

Hybrid project learning and peer teaching as learning strategies for learners with high activity

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ABSTRACT

The mosque is the Muslim community's place of worship and education. Regular worship occurs according to a timetable. However, educational activities require quite a long time, so the mosque management schedules learning activities periodically. In addition, mosque congregations have a very high diversity and density of activities, especially mosque congregations in urban areas. The management of urban mosques has difficulty organizing learning consistently because the congregation has difficulty meeting at the same time periodically. This paper offers a solution by teaching with a hybrid learning method between project learning and peer teaching. Projects are created based on the needs of the environment and the congregation. The project development team is formed from worshippers who can work on projects. Other congregants receive knowledge through the project development team when the project is in the process of being created and run. This hybrid learning was experimented with by creating an aquaponics project. Aquaponics is operated with solar electricity. The project development team consists of a congregation of children to parents. The project has successfully transferred knowledge to the project development team members. The project operation attracts non-team worshippers to discuss independently with team members. Some non-team members have developed fish farming independently.

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1. INTRODUCTION

A Mosque has a function as a center for Muslim activities, so the mosque has an important role for its worshippers. The main function of the mosque is as a place of worship. In addition, mosques facilitate worshippers for social, educational, and economic activities (Al-Krenawi, 2016; Jaya et al., 2022; Nuriyah & Fakhri, 2022). Mosques have a role in education (Jaya et al., 2022), but most lessons are in religious knowledge. The mosques' management tends to focus on worship activities, religious education, and religious commemoration, so mosques rarely have an economic role (Azhar & Krisdiyanto, 2021; Marjayanti, 2021). The mosque's role makes the mosque a place that is always visited by worshippers every day. The diversity and number of worshippers increase the complexity of the mosque's role. Mosque management

must respond to the diverse needs of worshipers, especially in urban areas. Urban worshipers have quite a high activity and religion. Scheduled activities cannot be a solution. All worshipers cannot always meet at the same time and period. Therefore, this paper discusses a knowledge transfer solution through a hybrid method between project learning (Knoll, 1997; Kokotsaki et al., 2016) and peer teaching (Abedini et al., 2013; Stigmar, 2016) for urban mosque worshipers.

This hybrid learning method comprises project needs, needs analysis, project planning, project implementation team formation, and learning evaluation (Al-Saedi et al., 2017; Lamilla et al., 2022; Lopes, 2022). The project was created based on the needs of the mosque congregation. Needs are obtained through interviews with worshipers and mosque management. The community empowerment team analyzed the interview results, and then the community empowerment team made a project plan. The team identified the congregation who could work on the project. The congregation involved in the project work is adjusted to the needs at the project stage. Projects are placed around the mosque, so that worshipers who do not have the opportunity to be involved in the project can see the results of the project. Congregants who are not members of the project can discuss with congregants involved in the project. Discussion between worshipers is a transfer of knowledge with peer teaching methods. The hybrid project learning and peer teaching method was tested in a small mosque (*mushola*) in an urban area.

This hybrid learning method has been tested in the *Mushola* Sunan Kalijaga, Jalan Sunan Kalijaga Dalam, Dinoyo, Malang. This *mushola* has a high diversity of worshipers. The *mushola* is located in an urban environment, with 40 percent of the houses as domiciles and 60 percent as dormitories. The trial involves the domicile congregation because the domicile congregation has a long enough stay. Most domicile worshipers are young and have various permanent jobs. The congregation from the dormitory consists of 95 percent pure students and 5 percent students who have worked.

The results of the interview with the community empowerment team showed that the congregation of the Sunan Kalijaga Mosque needed agricultural management on narrow land. The team created a precision aquaponics project (Bahri et al., 2022; Marpaung et al., 2022; Sufiyanto et al., 2021). The team divided the congregation into work groups based on the abilities possessed by the congregation. The trial results show that the project group congregation can receive knowledge transfer directly from the community empowerment team. The project group congregation received knowledge from the project implementation. Non-domicile worshipers get knowledge from project group worshipers. Non-domicile worshipers discuss or ask precision aquaponics to project group worshipers.

