and access the learning resources easily. 2) Remixing, the learning environment should have a tool that learners can use to connect the learning resources based on their interests together in their own way. 3) Repurposing, the learning activities should allow the learners to present or express the knowledge that they have learn based on their understanding. 4) Feed Forward, the learning activities should be open so that learners can share what they have learn or understand with other learners, which is an important part to build the learning community of the learners together and also is an important part for the Connectivism learning approach.

There is considerable research on Connectivism as one of the main pedagogies for learning in recent years. For example, using it as the learning theory during COVID-19 to facilitate collaboration among learners (Liu et al., 2024), and applying Connectivism to improve AI literacy among bilingual teachers in K-12 education (Davoodi, 2025) and medical students (Chang & Sreedhar, 2026), study to use Connectivism with the emerging technologies in foreign language teaching (FLT) (Mammadova, 2026). use as the basis for implementing the learning environment for a logic design study (García et al., 2026). Blended with AI technology for a surgical study (Lee & Wong, 2025), transforming the history education from traditional resources to a learning network (Mishra et al., 2026). or even use as a basis for collaborative learning on sustainable development among learners (Azizah et al., 2024).

Inquiring Mind

An inquiring mind means feeling the need to find the truth through questioning an individual throughout their life, using their 5 senses. or a response process to find out the answer from stimulation with a question or an unfamiliar situation. (Exline, 2011; Berlyne, 1954). As well as the determination to find the answer to the question or QDI (Question-Directed Intention) (Friedman, 2025). It consists of 2 types: 1) CFI (feeling-of-interest), which involves positive feelings when learning something new. 2) CFD (feeling-of-deprivation), the negative feeling, for example, stress, anxiety, or dissatisfaction, when a person feels a lack of knowledge and wants to find the answer (Litman & Jimerson, 2004).

Regarding setting up the environment to support learners' inquiring minds. The learning environment should consist of 1) a supportive environment, which should reduce the learner's stress and make them willing to do a variety of learning activities and not make the learner feel negative when they make a mistake. 2) The learning activity should have a level of difficulty that fits with the learner's level. 3) The learning activity should be meaningful for the learners. When they finish the activities, the learner can feel they have gained new knowledge and skills. 4) The environment should make learners realise themselves as capable. 5) The environment should suggest to the learners that they lack knowledge and provide a way to help. 6) The environment should support learners and provide positive feedback to help them seek new knowledge. 7) The environment supports learners to have self-regulation for continued learning. 8) The environment should provide the learning motivation that is optimal for the individual learner (Brophy, 1986; Litman & Jimerson, 2004; Kashdan et al., 2004 ; Litman et al., 2010).

The Inquiring Mind remains an important topic for research in education today, particularly as a factor in boosting learners in the Epistemology dimension (Matheson & Dipaolo, 2025). Use it as a strategy to foster the learner's curiosity in language teaching (Dewi et al., 2025). Implementing learning technology has a positive impact on student collaboration (Chen & Chen, 2024). Moreover, in the medical field, one should use an inquiring mind as the basis for boosting patient care (Dwyer & Sebesta, 2026).

For the measurement, Jintavee Khlaisang and Prakob Koraneekij conducted the research by measuring the inquiry mind among undergraduate students at Chulalongkorn University, a total of 40 students. They create the self-assessment to measure the inquiry mind using Orlich's inquiry mind characteristics. The assessment was evaluated by the experts in undergraduate student teaching and educational psychology. Also tested with the sample closest to the experimental group before the research (Khlaisang & Koraneekij, 2011).

Personalized Learning Environment

The personalised learning environment (PLE) means an environment designed to support the learner's characteristics and attitudes, enabling learners to develop their potential based on their Preferences and aptitudes. It is composed of 6 components: 1) Tools for studying, 2) unit of learning, 3) Responsibility of each member, 4) Community, 5) Rules that members have to follow and 6) Subject for learning (Johnson et al., 2011). Important factors supporting learners'

success consist of motivation and self-regulated learning.

