

The Development of an Instructional Model for Self-Discovery Learning for Online Teaching: Foundation of Education Course

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Abstract

As online education has become increasingly prevalent, there is a growing need to develop innovative teaching models that can effectively engage students and enhance learning outcomes. This study aimed to: 1) develop a Self-Discovery Learning (SDL) teaching model for online instruction, 2) compare students' academic performance between pre-test and post-test results using this model, and 3) assess student satisfaction with the implemented teaching model. A sample of 30 students was selected using stratified random sampling. The statistical methods employed in the study involved paired t-tests to compare academic achievement results and descriptive statistics to analyze student satisfaction levels.

Results indicated the following: 1) the development of the model for online teaching in the basic education curriculum: The development of the teaching model followed the principles of constructivism, emphasizing learning through creation, collaboration, and knowledge construction linked to real-world contexts. The SDL model was applied across four lessons, integrating digital tools and interactive learning activities. The model effectively supported: Learning through creation; Emphasizing the importance of working with tangible elements; Encouraging creative learning and collaboration; Facilitating knowledge construction linked to context; and Incorporating online teaching techniques. 2) The comparison results demonstrated a significant improvement in academic achievement. On average, students showed a marked increase in their post-test scores across multiple lessons, indicating that the SDL model effectively enhanced student knowledge and understanding. The paired t-test results revealed statistically significant differences, confirming the model's positive impact on academic performance; and 3) Results of the evaluation of student satisfaction with the model for online teaching in the basic education curriculum: The evaluation of student satisfaction revealed that learners were highly satisfied with the teaching model. Key factors contributing to their satisfaction included the variety of learning processes, the use of digital tools, and the clarity of learning objectives. The overall satisfaction rating was very high, suggesting that the model not only improved academic outcomes but also created an engaging and enjoyable learning experience. In conclusion, the developed SDL model effectively improved student academic achievement and satisfaction by incorporating constructivist principles, digital tools, and interactive learning activities, fostering creative learning, collaboration, and real-world knowledge construction.

Keywords: Self-Discovery Learning; Online Teaching; Instructional Model

Introduction

In the continuously changing environment of education, particularly in sectors such as Artificial Intelligence (AI), the necessity for creative instructional methodologies is of the utmost importance. As a result of the growth of online learning platforms and the growing demand for education that can be completed remotely, educators are faced with the difficulty of modifying traditional teaching approaches to properly suit the digital world. Self-Discovery Learning (SDL) is one of these approaches that has garnered a lot of attention since it is effective in cultivating both profound comprehension and the ability to think critically. SDL, which has its origins in constructivist ideas of education, places an emphasis on inquiry-based learning and student-centered exploration. There is a great deal of potential for the implementation of SDL principles in the field of online teaching education, which is characterized by the intersection of intricate ideas and practical applications. The application of SDL to online contexts, particularly in artificial intelligence classes, is still relatively unexplored, even though it has been extensively researched and implemented in traditional classroom settings (Zhou, Y., 2020).

Online Teaching is essential for understanding its complex ecology and enhancing practical skills, as traditional teaching methods fall short in addressing the unique demands of online platforms. Discovery Learning, which promotes active engagement through curiosity, investigation, and inquiry, can boost critical thinking. However, challenges persist in translating abstract theories into practical applications. A deeper understanding of drug representations, Discovery Learning models, and benchmark datasets is crucial for success in Online Teaching education (AlQaheri, H., & Panda, M., 2022).

While Online Teaching revolutionizes learning by fostering critical thinking, problem-solving, and analytical skills, its implementation can be hindered by resource constraints and insufficient instructor expertise. Therefore, developing a tailored instructional model for Online Teaching courses is critical to overcoming these challenges (Paul, D. et al., 2021).

The rapid expansion of Online Teaching demands skilled professionals capable of managing its complex ecology. Deep learning technologies, including machine learning, play an essential role in Online Teaching education. Combining Discovery Learning with innovative instructional methods enhances student engagement and cultivates Online Teaching skills.

Furthermore, Online Teaching technologies have significantly improved supply chain integration and environmental performance, enabling logistics managers to support green supply processes (Benzidia, S., Makaoui, N., & Bentahar, O., 2021). This illustrates the broader potential of Online Teaching technologies in various industries.