2. METHODS

The hybrid learning method between project learning and peer teaching is implemented in this Qaryah Tayyibah community service activity using the Participatory Action Research method (Dancis et al., 2023). The hybrid between project learning and peer teaching is carried out in three stages: preparation, implementation, and evaluation. Preparation is to determine the initial condition of the environment. Implementation is the stage to create a project. Evaluation is done to collect responses to knowledge transfer.

Preparation

The first activity was to conduct environmental observations and interviews. Observation to identify economic activities that the congregation of the Sunan Kalijaga *Mushola* has carried out. Interviews

with the management and several Sunan Kalijaga *Mushola* congregations clarified the observations' results. The interview aims to get the problems and interests of the congregation in the development of economic activities.

Implementation

This activity is implemented with four activities, such as design, manufacture, planting, and maintenance. The team and the congregation of the Sunan Kalijaga Mosque designed an aquaponics model that was adapted to the conditions of the planting location. The aquaponics system was made in the second activity. The planting of vegetable seeds and fish seeds was carried out in the third activity. The team accompanied the congregation to care for the vegetable and fish plants.

Evaluation

The community empowerment team directly observed the congregation's response to the project work. Observations were made throughout the project. The community empowerment team is involved in the project's operation to watch the reaction of the non-project congregation group. Evaluation of peer teaching is obtained from observations in running aquaponics projects.

Table 1. Activities of hybrid learning method between project learning and peer teaching

Activity 1	
Action	- Introduction to several aquaponics models - Selection of the model used. - Designing an aquaponics model
Objective	- Increasing the congregation's knowledge about aquaponics models - Plan material requirements
Activity 2	
Action	- Construction of the first model aquaponics framework - Construction of hydroponic system - Installation of ponds and hydroponics on the aquaponics framework. - Testing the aquaponics system as a whole
Objective	- The congregation has experience in making aquaponics frameworks - Prayer room congregation has experience in making hydroponics
Activity 3	
Action	- Fish seed stocking - Planting vegetable seeds
Objective	- The congregation has initial experience of vegetable and fish cultivation using aquaponics
Activity 4	
Action	- Vegetable gardening and fish rearing
Objective	- The congregation has experience in caring for vegetable plants and raising fish in aquaponics.

3. RESULTS AND DISCUSSION

This community service activity makes small aquaponics for farming training on narrow land. The aquaponics model was made from a design by the community service team and the congregation of the Sunan Kalijaga Mosque. We chose Sunan Kalijaga *Mushola* because the *mushola* is in the middle of the

city, and the surrounding environment has a lot of vacant land. The results of environmental observations and interviews with the Sunan Kalijaga *Mushola* management showed that the congregation wanted to increase the utilization of vacant land owned by the *mushola* congregation. The current condition is vacant land, but the land will be built for housing or shops because the *mushola* area is in a high economic area.

Problems Encountered

Pilgrims have been utilizing empty land to grow fruits and vegetables in pots. The pots are made from used mineral water bottles measuring 15 to 20 liters. However, this agricultural model requires intensive maintenance, so not everyone can do it. To bridge the needs of the congregation of the Sunan Kalijaga prayer room, the community empowerment team conducted knowledge transfer activities to the congregation about agriculture with an independent aquaponics system. The congregation of the Sunan Kalijaga mosque has planted vegetables and cultivated fish. Vegetables are grown using used mineral water bottles. The congregation of the Sunan Kalijaga *Mushola* has raised fish in an earthen pond with water from a small river beside the *mushola*. Vegetables cannot grow well due to lack of nutrition and sometimes late giving water. Fish cannot grow optimally because the water conditions are not good. The community empowerment team offered a solution to make vegetable and fish cultivation aquaponics. The team explained that aquaponics cultivation only requires a small area of land. Aquaponics is a 100 percent organic cultivation model. The management and congregation agreed to learn cultivation through practice. The team met the landowner to ask permission to use the land for aquaponics.