Motivation refers to the elements that drive purposeful behaviour. The unsuccessful learner might lack motivation. The motivation can be divided into 2 types: 1) Intrinsic Motivation, the internal motivation within the person. It is an internal drive that pushes the person to express the behaviour without expecting reward or external reinforcement. 2) Extrinsic Motivation is the motivation that is affected by the influence of external factors, such as reward. Moreover, to maintain the learning motivation, it should consist of 4 components: 1) Attention, perceived in the learner's interest, arouses the learner's curiosity and learn. 2) Relevance, adject the learning objective of the learner's needs to have a positive attitude. 3) Confidence, help and support learners to succeed in the learning path 4) Satisfaction, reward or reinforcement when learners succeed (Keller, 2010).

The definition of self-regulated learning is the process or behaviour that enables learners to achieve their goals at each learning step along the learning path, relying on their motivation and the result of their own learning (Zimmerman, 1989). The circle of self-regulated learning consists of 3 phases: 1) Performance phase, the learner will do self-control and self-observation by setting up the objective and goal of learning and behave to complete their objective or goal. 2) Self-Reflection phase, the learner will do self-judgment to compare the result with what they have done with the goal which has been set in phase 1. 3) Forethought Phase, the phase will relate to the result from the completion of the learner and the learner's internal motivation and expectation. If the learner would like to continue their learning, they will go to the first step to set up a new goal and an action to achieve it (Zimmerman, 2011). Also, using learning tools that combine both asynchronous and synchronous components can help learners regulate themselves better than using them separately (Elfaramawy, 2025).

PLE is still an important topic for researching setting a learning environment in recent years. The study found that PLE allows learners to learn together; it can help reduce stress and support collaboration within the learner group (Xu et al., 2025). Also focusing on bringing new technology like AI to apply with PLE. for example, use LLM and Generative AI to help the expert in curriculum design (Guettat et al., 2025), and some studies suggest that they have to make the learner trust the AI that is applied to the environment (Thangaraj et al., 2026). Also, suggest an effective model to implement PLE for learners (Enríquez et al., 2025). and concern for the diversity of learners (inclusive education), including their use and access to it, and let learners use PLEs to develop themselves effectively. (Kiong et al., 2025; Enríquez-González et al., 2026). PLE can also support the implementation of Self-Directed Learning, enabling learners to adjust the learning experience to fit their style in the future (Fadli & El Mediouni, 2025).

Virtual Assistant Technology

A virtual assistant is an application designed to help or solve problems more effectively, using fewer resources. People can use a virtual assistant directly on their personal computers or mobile devices (Palilingan & Batmetan, 2019). The study indicated that learners value virtual assistant technology for supporting their learning but are concerned about the accuracy and trustworthiness of the tools they use (Bajaj et al., 2026).

Virtual Assistant Technology is now used in educational technology. For example, implement a virtual assistant as a chatbot, which will be an important aspect of the modern learning environment (Nayak, 2026) and be integrated with the LMS to help learners with communication (De Queiroz, 2026). or even implement as a teacher assistant in computer science study (Sarshartehrani et al., 2026) or digital to do personalised learning and 24/7 support for learners (Yingsoon et al., 2026), as well as to implement as a voice assistant guide for visually disabled students (Millán Martínez et al., 2026). Or implement as a consultant in the nutritional care centre to provide advice or basic treatment for the patient (Nuraini et al., 2026). Also, leverage real-time responses and personalisation to build an intelligent coach to assist the human (Mansurbekovna, 2026). Some studies recognise that a virtual assistant powered by AI will significantly reshape and modernise education, but they must be applied ethically and responsibly at the same time (Kayyali, 2026). It's clear that virtual assistant technology and related technologies play a major role in educational technology today.