The statement of the problem for this issue could be concluded that in light of the historical context and the growing significance. There is a need to develop effective instructional models that leverage online teaching methods, specifically focusing on the implementation of Discovery Learning. This study aims to address this gap by investigating the development and application of an instructional model for Discovery Learning in online Foundation of Education course. The primary objective is to assess how such an approach can enhance student engagement, foster critical thinking and problem-solving skills, and ultimately prepare learners for the challenges of the rapidly evolving field of Online Teaching. Additionally, the research seeks to explore the potential benefits of this model for teachers and educational institutions, including its impact on the comprehensiveness of understanding Online Teaching concepts and its ability to facilitate personalized learning experiences.

Research Objectives

1. To develop an instructional model for Self-Discovery Learning for online teaching in the Foundation of Education course.
2. To compare achievement between pre- and post-tests on an instructional model for Self-Discovery Learning for online teaching in the Foundation of Education course.
3. To assess the student's satisfaction with an instructional model for Self-Discovery Learning for online teaching in the Foundation of Education course.

Research Methodology

Population and Sample Group

Currently, approximately 120 undergraduate students are enrolled in the Foundations of Education course across four different classes. The sampling method employed is stratified random sampling, selecting one class with diverse characteristics. This includes a mix of high-achieving and average students, a near-equal gender distribution, and students who all major in the same field of study. This approach ensures diversity in terms of demographics, educational background, and technological proficiency.

The sample consists of one class with 30 students selected from the Foundations of Education course. The students are divided into 5 groups, with 6 students in each group.

Research Instruments

1) Self-Discovery Learning Course for Online Teaching in Basic Education

The researcher selected 4 lessons to use self-directed learning. The 4 lessons were selected as follows:

- Lesson 1: Emphasizing Eternal Truths
- Lesson 2: Ancient and Medieval Education
- Lesson 3: Cognitive, Constructivism, and Behaviorism Learning Theories
- Lesson 4: Cultural Foundations

2) Learning Achievement Evaluation Form

This study incorporates pre- and post-test evaluations to assess the efficacy of a self-directed learning curriculum designed for online delivery in a Foundations of Education course. These lessons provide opportunities for qualitative assessment of student learning, allowing for granular evaluation of specific learning outcomes. In this study, the course curriculum focuses on four lessons:

- Lesson 1: Emphasizing Eternal Truths
- Lesson 2: Ancient and Medieval Education
- Lesson 3: Cognitive, Constructivism, and Behaviorism Learning Theories
- Lesson 4: Cultural Foundations.

This includes pre-test and post-test evaluations for the Self-Discovery Learning curriculum for online teaching in the Foundations of Education course. Three experts in evaluation were invited to review the learning achievement test and provide feedback for any modifications. The Item-Objective Congruence (IOC) Index, developed by Rovinelli and Hambleton (1977), was used to evaluate each item. The IOC results range from -1 to +1:

- +1: Indicates the item meets its specific objective.
- 0: Indicates uncertainty about whether the item meets its objective.
- 1: Indicates the item does not meet its specific objective.

3) Questionnaire on Satisfaction with Learning Through Self-Discovery Learning Courses

The assessment covers satisfaction with the Self-Discovery Learning curriculum, including the following three parts:

Part 1: General information of respondents (e.g., gender, grade level).

Part 2: Satisfaction with course content across 4 lessons

Part 3: Satisfaction with online learning, including the ease of using the system in various areas such as learning, assessment, and chapter tests.

Validity and Reliability

The research instruments of this study were verified by five experts. The research instrument verification was calculated according to the Index of Item-Objective Congruence (IOC) developed by Rovinelli and Hambleton (1977) to determine whether the items meet the research objectives. Based on Rovinelli and Hambleton's (1977) rating categories. Evaluated by 5 experts. From the evaluation results, the researcher made corrections according to the suggestions and cut out the items with a total score lower than 0.6 and let the experts reconsider. The overall questionnaire score was equal to 1.

Analysis of the Cronbach's Alpha curriculum for self-discovery for online teaching in basic education overall has a Cronbach's Alpha value of 0.889. Each section of the questionnaire has a Cronbach's Alpha value as follows.

