Available online at www.ijrp.org

International Journal of Research Publications

Development of strategic HR based IT literacy in vocational high schools in the city of Semarang

Harjono[a,b,*], W.T. Eden[b], K.I. Supardi[b]

[a]*Doctoral Student of Graduate Program, Universitas Negeri Semarang, Semarang City Central Java 50223, Indonesia*
[b]*Chemistry department, Faculty of Mathematic and Natural Sciences, Universitas Negeri Semarang, Semarang City Central Java 50229, Indonesia*

Abstract

The development of IT-based strategic HR has been carried out through the School-Based Management (SBM) implementation study in the Vocational School in Semarang. The focus of SBM implementation is aimed at increasing the teacher's role in transferring knowledge and skills in chemical waste metal analysis, increasing the professional competence of teachers in using the AAS (Atomic Absorption Spectroscopy) instrument for chemical metal waste analysis, as well as increasing the teacher's ability in making videos and practical guidance. The action program carried out was an IT-based innovative learning strategy workshop, information seminars and training on the use of AAS instruments, and the making of video preparations and analysis of chemical waste metals using AAS. Based on the pre and post-test analysis of teacher knowledge in using IT-based learning media or online systems increased by 32%. Teacher professional competence in operating AAS instruments and the formulation of solutions related to analysis problems increased by 68%. The teacher is able to make the master solution, the standard series, the calculation of linearity and metal content in the waste sample precisely. The teacher is able to revise the lesson plan in the learning media section. The teacher is also able to make a practicum guide for the analysis of metal waste samples with a video guide to support the dry laboratory concept. Program feedback from teacher questionnaires and interviews shows a positive response from the teacher regarding the metal analysis and technology update.

Keywords: Implementation of SBM, Teacher Competence, Vocational School

Corresponding author. Tel.: +62-81901911921;
E-mail address: harjono_hanis@mail.unnes.ac.id

1. Introduction

Humans as technology users must be able to take advantage of technology that already exists today, as well as subsequent technological developments. Adaptation of humans to new technologies that have evolved must be done through education. This is done so that the next generation does not lag behind in terms of new technology. The estuary is technology and education able to develop together along with the existence of a new generation as the successor to the old generation. Some ways of adaptation can be realized in education which can be in the form of training or assistance. Advanced technological development must occur in our schools and educational institutions if we are to prepare students for a competitive global marketplace (Dooley, 1999).

Education in Indonesia is held in two ways, formal and non-formal education. Schools as formal educational institutions have an important role in the process of adaptation of students into generations that are not left behind in the face of technological developments. Vocational High School (SMK) is one form of formal educational institutions that is demanded to be able to follow technological developments so as to produce graduates who are competent cognitively, psychomotorically, and affective. The introduction of new technology must be done in the process of teaching and learning activities in vocational schools so that students are able to become cadres who are ready to face the challenges of the world in the technological era. One of the vocational skills competencies related to technology is Industrial Chemistry. Industrial chemical expertise competence is the development of the field of Technology and Engineering expertise in all aspects of the basics of chemical engineering in terms of production, quality control of raw materials and products, product development, product marketing and waste treatment in various industries (pharmaceutical industry, chemical industry , metallurgy industry, food processing industry, and so on). The existence of the Industrial Chemistry Vocational School is one of the choices of the Semarang City community for their children in the vocational secondary education level. Hopefully, parents in the future after graduating from the Industrial Chemistry Vocational School, their children will be ready to work in various manufacturing industries or be able to continue their education to a higher level in accordance with their competencies. One of the vocational schools with industrial chemical expertise competency, namely Theresiana Vocational School which is managed by the private sector in the form of educational foundations. Limitations in the procurement of tools that support the learning process, especially in the form of non-B3 waste analysis and evaluation practicums based on their nature and characteristics become obstacles. Implementation of School Based Management (SBM) is an alternative that can be applied.