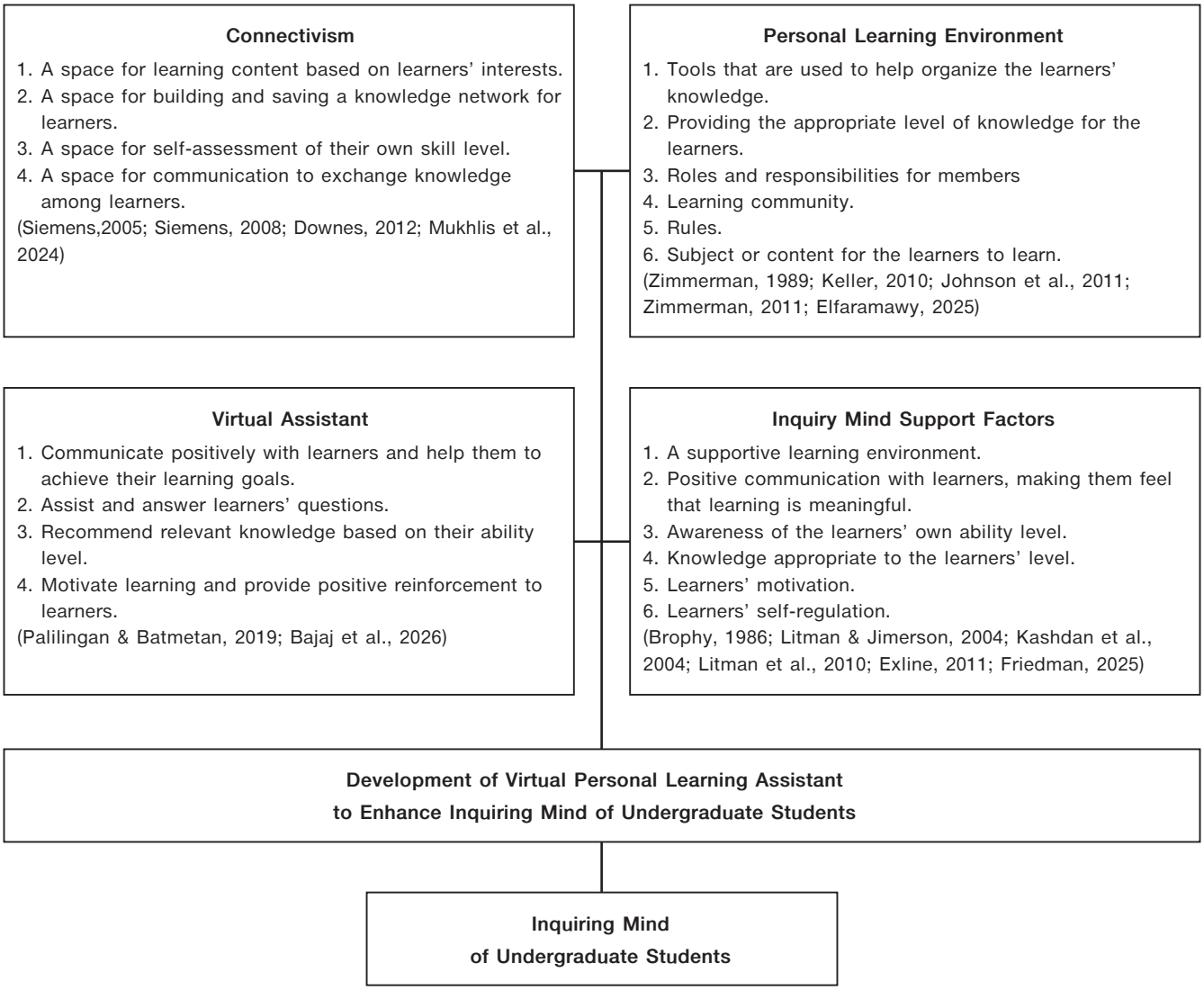
Methodology

In this study, the researcher conducted research and development (R&D) to develop a virtual personal learning assistant that supports a connectivist learning style to enhance an inquiring mind. The research consists of 4 phases: 1) Needs analysis, 2) System design, 3) Development, and 4) Implementation and evaluation. Researchers design the research method and learning design based on Siemens' Connectivism.