Lesson 1 :Emphasizing Eternal Truths yielded a Cronbach's Alpha value of “.0.881Good”

Lesson 2 :Ancient and Medieval Education yielded a Cronbach's Alpha value of “.0.845Good”

Lesson 3 :Cognitive, Constructivism, and Behaviorism Learning Theories yielded a Cronbach's Alpha value of “.0.802Good”

Lesson 4 :Cultural Foundations yielded a Cronbach's Alpha value of “.0.898 “Good”

Upon reviewing the Cronbach's Alpha values for these four lessons, it is evident that all the lessons demonstrate good internal consistency, as indicated by the Good Cronbach's Alpha values.

Questionnaire on Satisfaction with Learning Through Self-Discovery Learning Courses Evaluated by 5 experts. From the evaluation results, the researcher made corrections according to the suggestions and cut out the items with a total score lower than 0.6 and let the experts reconsider. The overall questionnaire score was equal to 1. The analysis of Cronbach's Alpha for questionnaire on Satisfaction with Learning Through Self-Discovery Learning Courses. is equal to 0.924.

Data Collection

The data collection process was carried out in alignment with the study's objectives and proceeded through the following phases:

Phase 1. Developing the Instructional Model

An instructional model for Self-Discovery Learning in online teaching was developed specifically for the Foundations of Education course. This involved designing a curriculum structured around key lessons, integrating online learning platforms such as DingTalk and WeChat. These platforms facilitated group-based learning, content delivery, and collaboration.

Phase 2. Content Development

Four key lessons were identified for online delivery through DingTalk and WeChat. The content was designed to promote independent exploration and application of concepts via practical assignments, which were tailored to encourage reflective learning.

Phase 3. Learning Platform Development

The researcher adapted DingChat, a combination of DingTalk and WeChat, as the primary platform for communication, online collaboration, and educational activities. These platforms provided tools for real-time discussions, content sharing, and assignment submissions, effectively supporting the online learning environment. This adaptation was essential due to local constraints on other popular educational tools.

Data Analysis

The data analysis was conducted according to the study's three main objectives:

1. Development of the Instructional Model

Data from the expert assessments were collected and analyzed using descriptive statistics, including frequency, percentage, and mean. This analysis was used to refine and improve the Self-Discovery Learning curriculum.

2. Comparison of Pre-test and Post-test Results

To evaluate the instructional model's effectiveness, pre-test and post-test results were analyzed using a paired t-test. This statistical approach helped assess learning achievement by comparing data before and after the implementation of the Self-Discovery Learning model.

3. Student Satisfaction Analysis

Data on student satisfaction with the instructional model were analyzed using descriptive statistics, including number, percentage, mean, and standard deviation. The interpretation of scores was based on a predefined scale (e.g., 4.20-5.00 = Very High, 3.40-4.19 = High) to measure satisfaction levels across different aspects of the learning experience.

Research Conceptual Framework

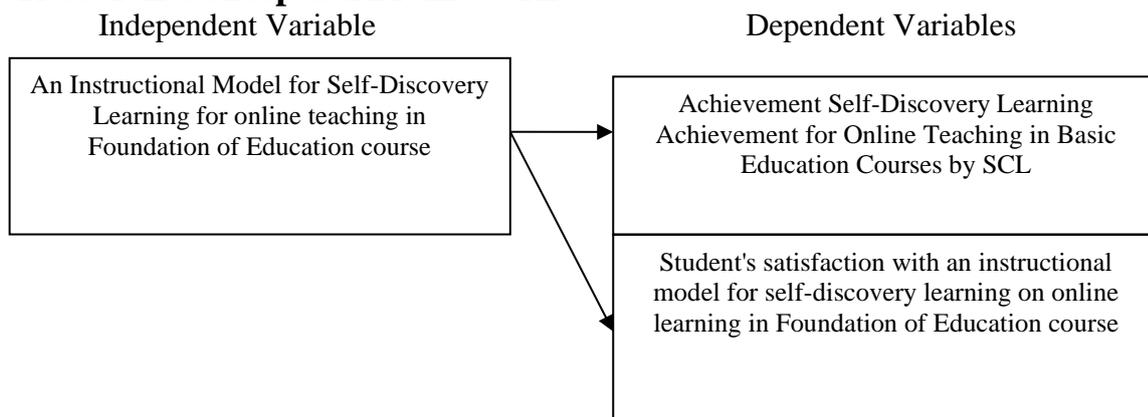


Figure 1 Conceptual Framework for an Instructional Model for Self-Discovery Learning in Online Teaching for a Foundation of Education Course

