



Science and Technology Transmission for Society: Training on Development of Learning Tools for Teachers to Train Students' Critical Thinking Skills

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Abstract: *The Science and Technology Transmission for Society (STTS) activity is a community service activity that aims to improve the ability of Madrasah Aliyah teachers in developing learning tools (RPP) and teaching materials (textbooks and worksheets) to train students' critical thinking skills. Partners in this activity, namely the Madrasah Aliyah Negeri (MAN) Sengkol and Madrasah Aliyah (MA) NW Remajun teacher groups. Both schools are located in Central Lombok district, NTB. Members of the partner groups in both schools consisted of teachers of Mathematics and Natural Sciences (Physics and Chemistry). This STTS activity has been carried out with a series of In Service Training (IST), On Service Training (OST) activities, as well as the implementation and measurement of students' critical thinking skills. IST activities provide education and training to the two partners on learning analysis, the concept of learning tools which include lesson plans and teaching materials (textbooks and worksheets), the concept of developing learning tools that can train students' critical thinking skills, and critical thinking ability test instruments. OST activities are carried out by providing assistance to the two partner groups in preparing lesson plans and teaching materials (textbooks and worksheets) that can train students' critical thinking skills, as well as preparing critical thinking ability test instruments. Implementation is carried out to ensure that the learning tools developed can train students' critical thinking skills. Furthermore, the measurement of students' critical thinking skills was carried out using the critical thinking skills test instrument that was developed previously. The results of STTS activities in general are that teachers in partner schools have the competence to develop learning tools to train students' critical thinking skills.*

Keywords: Training, Learning Tools, Science Teacher Groups, Critical Thinking Skills

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BACKGROUND

The implementation of this STTS activity involved 2 (two) partner schools, namely Madrasah Aliyah Negeri (MAN) Sengkol and Madrasah Aliyah (MA) NW Remajun, both of which are located in Central Lombok, West Nusa Tenggara province. Members of the partner groups in both schools consisted of teachers of Mathematics and Natural Sciences (Physics and Chemistry). MAN Sengkol is one of 3 (three) MANs in Central Lombok district and is the head of the Madrasah Working Group (KKM) for 2 (two) sub-districts, namely Pujut and West Praya sub-districts. MAN Sengkol as the head of KKM oversees 15 (fifteen) KKM members in the area, one of which is MA NW Remajun in Pujut sub-district. These two Madrasah Aliyah (MA) were made partners in the implementation of STTS because situationally it was possible for this activity to be carried out together.

The results of interviews conducted by the STTS Service Proposing Team together with teachers of Mathematics and Natural Sciences (Physics and Chemistry) at MAN Sengkol, it is known that teachers still find it very difficult to teach

and train students in critical thinking skills. The teachers also said that the government's demands to implement the 2013 curriculum caused deep anxiety and complaints in them, because one of the indicators expected in the curriculum was to train students' critical thinking skills.

The implementation of the 2013 curriculum for the KKM area has been decided through KKM meetings starting in the 2014/2015 academic year, with the excuse of carrying out the government's demands. However, in reality the implementation of learning carried out by teachers is still oriented to the previous curriculum. The STTS Proposing Team conducted more in-depth interviews about this situation, and the teachers explained that they were not ready to carry out learning using the 2013 curriculum. Along with the change of government, when there was a delay in the implementation of the curriculum, the KKM meeting decided to re-implement the previous curriculum even though learning had been completed. implemented by implementing the 2013 curriculum for one semester, on the grounds that teachers and students are not ready to carry out learning according to these demands. For example, students are required to carry out learning activities oriented to critical thinking skills which include indicators: (1) interpretation ability, (2) analysis, (3) evaluation, (4) inference, (5) explanation, and (6) regulation. Of course, in this case the teacher must prepare learning tools in the form of a Learning Implementation Plan (RPP), and teaching materials oriented to critical thinking skills, including preparing critical thinking ability test instruments. The teachers explained that the preparation of critical thinking skills-oriented tools was still difficult, because they did not understand critical thinking in depth and did not know how to describe the indicators for critical thinking in learning, let alone the preparation of lesson plans. This situation caused teachers to return to teaching by referring to the previous curriculum, even though the label of the curriculum applied by the school was the 2013 curriculum at that time. This is what causes a gap between school expectations and curriculum demands with the reality of learning that occurs, of course this is a very urgent problem to find a solution.

The STTS proposal team also conducted an analysis and evaluation together with the Mathematics and Natural Sciences (Physics and Chemistry) subject teachers at the 2 (two) Madrasah Aliyah regarding the suitability of the problem grids that had been prepared and the questions that had been tested. This activity was carried out because according to the teachers' recognition, making evaluation tools according to the expected grid was still difficult, especially when it was added with other demands. The results of the analysis and evaluation jointly obtained that the questions that had been used to measure cognitive abilities did not reach the analytical skills (C-4), synthesis (C-5), and evaluation (C-6), while the lattice questions expect students to be capable of these three abilities. Furthermore, the teachers said that the preparation of evaluation questions according to the grid that had been prepared by themselves was still a problem, especially the demands to train critical thinking skills.