Researcher Framework

Figure 1

Research Framework



Needs Analysis

To study the learners' conditions and needs, the researcher conducted a survey with 446 undergraduate students. The researcher also interviewed 7 subject matter experts in educational technology about the conditions for applying technology to arrange the learning environment in a Connectivist approach and the factors for boosting students' inquiry minds. The conclusion can be summarised in these points: 1) the learning environment should support both personal computers and smartphones; for smartphones, it should support both iOS and Android. 2) The learning environment should train students before use and help them when they find problems. 3) The learning environment should include components that support learning among learners, show individual knowledge levels, and provide resources based on their interests. 4) The learning environment should be a community that supports learning between learners and includes suitable rules for all members. 5) The learning environment should give learners motivation, help them feel the meaning of learning, and arouse them to learn new things.

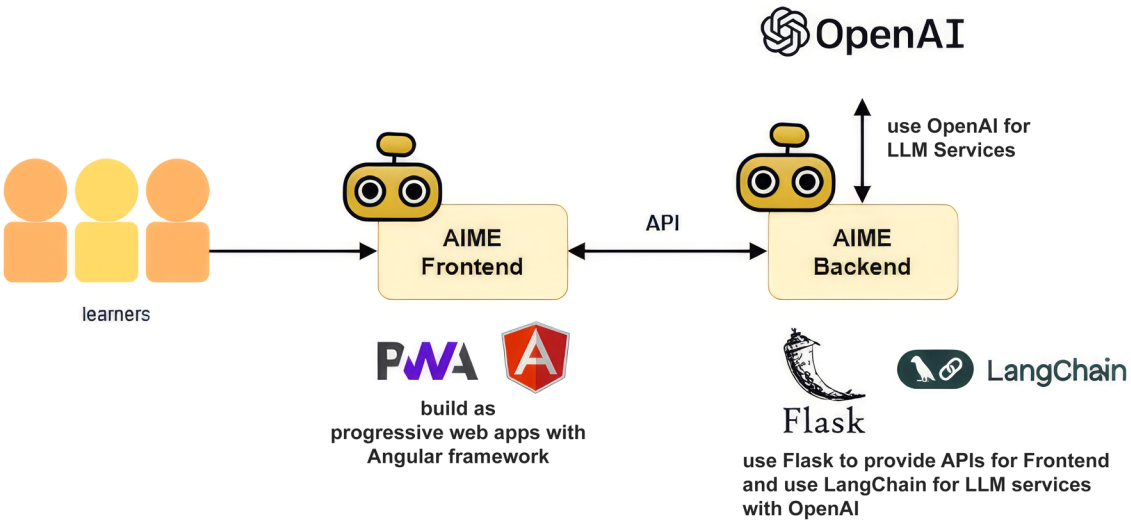
System Design

In the next step, the researcher prototyped the learning environment, which consists of the following components: 1) Home component, the first component that the learner can access. It shows each learner's progress and activities so they can see and be inspired to inquire. This component also lets learners ask questions and get support by typing inquiries in the chat panel. 2) Study component, the main component for displaying content for study. It also provides related activities, such as a quiz or assignment, to the learner. 3) Bookmark component, the component for creating or saving content based on the learner's interest, following the Connectivism learning approach. 4) Forum component, the component where learners can exchange their knowledge or opinions with other learners. 5) Achievement component, which shows the learner's progress compared with another learner to provide reinforcement and rewards, increase motivation, and reflect the learner's inquiring mind. The component displays points from learning activities and the badge the learner earned.

The researcher used the system prototype to evaluate 7 educational technology experts, who completed a ques-

tionnaire with a five-level rating for each question. The results for all components are *M* = 4.83 and *SD* = 0.06, indicating that the components the researcher designed are suitable for developing the system to enhance an inquiring mind. After assessment with the expert, the researcher used this information to develop a virtual personal learning assistant that supports a connectivist learning style to enhance an inquiring mind, named AIME (Assistant for Inquiry Mind Enhancement)