Research Results

1. Development of an instructional model for Self-Discovery Learning for online teaching in the Foundation of Education course

1.1 Development of a Self-Discovery Learning model for online teaching in the course of educational foundations.

The development of the Self-Discovery Learning model involved an analysis of relevant theories and research, which were integrated with online teaching platforms. This resulted in the formulation of the Self-Discovery Learning model as follows:

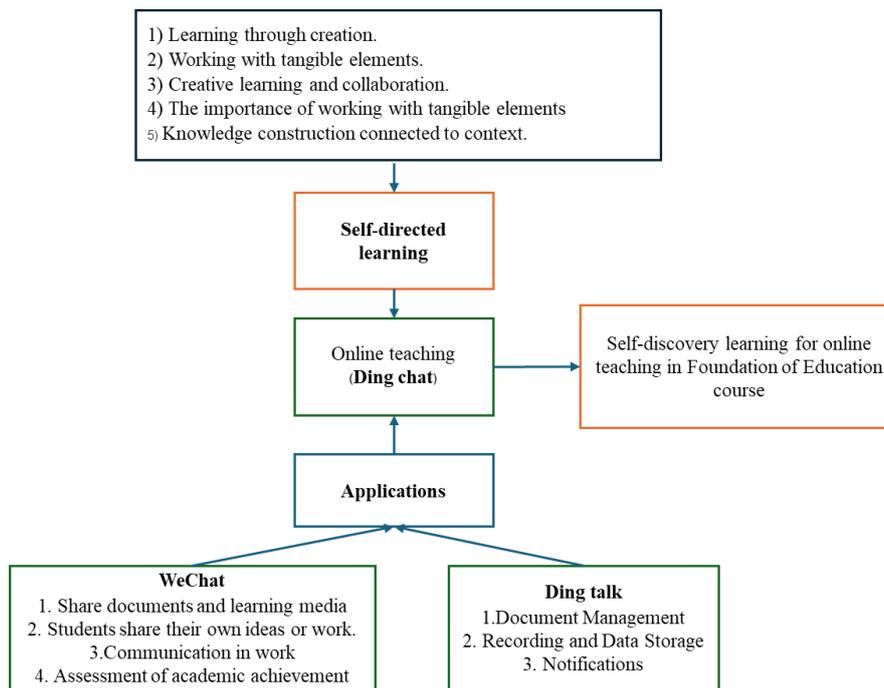


Figure 2 Self-Discovery Learning Model for Online Teaching in Basic Education Subjects.

The Self-Discovery Learning model for online teaching utilizes Self-Discovery Instructional techniques, with online learning as the primary process for teaching and learning. The model incorporates knowledge construction, working with tangible elements, creative learning and collaboration, and contextualized knowledge building into the instructional design. Each learning session employs the following processes and instructional methods:

1. Learning through creation, such as constructing physical objects or digital media;
2. Emphasizing the importance of working with tangible elements, such as knowledge construction and conceptual connections;
3. Encouraging creative learning and collaboration, such as group work;
4. Facilitating knowledge construction linked to context, such as connecting prior knowledge with lessons or utilizing case studies; and
5. Incorporating online teaching techniques, such as using computers and software to create a learning environment that enables learners to freely explore and experiment with new ideas.

1.2 Development of Self-Discovery Learning curriculum for online teaching in the course of Foundations of Education

In developing the Self-Discovery Learning model, the researcher created a learning framework for online teaching by designing a self-discovery curriculum consisting of 4 lessons for online instruction as follows:

- Theories
- Lesson 1: Emphasize Eternal Truths
 - Lesson 2: Ancient and Medieval Education
 - Lesson 3: Features of Cognitive, Constructivism, and Behaviorism Learning
 - Lesson 4: Cultural Foundations