Table 2. Worshipers Distribution who participated in the aquaponics project

Age	Percentage
5 - 15	37
15-30	8
30-45	11
> 45	44

Participants

This aquaponics cultivation project involved 27 congregants of the Sunan Kalijaga Mosque. The participating congregants are grouped as project group congregants. The Project Group involves worshipers of various ages, ranging from children to teenagers and elderly worshipers. The distribution of Project Group members can be seen in Table 2. Each member is involved in the project stages according to the member's ability and expertise. Children are engaged in light activities. Children make planting media, planting seeds, and transferring plants to hydroponic installations. Younger congregation members are involved in the pond-making and hydroponic stages of aquaponics. Older congregants and women are involved in the plant and fish care stage.

Aquaponics Training

This community service activity provides aquaponics training with an experimental model. The congregation is directly involved in designing and caring for plants and fish. The aquaponics design team involved congregants with carpentry and electrical engineering expertise. The pond and hydroponic framework were designed with congregants with carpentry skills (Figure 1a). Those with electrical expertise created aquaponics electricity (Figure 1b). Electrical energy is sourced from solar power (Hariyanto et al., 2023). Electricity is used to run a water pump to take dirty water from the pond

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and then flow it into hydroponics. Dirty water becomes a nutrient for plants in hydroponics. Hydroponic water goes back into the fishpond. The water from the hydroponics is fish-friendly water.



Figure 1. Activities to design an aquaponics model that is applied in the Sunan Kalijaga Mosque:
(a) Designing a pond and hydroponic framework model; (b) Designing an electrical system.



Figure 2. Aquaponics making activities applied in Sunan Kalijaga Mosque:
(a) Making aquaponics framework, (b) Installing solar electricity

The aquaponics manufacturing stage involves *mushola* congregants who have expertise in carpentry. Aquaponics begins with the construction of a framework (Figure 3a). The framework is made of mild steel channel C. First trial: The pool is made of A12 tarpaulin and is lined with kalsiboard (ceiling board). The results of the lower part of the framework needed to be stronger to hold water. The kalsiboard cracked easily. Based on the initial trial, the shell was improved by adding mild steel battens at the bottom. The addition of the battens was useful to resist water pressure at the bottom of the pond (Figure 2a). The kalsiboard was replaced with rubber gutters because rubber gutters are more elastic. The electrical and water circulation systems were installed after stabilizing the aquaponics system (Figure 2b).

Planting vegetable seedlings was done in parallel with aquaponics construction. Planting begins with making pots from plastic cups. The bottom of the plastic cup is given several holes with a diameter of 0.5 - 0.8 cm. The small holes circulate nutrients from the pond water to the vegetable plants. After the glass is perforated (Figure 3a), the pot is given planting media and watered until saturated. Vegetable seeds are planted with a gap of two or three days after preparing the growing medium. Seeds aged 14-21 days are transferred to aquaponics (Figure 3a). In this service activity, the team planted kale and

lettuce vegetables. The team and the *mushola* congregation, aged children to teenagers, carried out this stage.



Figure 3. Activities of planting vegetables and spreading fish seeds in the Sunan Kalijaga Mosque: (a) Planting vegetable seeds in aquaponics; (b) Tilapia fish seeds after release



Figure 4. Periodic aquaponics maintenance activities: (a) The congregation together with community empowerment team performs vegetable plant maintenance; (b) The project team congregation performs aquaponics frame maintenance

Fish fry stocking is done after pond preparation. Pond preparation involves filling the pond with water. The pond water is salted to reduce mold. The pH of the water is neutralized by applying *ketepeng* (*Terminalia catappa*) leaves. The preparation process takes between 7 to 14 days. The preparation process is considered sufficient if the pond water has turned brown. Fish fry is released in the pond with an adjustment stage to the temperature and pH of the pond water. The Qaryah Tayyibah community empowerment team carries out this stage. Figure 3b shows the condition of the fish after being released into the aquaponics pond.