Figure 2
AIME System Architecture



Development

To build the system, the researcher breaks AIME into a frontend and a backend. The frontend is built as a progressive web application. The benefit of using a progressive web application is that the virtual personal learning assistant can display responsively based on the learner's screen and behave like an application on Android or iOS, while not requiring installation. The backend provides APIs for the frontend to interact with and includes a database to store learners' learning progress and learning activities. The backend also connects with the LLM service for natural language processing and generative AI tasks. The researcher used OpenAI as the service for handling the tasks:

1) Home, the landing page for learners. After the learner successfully logs in to the virtual personal learning assistant, this component appears. It combines three sections: (1) a section to display the learner's progress, showing completed activities as a percentage, total points earned, and badge level; (2) a section to recommend extra knowledge that may interest the learner and match their level to raise inquiry mind; and (3) a section to display other learners' activities, showing completed activities from other learners. The learner can see these completions to boost motivation.

2) Ask, the component was designed to suggest, recommend, and help learners. Learners can ask about a topic of interest or request help by clicking the Ask button. AIME will process the learner's inquiry and provide an answer based on the learner's knowledge level. For example, if the learner's level is beginner, the answer will be simple and easy to understand. If the learner's level is higher, the answer will be deeper and more detailed. Furthermore, the Ask component will search AIME for content related to the learner's inquiry and present it as links for the learner to select. The learner can click a link to study the topic that interests them.

Figure 3
AIME Responses Feedback and Helps Learners



3) Study, The component was designed as the primary learning resource for learners. It was designed to support a variety of learning activities, including reading, watching videos, and coding, to help learners practise their coding skills. The activity presents the problem and lets the learner solve it by coding in the programming language. Learners can check the result immediately by clicking the Run Code button. When the learner submits code to solve the problem, AIME processes the feedback response. If the code is correct, AIME displays a success message. If the code is incorrect, AIME displays two buttons for the learner to select: (1) Re-check, which lets the learner go back to the code and fix the wrong code by themselves, or (2) Ask, which triggers AIME to help and guide the learner on the correct code so they can fix it. Moreover, AIME also supports the learning activities that may be required in the connectivism learning approach, namely reflection and exchange. The reflection learning activity lets learners summarise what they learned in their own words. The exchange learning activity allows learners to express their ideas or knowledge and receive feedback from another learner. Finally, when learners complete the learning activity, they receive points from AIME, which are counted toward the learning badge level and increase learners' motivation and inquiry mind.

4) Bookmark: to support the connectivist learning approach, AIME needs a component that does so. This component was designed for learners to write a conclusion or reflection of what they have learned in their own words. When learners save their knowledge in the system, AIME makes a summary so they can catch up later. It also provides 5 keywords related to their knowledge that learners can use to search for other learning resources or use in the Ask component. The bookmark component also allows learners to save learning resources as links. In this case, AIME tries to extract information from the learning resource the learner provided. Then AIME summarises the content and displays it to the learner. It also provides 5 keywords related to linked resources for learners to search in the future.

5) Forum, this component was designed to enable the exchange of opinions and knowledge among the learner base within the connectivist learning approach. A learner can create a topic to ask a question and share an opinion or comment with a group of learners, supporting sharing and increasing learners' motivation.

6) Achievement, the component was designed to enable learners to receive feedback on their learning progress and compare it with other learners' progress, thereby increasing learners' inquiring minds. It contains three sections: (1) a section to display the learner's level, which shows the level as a badge and provides information on the total points and percentage of completion that the learner has gained. It also shows how many people are ranked at each level. (2) a section to display the top 5 learners with the highest earning points. The component presents the top 5 highest-scoring learners as a graph and a list. The graph highlights each learner's point relative to others, making it easier for learners to compare their points with others and boosting motivation and inquiry. (3) a section to display the top 5 learners with the highest percentage of learning activity completion. This component also sorts by the highest percentage of activity completion and displays it to the learner as a graph and details, similar to the highest-earning points. This also supports increasing the learner's motivation and inquiry mind.