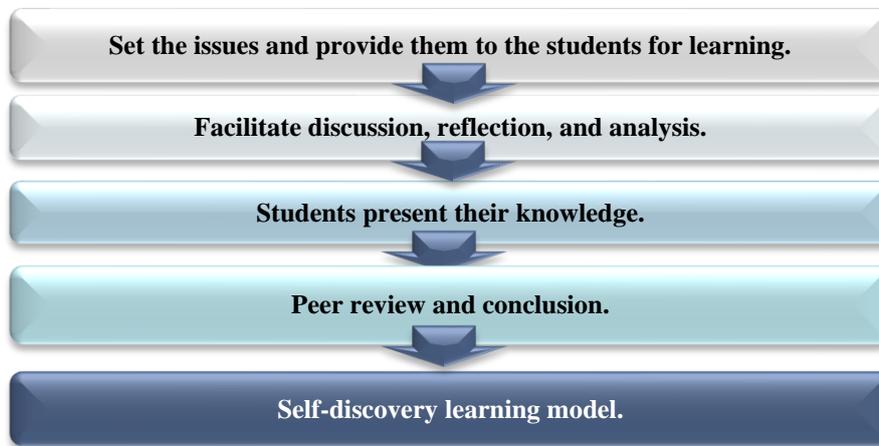


Figure 3 Development of Self-Discovery Learning curriculum

Figure 3 displays the Development of Self-Discovery Learning Curriculum, the following teaching and learning processes are implemented:

Set the issues and present them to students for exploration.

1. Divide students into groups of 4-6 members to discuss and investigate the issues in small groups.
2. Encourage students to reflect, discuss, and analyze the topics.
3. Have students present their findings and knowledge to the online class.
4. Conclude and summarize the key points.

2. Compare achievement between pre- and post-tests on an instructional model for Self-Discovery Learning for online teaching in the Foundation of Education course

2.1 Comparison of Academic Achievement Before and After Instruction in the Self-Discovery Learning Approach for Online Teaching in the Basic Education Curriculum.

Table 1 Test Results of Comparison of Academic Achievement

Lesson		Pre-test	Post-test	Point difference	Mean Group Pre-test	Mean Group Post-test
Lesson 1	Mean	14.53	24.37	9.83	14.53	24.37
	Standard Deviation	4.42	3.38	3.14	2.46	1.51
Lesson 2	Mean	14.07	24.36	10.3	14.07	24.37

	Standard Deviation	4.25	2.86	3.56	2.75	1.01
Lesson 3	Mean	14.07	24.36	10.3	14.07	24.37
	Standard Deviation	4.25	2.86	3.56	2.75	1.01
Lesson 4	Mean	14.06	24.83	10.77	14.07	24.83
	Standard Deviation	3.79	3.63	3.81	1.28	1.39

Table 1 shows the Pre-test and Post-test results for Lesson 1-4. It is noted that the average score after instruction was higher than before instruction.

Table 2 Comparison of Academic Achievement Before and After Studying.

	Test	Number of Students	Full Score	Average Score	Standard Deviation	t	Sig.
Lesson 1	Before	30	30	14.53	4.41	-17.146	.000
	After	30	30	24.36	3.37		
Lesson 2	Before	30	30	14.06	4.25	-15.831	.000
	After	30	30	24.36	2.85		
Lesson 3	Before	30	30	14.06	4.25	-15.831	.000
	After	30	30	24.36	2.85		
Lesson 4	Before	30	30	14.06	3.78	-15.471	.000
	After	30	30	24.83	3.63		

Table 2 presents the comparison of academic achievement before and after instruction for Lesson1-4. The results indicate that the post-instruction academic performance was significantly higher than the pre-instruction performance at a statistical significance level of 0.05.

3. Assess the student's satisfaction with an instructional model for Self-Discovery Learning for online teaching in the Foundation of Education course

Results of the assessment of student satisfaction with the Self-Discovery Teaching Model for Online Teaching in the Foundation of Education course are based on the interpretation of the score range (Pimentel, 2010), determined through quartiles, the opinion levels are divided as follows:

- 4.20 – 5.00 = Very High
- 3.40 – 4.19 = High
- 2.60 – 3.39 = Medium
- 1.80 – 2.59 = Low
- 1.00 – 1.79 = Very Low

Table 4.1 Overall of Students' Satisfaction

Overall of Students' Satisfaction	Mean	S.D.	Level of Perception
1. Targeting	4.31	0.96	Very High
2. Various learning processes	4.21	0.93	Very High
3. Use of supporting technology	4.23	0.95	Very High
4. Development of the learning process	4.13	0.91	High
Total	4.23	0.96	Very High

Table 4.1 Overall satisfaction is at the Very High level. ($\bar{x} = 4.23$, S.D. = 0.96). In each aspect, it was found that Targeting satisfaction level is at the Very High level. ($\bar{x} = 4.31$, S.D. = 0.96). Use of supporting technology Satisfaction level is at the Very High level ($\bar{x} = 4.23$, S.D. = 0.95). Various learning processes Satisfaction level is at the Very High level ($\bar{x} = 4.21$, S.D. = 0.93), and Development of the learning process satisfaction level is at the High level ($\bar{x} = 4.13$, S.D. = 0.91).