According to Mulyasa (2002) and Nurkolis (2006), SBM is a model of school management by giving greater authority at the school level to manage their own schools directly. School Based Management (SBM) is a concept that offers autonomy to schools to determine school policies in order to improve the quality, efficiency and equity of education in order to accommodate the wishes of local communities and establish close cooperation between community schools and the government. The implementation of SBM in this activity refers to the opinion of Sudarwan Danim (2005), that SBM can be defined as a work process of the school community by applying the principles, autonomy, accountability, participation, and sustainability to achieve quality educational and learning goals. So SBM can be interpreted as the work process of the school community by giving greater authority to schools in order to improve the quality, efficiency, and equity of education so that it is better and more adequate to be able to accommodate the wishes of the local community and establish close cooperation between schools, communities and government.

Teachers as educators have pedagogical and professional competencies in carrying out their duties. Industrial Chemistry SMK teachers are expected to develop learning strategies to improve their pedagogical competencies. This learning strategy is related to the way or system for delivering curriculum content with the effort to achieve the goals that have been formulated. The success of student learning activities is much influenced by the teaching strategies used by the teacher. Development of learning media also needs to be a concern in efforts to increase student motivation. Learning media must challenge students in developing their thinking and creativity in accordance with their respective potentials and abilities, thereby fostering interest in pursuing their field of expertise. Audio visual based media such as video can attract students' interest, especially in practicum eyes that should be practiced per individual student but are changed by demonstration of the implementation of methods or the use of tools and materials called dry laboratories. The Semarang City Industrial Chemistry Industrial Vocational School teacher still applies the classic learning strategy by giving assignments that only direct students to achieve mastery of competencies that have been programmed together between schools and industries without producing products or works that are sold / marketed and are consumer-oriented. Learning media also still use power points without modification that interest students' learning interests.

2. Method

The implementation of SBM is carried out through a case study that is applied to vocational teachers of Industrial Chemistry in Semarang City, which are facilitated by the Chemistry Teachers Conference MGMP of Semarang City. The study was conducted through the following stages:

1. Organizing an IT-based creative innovative learning strategy workshop. This activity was delivered scientifically the selection, development, determination and problems associated with the application of learning strategies and learning media in the classroom in order to improve students' thinking abilities and motivation to learn.
2. Organizing seminars and training on the use of AAS instruments with an interactive discussion approach relating to the basic knowledge of using AAS instruments before direct training.
3. Organize workshops on making video preparation and analysis of chemical waste metals using AAS to teachers. The research team prepared all kinds of tools and materials needed. The program approach is more towards technical solution making, calculation, data analysis and discussion of problems related to AAS determination of metal content procedures.

Evaluation of program implementation is done by direct interviews with teachers and distributing pre-test questionnaires at the beginning of the activity and post-test at the end of the activity to determine the level of teacher understanding of the material provided by the research team. The indicator of the success of the questionnaire was an increase in the post-test score compared to the pre-test with a maximum final score of 100.

3. Results and Discussion

Education is an important component in the advancement of a nation's civilization. Many efforts have been made to improve the quality of education. However, it is still not felt that it has an optimal and significant influence. There are several factors that trigger such things happen. These trigger factors are; policies on the implementation of results-oriented national education, centralized education, and the lack of involvement of the community, especially parents. To maximize education improvement, the Government is striving to provide education through School Based Management which is regulated in Law Number 20 Year 2003 concerning the National Education System. School Based Management (SBM) is the process of managing resources effectively to achieve goals that provide greater autonomy to schools and encourage direct participatory decision making of all components of school community, namely; principals, teachers, students, parents and the community.

The implementation of SBM makes the school more effective. Schools are becoming more effective for four reasons: (a) Leadership is getting stronger. SBM encourages school leaders to be chosen using transparent criteria. School improvement plans are developed according to the local context. Resources are really used for schools. (b) the teacher is more competent and characterized. Schools have the authority to make changes to their curriculum and methods. The teacher takes full responsibility in the school development plan. Teachers are evaluated by local school leaders. Schools have the authority to determine what training is needed by teachers. Those are the things that strengthen the teacher. (c) The focus in learning is increasing. The focus of the school is getting better because it suits the context and needs. Information related to the process and learning can be more transparent. (d) Responsibility for better results. SBM encourages schools to think about the importance of results and does not stop at the process.