Implementation and Evaluation

The researcher selected the sample by using a purposive sampling approach. Undergraduate students are studying in the Python application development subject, a total of 18 people, who were volunteer students aged 20-22 years old, currently pursuing a bachelor's degree in computer science and educational technology, and possessing a background in using technology in learning, which aligns with the research's specific target group. The researcher applied AIME in a 7-week Python application development class using the Connectivism approach (Downes, 2012), which consists of four stages: (1) Aggregation, which lets learners access a variety of learning resources, (2) Remixing, which lets learners connect the learning resources based on the learner's interest, (3) Repupposing, which lets learners create knowledge from the collected resources and represent it in their own way, and (4) Feed Forward, which lets learners share the knowledge they have built with other learners.

For the measurement, the researcher used Jintavee Khlaisang and Prakob Koraneekij's inquiry mind self-assessment to assess students' inquiry mind. (Khlaisang & Koraneekij, 2011) It contains 34 questions and a 5-point rating score with 6 sections: (1) Awareness of what is encountered or what is happening. (2) Formulating questions or presenting hypotheses that can be tested. (3) Data collection using various methods. (4) Analysing and interpreting data using meaningful and credible language. (5) The ability to summarise, categorise, classify, or identify results and apply information in different contexts. (6) Upon receiving new information, they can confirm or modify their original conclusions. It was used to test 40 graduate students who were similar to the sample used in the research. Reliability was measured using Cronbach's Alpha, yielding 0.788. The researcher used this assessment to measure during the 7 weeks. The measurement was conducted 3 times: the 1st, 3rd, and 7th weeks. The measurement result would be used in the next step of data analysis.

For the analysis, the researcher compared the learner's inquiry mind before and after using AIME using a paired-samples *t*-test. The researcher analysed the learners' inquiry mind before, during, and after using AIME using a one-way repeated measures ANOVA. The researcher also analysed the distribution of data points and the learners' percentage of learning activity completion.

Results

For the analysis, the researcher used 2 methods. In the first part, the researcher compared the learner's inquiry mind before and after using AIME using a paired-samples *t*-test. The second part, the researcher analysed the learners' inquiry mind before, during, and after using AIME using a one-way repeated measures ANOVA. The researcher also analysed the distribution of data points and the learners' completion rates for learning activities. The results from the experiment can be shown in 4 parts:

1. Comparing the differences in learners' inquiry mind before and after using AIME. In this part, the researcher measured learners' inquiry mind at the 1st week (T1) and 7th week (T2)

of learning and used the paired-samples *t*-test to analyse the difference in inquiry mind of the learner. The results are shown in Table 1.

Table 1
The Comparison of the Differences in Learners' Inquiry Mind Before and After Using AIME

Inquring Mind Measurement (I)	Inquring Mind Measurement (J)	*M* (I-J)	*SD* (I-J)	*p*
1st	2nd	-4.333	2.037	0.048
	3rd	-13.111	1.666	< 0.001
2nd	1st	4.333	2.037	0.48
	3rd	-8.778	2.478	0.003
3rd	1st	13.111	1.666	< 0.001
	2nd	8.778	2.478	0.003

The analysis has shown that learners' inquiry mind increased before, during, and after using AIME, at a statistically significant level of .05.

3. Point from the learning activities while using AIME. The researcher examined how learners prefer to learn and whether they are interested in studying more. The researcher also analysed the learners' learning activity points, which they have completed. The result show that most learners completed the learning activities in AIME. The learner's high-value points are the results, respectively.

4. The percentage of learners' completion in learning activities while using AIME. The researcher also examined the completion of learning activities for individual learners by checking the skewness and Kurtosis of the percentage of learners' completion. The results showed that that most learners completed the learning activities in AIME at a high value in line with the result from point.

Discussion

In this research, the researcher developed AIME, a visual assistant based on connectivism, to enhance undergraduate students' inquisitive minds. In the experiment, the researcher set up a 7-week Python application development learning program and measured learners' inquisitive minds.

The researcher analysed differences in students' inquiring minds before and after using AIME. A paired-samples *t*-test was used to compare the results. Learners' inquiring minds increased significantly at the .05 level. The researcher also analysed differences in students' inquiring minds while using AIME. A one-way repeated measures ANOVA compared learners' inquiring minds before, during, and after using AIME. The results show significant differences at the .05 level.