Discussion

1. Results of the development of Self-Discovery Learning teaching model for online teaching in the basic education curriculum

The Self-Discovery Learning model presented in this study is fundamentally rooted in constructivist theory, which posits that learners actively construct knowledge by interacting with their environment and making sense of new information based on their prior experiences (Piaget, 1952). This theoretical foundation is critical for understanding the model's efficacy, as it promotes an active learning environment where students are engaged in discovery, experimentation, and problem-solving, rather than passive reception of information. Vygotsky's (1978) social constructivism further supports the collaborative nature of the learning model. His theory emphasizes the importance of social interaction in cognitive development, suggesting that learning occurs most effectively through meaningful exchanges with others. In the self-discovery model, collaboration is fostered through group discussions and peer-to-peer learning, which not only promote deeper understanding but also align with Vygotsky's concept of the *zone of proximal development* (ZPD). The ZPD indicates that learners can achieve higher levels of understanding with guidance from peers or instructors, which is evident in the study's use of group activities and collaborative tasks.

Dewey's experiential learning theory also resonates with this model, particularly in the emphasis on real-world application and tangible learning experiences. Dewey (1938) argued that education should be grounded in real-life experiences and practical engagement. The Self-Discovery Learning model effectively incorporates this by integrating real-world case studies, psychological tests, and practical assignments. This approach helps bridge the gap between theoretical knowledge and its application, making abstract concepts more accessible and meaningful for students (Hashmi et al., 2021). The integration of digital platforms such as DingTalk and WeChat for video-based classes, document sharing, and communication further supports the model's alignment with modern educational frameworks. The use of these platforms facilitates real-time interaction and collaboration, essential components for fostering active learning in an online environment. This mirrors findings from contemporary research on

the role of technology in enhancing engagement and accessibility in online education (Byukusenge et al., 2022; Xue, 2022).

The Role of Constructivism and Self-Directed Learning in Online Environments The success of the Self-Discovery Learning model also ties closely with self-directed learning (SDL) theories. SDL emphasizes learners' autonomy and responsibility in guiding their own learning process, which is a core aspect of the self-discovery model. As pointed out by Knowles (1975), self-directed learners are motivated to take initiative in identifying their learning needs, setting goals, and evaluating their progress. The model's structure, which allows students to engage in creative tasks such as presentations and self-guided projects, reflects these principles. Ryan and Deci's (2000) self-determination theory (SDT) further enhances this understanding by highlighting the importance of autonomy, competence, and relatedness in promoting intrinsic motivation. The Self-Discovery Learning model facilitates autonomy by allowing students to choose how they interact with the material, and it fosters competence through structured tasks that challenge students to apply their knowledge. Moreover, the collaborative elements of the model help build a sense of relatedness, enhancing both engagement and satisfaction.

Research on self-regulated learning (SRL), which closely aligns with SDL, supports the finding that learners perform better when they are able to regulate their own learning process through goal setting, self-monitoring, and reflection (Azevedo et al., 2022). The inclusion of reflection and feedback loops in the model, although noted as an area for improvement, is crucial for helping students internalize what they have learned and apply it to future tasks.

2. Comparison of academic achievement results between the Pre-test and Post-test of the Self-Discovery Learning teaching model for online teaching in the basic education curriculum

The improvement in students' academic performance, as evidenced by the pre-test and post-test scores, aligns with the theory of cognitive development within constructivism. Constructivist approaches emphasize learning as an active process, where students engage in problem-solving and knowledge construction, leading to better retention and understanding (Chernikova et al., 2020). The significant 9.83-point increase in post-test scores for Lesson 2 (Eternal Truths) highlights the model's effectiveness in fostering deeper comprehension of complex philosophical concepts. This finding supports Mayer's (2002) research, which demonstrated that active engagement with learning materials, as opposed to passive listening or reading, significantly enhances cognitive processing and long-term retention.

The statistically significant improvements observed across multiple lessons, confirmed through dependent samples t-tests, further suggest that the Self-Discovery Learning model is highly effective in promoting critical thinking, conceptual understanding, and knowledge retention. These results reflect findings from studies on the efficacy of discovery-based and inquiry-based learning, both of which have been shown to foster deep learning and improve problem-solving skills (Byukusenge et al., 2022).