Various efforts have been made by the leaders in the two Madrasah Aliyah to continue to develop the ability of teachers in mastering the 2013 curriculum, such as, (1) involving teachers of Mathematics and Natural Sciences (Physics and Chemistry) to participate in training activities both in internal KKM as well as those organized by the district or provincial government; (2) optimizing the implementation of activities that lead to the understanding of the 2013 curriculum through the Subject Teacher Conference (MGMP), and (3) evaluating the learning tools that have been prepared and monitoring the process of implementing learning in the classroom.

Although various efforts have been made, by looking at the phenomena that occur in the field, it turns out that the results achieved are still far from expectations. This is caused by; (1) the teachers involved in the training activities are teachers who have civil servant status, while in the two MAs most teachers are non-civil servants and they are not involved. (2) Availability of learning facilities that are not supportive, for example facilities in the form of laboratory tools and materials in science learning are minimal at MAN Sengkol, let alone other KKM members, especially MA NW Remajun as a private MA. (3) The two MAs are located in remote areas and are classified as underdeveloped villages, which causes students who are in an economically disadvantaged situation, of course this also affects their learning indirectly.

Based on the analysis of the situation above, it is very important to carry out STTS activities. This activity was strongly supported by the two schools that were partners to better prepare themselves to welcome the implementation of the 2013 curriculum which was temporarily postponed.

Critical thinking has become a very important part of learning, even the curriculum in Indonesia has made critical thinking one of the learning objectives, so that subject teachers as the spearhead in teaching and training critical thinking should be able to develop learning that can train critical thinking to students. . As stated by (Ariyati, 2012), that the low quality of learning is one of the causes of learning that does not encourage students to think critically. Critical thinking has become a major trend and center of attention in learning, even curriculum authorities in several developed countries have included critical thinking skills in their curriculum as learning objectives (Bailin, 2002). (Rezaee et al., 2014) (Albrecht & Sack, 2000) stated that most teachers believe developing critical thinking in students is the main thing that is very important, however very few have an idea how to teach it (Duron et al., 2006; Paul, 2014; Prayogi et al., 2018; Prayogi & Muhali, 2015), whereas teaching critical thinking is very important. According to (Thompson, 2011), teaching critical thinking skills requires a holistic learning approach and must involve a set of appropriate and goal-oriented learning that allows students to manipulate their cognitive skills. This study is certainly a very important part that encourages the STTS Team to carry out service in the two partner schools that have been described previously.

METHOD

The solutions planned to solve problems for the two partner groups are conducting a series of In Service Training (IST), On Service Training (OST) activities, and implementing tools to ensure that the tools developed can train students' critical thinking skills. Partner groups in this activity are described in Table

Table 1. Partner group of STTS activities

Partner	Partner Identity	Address	Teacher Group Leader
I	Teacher Group of State Madrasah Aliyah (MAN) of Sengkol	Anyar Street, Sengkol Village, Pujut District, Central Lombok Regency, West Nusa Tenggara.	Roniati Sukaisih
II	Teacher Group of Madrasah Aliyah (MA) NW Remajun	Remajun, Pemembur Village, Pujut District, Central Lombok Regency, West Nusa Tenggara.	Wirdani

In Service Training (IST) activities are carried out using an andragogic approach that prioritizes lecture, discussion, and presentation methods, with the hope of increasing teacher competence. IST in this activity, namely increasing competence in terms of: a) Learning analysis from Core Competencies into a number of Basic Competencies and translated into a number of indicators of critical thinking skills; b) The concept of learning tools which include lesson plans and teaching materials (textbooks and worksheets); c) The concept of developing learning tools which include lesson plans and teaching materials (textbooks and worksheets) that can train students' critical thinking skills; and d) Assessment of critical thinking skills.

On Service Training (OST) activities are carried out when the teacher prepares lesson plans and teaching materials (textbooks and worksheets) that can train students' critical thinking skills with assistance by the STTS Team. This is intended as an effort to improve teacher competence, so that by the time this activity ends the teacher already has learning experience and the ability to develop learning tools to train students' critical thinking skills.

The implementation of the tools was carried out after the IST and OST activities, with the aim of ensuring that the tools in the form of lesson plans and teaching materials (textbooks and worksheets) were developed to train students' critical thinking skills. The implementation of the device will be carried out in two partner schools with the assistance of the STTS Team.