The analysis shows that AIME's components can support students' inquiry mind. These components were designed to encourage learners' inquiry mind by helping them perceive their learning level, build motivation, and support self-regulation in an environment built to support them.

The results can be shown through learners' completion rates, with points and percentages indicating that most learners are at a high level. Learners completed several AIME learning activities to earn points, which were intended to provide positive reinforcement. Completing the AIME learning activities to earn points indicated that the learners were satisfied with this reinforcement.

In particular, the results show that some learners tried to complete the learning activity to achieve a point above their usual level. This shows that learners did their best when they tried to complete the learning activity. The point is the component of AIME intended to provide positive reinforcement and rewards, helping learners perceive success when they complete the learning activity and boosting their motivation to learn (Keller, 2010). Motivation supports the inquiring mind and helps increase it. In other words, AIME can support and raise the learner's inquiry mind through the experimental results.

Also, the completion rate for learning activities is high. It can be inferred that the percentage of learners completing learning activities is also high. This indicates that AIME can encourage motivation and self-regulated learning, resulting in high completion rates. The AIME component also provided support and encouragement. For example, the achievement component enables learners to visualise their learning progress and compare it with others. It is designed to raise learner motivation and self-regulated learning, especially as factors that encourage the inquiring mind of the learner (Kashdan et al., 2004; Litman & Jimerson, 2004; Litman et al., 2010). Moreover, it is designed so learners can see their progress and assess their knowledge level relative to other learners. It can also encourage learners' motivation and self-regulated learning (Zimmerman, 1989; Zimmerman, 2011), which are important factors in supporting the learner's inquiring mind. It helps learners complete their learning activities and learning path. However, the sample size in this experiment was small (N = 18), no control group was used, and the experiment lasted only 7 weeks. The researchers will take these limitations into consideration for future research.

The research has shown and contributed that incorporating AIME into the learning process may promote a learner's inquiry mind. It may support learning processes at both the university level and across several digital learning environments. For example, including Artificial Intelligence (AI) technology into AIME with the four-step Connectivism learning process includes aggregation via AIME Ask and Bookmark, remixing

via AIME Note and Repurposing, and feed-forward via AIME Forum with another learner. It can also be used in inquiry-based learning by designing a learning process in which learners can investigate with personalised questions adapted to their abilities. Learners can search for knowledge via AIME Ask and construct their own knowledge via AIME Note. Instructors assess learners' knowledge through question-answering activities in AIME or through shared feedback from other learners in the Forum. Furthermore, in each learning process within AIME, learners receive points as rewards to motivate them. This may support learners' thirst for knowledge and lead to successful learning.

Conclusions

The researcher developed AIME: A virtual personal learning assistant that supports a connectivist learning style to enhance an inquiring mind. which conducts the experiment with undergraduate students in the Python application development subject using a connectivist learning approach. And measure the difference in learners' inquiry mind before and after using AIME, including during its use. The result shows that AIME can support increasing learners' inquiry mind at a statistically significant level of 0.05. also boosting the learning motivation and self-regulated learning, which are necessary factors for lifelong learning. In line with the movement of knowledge that changes rapidly in the present day, which becomes an increasingly important feature for people who will value resources for the new creativity economy in the future.

Ethics

This research was approved by the Chulalongkorn University Institutional Review Board (IRB), The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts (Reference Number: 660134).

Declaration of Generative AI

Generative AI was used only to check grammatical accuracy and polish the language. The researcher designed the study, collected and analysed the data, and produced all conclusions and findings presented in this research.

Funding

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Declaration of Competing Interest

The authors affirm that there are no conflicts of interest associated with the conduct of this study.

Author Contributions

Sutthirak Sangchan: Writing – original draft, Writing – review & editing, Formal analysis, Software, Visualization. **Prakob Koraneekij:** Writing – review & editing, Validation, Supervision. **Jintavee Khlaisang:** Writing – review & editing, Validation, Supervision.

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