Alignment with Technology-Enhanced Learning (TEL) Research, the digital tools employed in the study, specifically the DingChat platform, reflect the growing trend of utilizing Technology-Enhanced Learning (TEL) to create interactive and accessible learning environments. According to Lázaro and Duart (2023), technologies like these can overcome the limitations of traditional classrooms by facilitating collaboration, real-time feedback, and flexible learning paths. Positive student feedback on these tools, particularly regarding the

interactive quizzes and video-based learning, underscores the importance of technological integration in modern education.

Moreover, the blended learning approach that combines digital platforms with self-directed learning strategies aligns with research by Reeves and Crippen (2020), which found that virtual laboratories and interactive environments can enhance student engagement and provide hands-on experiences that are often difficult to achieve in traditional settings. The study's results further affirm that well-implemented TEL strategies can lead to significant gains in both student performance and satisfaction.

3. Results of the evaluation of student satisfaction with the Self-Discovery Learning teaching model for online teaching in the basic education curriculum

The high levels of student satisfaction reported in the study are particularly noteworthy, as they suggest that the Self-Discovery Learning model not only promotes academic success but also creates a positive and engaging learning environment. The mean satisfaction score of 4.23 out of 5 indicates that students appreciated the flexibility and autonomy afforded by the model, which allowed them to tailor their learning to their individual needs and preferences. This finding aligns with research on learner autonomy and motivation, which shows that students are more engaged and perform better when they are given control over their learning processes (Anca, 2023). The high ratings for the use of technology, such as Ding Talk and WeChat, further suggest that students found the digital tools to be effective in supporting their learning. Wallace et al. (2020) noted that digital tools that facilitate real-time feedback and peer collaboration can significantly enhance student satisfaction and engagement, particularly in online and blended learning environments.

However, the relatively lower score for instructor feedback (3.73 out of 5) highlights an area for improvement. Providing more comprehensive and timely feedback could further enhance the learning experience by helping students reflect on their performance and understand how to improve. This aligns with findings from Porter et al. (2020), who emphasized the importance of feedback in promoting self-regulation and continuous improvement in learning outcomes.

Implications for Future Research and Practice, the findings of this study have important implications for both research and practice. First, they suggest that the Self-Discovery Learning model, with its foundation in constructivist theory and integration of technology, is highly effective in improving student outcomes in online education. This supports calls for the broader application of constructivist and inquiry-based models in online and blended learning environments (Xue, 2022).

Additionally, future research should explore how enhancing the quality and timeliness of instructor feedback could further boost student engagement and performance, as well as the long-term effects of such pedagogical models on student learning and motivation.

Future research should explore ways to enhance the feedback mechanisms within the model to provide more detailed and constructive guidance for students. Additionally, further studies could investigate the scalability of the model across different educational contexts and subjects, particularly in light of the growing demand for flexible, student-centered learning approaches in the digital age.

The overall findings are synthesized into a mind map as follows:

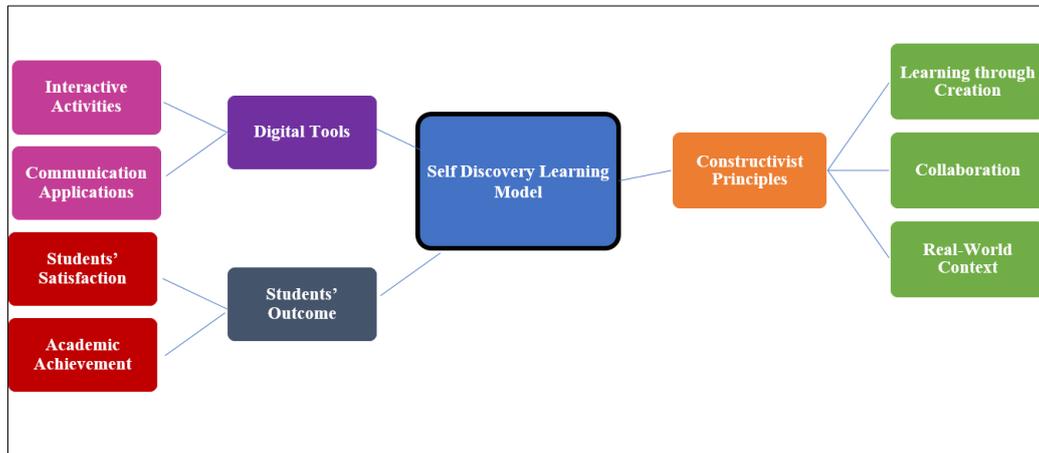


Figure 1: Mind Mapping Using Synthesis of Findings

Figure 1 demonstrated that Self-Discovery Learning (SDL) model is grounded in constructivist principles, promoting learning through creation, collaboration, and real-world connections. By integrating digital tools and interactive activities, the model effectively supports these principles. The outcomes of the model are evident in improved academic achievement, enhanced knowledge and understanding, and high levels of student satisfaction.

Recommendation

1. Recommendation for Academic

1.1 Incorporate Constructivist Pedagogy into Curriculum Design: Given the success of the Self-Discovery Learning model in this study, academic institutions should consider integrating constructivist approaches, such as self-directed learning, collaborative learning, and real-world application, into their curriculum. These methods have been shown to promote critical thinking and deeper conceptual understanding, aligning with contemporary educational theories such as those proposed by Vygotsky (1978) and Piaget (1952). Curriculum developers should focus on creating student-centered learning environments that encourage active participation and exploration.

1.2 Promote the Use of Digital Tools in Online Learning: The use of digital platforms like DingTalk and WeChat was instrumental in facilitating interaction and collaboration among students. Academic institutions should promote the use of appropriate technology to enhance engagement and learning outcomes, especially in online and blended learning environments. The alignment of technology with learning objectives can facilitate better communication, real-time feedback, and student collaboration, as supported by research on Technology-Enhanced Learning (TEL) (Reeves & Crippen, 2020).

1.3 Encourage Continuous Professional Development for Instructors: Instructors play a pivotal role in the success of Self-Discovery Learning models. Continuous professional development should be provided to equip educators with the skills needed to effectively facilitate self-directed and constructivist learning environments. Training programs should

focus on digital pedagogies, formative assessment techniques, and feedback strategies, enabling instructors to support student autonomy and collaboration (Hashmi et al., 2021).

2. Recommendation for Policy

2.1 Develop National and Institutional Policies for Technology Integration in Education: Policymakers should advocate for national and institutional frameworks that support the integration of digital tools in educational settings. This involves ensuring that digital infrastructure, such as reliable internet access and appropriate learning management systems, are available and accessible to both students and instructors. Policies should promote the use of technology to enhance teaching and learning experiences, particularly in online education where digital tools play a critical role (Xue, 2022).

2.2 Support Policies on Self-Directed and Lifelong Learning: Educational policies should emphasize the importance of developing students' self-directed learning skills, which are crucial for lifelong learning. As technology and the workforce evolve, students need to be equipped with the ability to learn independently and adapt to new knowledge. Policies should support the inclusion of self-regulation, goal-setting, and reflective practices in national curricula, fostering skills that students will carry beyond formal education (Ryan & Deci, 2000).

2.3 Standardize Assessment and Feedback Protocols in Online Learning: Policy frameworks should establish clear guidelines for assessment and feedback in online learning environments. Given the lower student satisfaction scores regarding instructor feedback, policies should ensure that institutions provide comprehensive and timely feedback to support student learning. This will involve setting standards for formative assessment and feedback loops to improve learning outcomes and maintain student engagement (Wallace et al., 2020).

3. Recommendation for Management.

3.1 Leverage Technology for Enhanced Collaboration: Given the positive feedback on the use of digital platforms such as DingTalk and WeChat, it is recommended to further expand their use for collaborative learning. Instructors should explore more advanced features, such as live polls, real-time collaborative tools, and asynchronous discussions, to foster even deeper engagement. Research shows that the integration of advanced technology enhances learner interaction and supports critical thinking in online learning environments (Lázaro & Duarte, 2023).

3.2 Strengthen Assessment and Feedback Cycles: The structured assessment of learning outcomes was highly appreciated by students. It is recommended that continuous and iterative assessment cycles be strengthened to ensure that students receive feedback before, during, and after each instructional phase. This would provide them with a more comprehensive understanding of their progress, aligning with self-regulated learning (SRL) theories, which emphasize the importance of ongoing assessment to support student autonomy and self-monitoring (Azevedo et al., 2022).

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