Periodic maintenance is carried out by the congregation and accompanied by the community empowerment team. Routine maintenance includes caring for plants, fish, water flow systems, and aquaponics frameworks. The congregation checks the health condition of the plants and fish. The inspection is carried out every day at the time of fish feeding. The irrigation system and aquaponics framework are checked at a glance. If damage or abnormality is found, the aquaponics is reviewed in detail. The aquaponics system is repaired based on the results of the detailed inspection. Figure 4a shows the routine maintenance activities by the congregation accompanied by community empowerment team. Figure 4b shows the repair of an aquaponics frame that was damaged due to overloading.

Table 3. Distribution of participants' understanding of the aquaponics system

Age	Quality (%)		
	Low	Middle	High
5 - 15	7	18	11
15-30	-	4	4
30-45	-	-	11
> 45	19	15	11
Total	26	37	37

Evaluation

The community empowerment team observed the participants' responses for a combined evaluation of the two knowledge transfer methods. The archives were evaluated through understanding the design, implementation, and maintenance of the aquaponics system. 26 percent of participants needed more time to be actively involved in understanding aquaponics. Some participants from the children group needed more understanding because some children needed the basic knowledge to receive knowledge transfer about aquaponics. 37 percent of participants from the teenage and older groups can receive knowledge transfer well because they already have basic knowledge about fisheries and caring for plants. 37 percent of partisans can receive knowledge well because these participants are actively involved in this community service activity. The distribution of participants' level of understanding of the aquaponics system can be seen in Table 3.

Community service activities get participants from non-members of Sunan Kalijaga Mosque. 2 participants discussed the aquaponics system. Both participants will develop aquaponics with cheaper and easily obtained materials from the surrounding environment. 1 participant discussed making solar electric energy. This participant will make a solar power plant for his farm, which the government's electricity network does not cover.

4. CONCLUSION AND RECOMMENDATIONS

Community service activities at the Sunan Kalijaga *Mushola* in Dinoyo Village, Malang City, have been completed. The congregation was actively involved in this activity, from children to adults. This aquaponics project triggered the congregation's interest in utilizing the empty land around the house of each congregation. In addition, this activity has influenced some worshipers to be actively involved in learning aquaponics through practice in the *mushola's* aquaponics. The congregation is interested in vegetable and fish cultivation with aquaponics because aquaponics can save time and space. Participants are interested in developing simpler and cheaper aquaponics because the land owned by participants is very limited. Participants are interested in adding hydroponics to the ponds they already have. In addition to project group members, the project appealed to non-participants. Non-participants are interested in developing aquaponics on a larger scale with simple materials. The results of the discussion between the two groups of pilgrims showed that the project requires high costs. Utilizing more easily available materials in the surrounding environment is a solution for project development. Some non-participants want to develop solar electricity for land not covered by government electricity. Electricity is used to drive water pumps to increase land benefits in the dry season.

This community service activity needs to be developed in several ways, including aquaponics is designed for large land areas, so it cannot be applied directly to individuals with narrow land. Therefore, it

is necessary to develop aquaponics for very narrow land. The developed aquaponics requires high costs, because the model is made with new materials. The model needs to be replaced with used materials to reduce manufacturing costs. Manufacturing aquaponics frameworks requires carpentry and electricity experts, so lay people need help to absorb the ways of making aquaponics. The aquaponics framework needs to be redesigned into a knock-down model so ordinary people can easily make it. Knowledge transferred to the community about engineering and natural science. Social science transfer cannot be reached with this hybrid model. The next community empowerment team must think of special techniques that can be used in social science.

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