To achieve the activity output target, there are several stages of implementation as follows: a) Preparation stage. Activities carried out at this stage include: compiling a ToR (Term of Reference), identification of potential participants, internal meetings of the service team (such as determining training times, places, and materials), and obtaining permits to carry out service activities; b) The education and training stage is in the form of In Service Training (IST) activities. Activities carried out at this stage include providing education and training to the two partners on learning analysis, the concept of learning tools which include lesson plans and teaching materials (textbooks and worksheets), the concept of developing learning tools that can train students' critical thinking skills, and test instruments. critical thinking skills; c) The teacher working group workshop stage is in the form of On Service Training (OST) activities. The activities carried out at this stage are providing assistance to the two partner groups in preparing lesson plans and teaching materials (textbooks and worksheets) that can train students' critical thinking skills, as well as preparing critical thinking ability test instruments. This activity is product-based, meaning that workshop activities are completed until lesson plans are produced, teaching materials (textbooks and worksheets), and critical thinking skills test instruments; d) Implementation phase and measurement of students' critical thinking skills. The activities carried out at this stage are applying the learning tools that have been produced in the workshop activities. The tools in the form of lesson plans and teaching materials (textbooks and worksheets) will be implemented in two partner schools with the assistance of the STTS Team. Implementation is intended to ensure that the learning tools developed can train students' critical thinking skills. In this stage, of course, the measurement of students' critical thinking skills is also carried out using the critical thinking skills test instrument that was developed previously; e) Monitoring, evaluation and reporting stages. Activities at this stage are intended to detect and evaluate all of STTS activities so that results can be known, identified problems or constraints that arise, factors that support and hinder and solutions to

solve them. All subsequent activities are made in the form of a final report on service activities.

RESULTS AND DISCUSSION

The initial stage of this STTS activity is preparation. Activities carried out at this stage include: compiling a ToR (Term of Reference), identification of potential participants, internal meetings of the service team (such as determining training times, places, and materials), and obtaining permits to carry out service activities. The participants of this STTS activity involved 8 (eight) teachers, while the location of the activity was at MAN Sengkol. The location determination is based on an agreement with the STTS activity participants. The preparation stage at least takes about 1 (one) month, because in addition to participant preparation and activity administration, internal preparation is also carried out where in the ToR, the STTS activity team regularly meets to discuss activity materials which will later be conveyed to activity participants. The next stage is education and training through the In Service Training (IST) mechanism. Activities carried out at this stage include providing education and training to the two partners on learning analysis, the concept of learning tools which include lesson plans and teaching materials (textbooks and worksheets), the concept of developing learning tools that can train students' critical thinking skills, and instruments. critical thinking skills test. IST activities run for approximately 1 (one) month. The findings of the STTS Team in this activity, namely that all activity participants did not understand the concept of critical thinking and did not understand how to develop learning tools to train students' critical thinking skills. Therefore, in this IST activity, the STTS Team provided an in-depth understanding of this matter, the discussion was quite interesting because the teachers were very enthusiastic about the material presented by the STTS Team.



Figure 1. Training on development of learning tools for teachers to train students' critical thinking skills

After the IST activities, the activities continued to the teacher working group workshop stage in the form of On Service Training (OST) activities. The activities carried out at this stage are providing assistance to the two partner groups in preparing lesson plans and teaching materials (textbooks and worksheets) that can train students' critical thinking skills, as well as preparing critical thinking ability test instruments. This activity is product-based, meaning that workshop activities are completed until lesson plans are produced, teaching materials (textbooks and worksheets), and critical thinking skills test instruments. Until the product is

produced, OST activities run for 3 (three) months. The products produced by partners are tools in the form of lesson plans, teaching materials (textbooks and worksheets) and critical thinking skills test instruments, each of which is produced by the two groups of partners in two subjects, namely physics and mathematics (attached product). The device developed refers to the 2013 Curriculum, because partner schools are implementing K-13 in class X (ten). After the IST and OST activities have been carried out, the next step is the implementation and measurement of students' critical thinking skills.

Activities carried out at the implementation stage, namely applying the learning tools that have been produced in the workshop activities. The tools in the form of lesson plans and teaching materials (textbooks and worksheets) will be applied in two partner schools with the assistance of the STTS Team, each in physics and mathematics. Implementation is intended to ensure that the learning tools developed can train students' critical thinking skills. In this stage, of course, the measurement of students' critical thinking skills is also carried out using the critical thinking skills test instrument that was developed previously. The measurement results show that the average critical thinking ability of students in physics and mathematics is categorized as quite critical. The results of this measurement are important findings, where students should be categorized as minimally critical in learning. This finding is a shared responsibility between teachers and stakeholders in partner schools so that learning development can be directed towards students' critical thinking goals, because students' critical thinking skills should be trained persistently, continuously, and using appropriate learning sets.

CONCLUSION

STTS activities involving 2 partner groups, namely the Madrasah Aliyah Negeri (MAN) Sengkol and Madrasah Aliyah (MA) NW Remajun teacher groups have gone well according to planning, where teachers in partner group schools have competence in developing learning tools to train students' critical thinking skills. This STTS activity has also produced learning tool products prepared by partner group teachers in the form of lesson plans, teaching materials (textbooks and worksheets), and critical thinking skills test instruments.

RECOMMENDATION

STTS activity results have benefited the partners involved, and we recommend similar activities to be carried out in other schools.

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