Researchers from related tertiary institutions see that schools experience difficulties in implementing this SBM. Therefore, through this activity in collaboration with MGMP provide technical training to help, encourage and assist the implementation of SBM. The training is structured in such a way as to answer the challenges of the industrial revolution 4.0 era for teachers so that it is expected to have an impact on students in the classroom. The limited access to the latest equipment needed by the industry, and updates on related soft skills and teacher hard skills make weaknesses that must be anticipated. Partnership programs with universities with the availability of more complete human resources and equipment is a strategic solution.

Chemistry Teachers of Industrial Chemistry have varied educational backgrounds, namely bachelor of chemistry, chemical engineering, and chemistry education who are professional teachers who teach chemistry subjects both theory and practicum. The real result of this case study is that the target audience has received knowledge and skills regarding IT-based learning strategies through animation software, destruction techniques, sample preparation and sample testing using AAS instruments, so that students can increase their ability in hard skills and life skills.

3.1 Innovative Learning Strategy Workshop

This case study outlines the provision of insights or knowledge from the research team regarding the use of innovative and creative learning media. In the activities of providing explanations about literacy solutions in the midst of the industrial revolution 4.0 through the blended learning program, the lecture method was followed by question and answer. Teachers are given the opportunity to directly simulate an online program that has been given a previous explanation, so that it can have a direct effect on the teacher, whether the program makes it easy to compile learning media or actually complicates routine tasks as a teacher. In addition, the teachers are also given training materials in the form of printouts, so that teachers can read them first. At the material explanation stage of using power points and animation, the research team also showed examples of media products and demonstrated their making to the teacher.

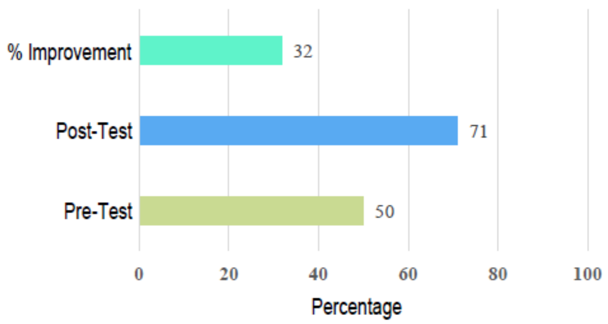

Figure 1. Increasing Teacher Knowledge in Learning Media

The teacher is very serious and interested in the material provided. This is evidenced by the many questions and suggestions / input during the explanation of the material takes place. The questions posed relate to the selection of good media backgrounds, how to integrate videos into learning slides and to combine photos and videos in one media. Determination of the type of media which is suitable to be applied to students in their respective institutions becomes a fairly dense conversation but runs conducive and finds solutions so that the determination of the future students will increase their understanding and facilitate student learning. The results of the pre and post test analysis show an increase in teacher knowledge by 32% which can be seen in Figure 1. The value is not too large because the teacher as an educator already has a good basic knowledge of teaching ability (pedagogic) and routinely holds a refreshment once a year by their respective institutions - mind.

Teachers as educators already have a good knowledge base about teaching ability (pedagogic) and routinely held once a year by their respective institutions. The teacher has not yet gained complete knowledge about the use of IT as an effective and efficient learning management media. Teachers have been reluctant to use due to lack of technical reasons and some teachers believe that it is not needed at this time.

3.2 Training and seminar on the Use of AAS Instruments

In the second stage, skills were provided through the work stages of the research team regarding the description of the parts and functions of the AAS instrument, the analysis strategy and the formulation of solutions related to problems during the analysis process. Before this activity was carried out, the research team gave a pre test to find out the teacher's initial knowledge before being given an explanation of the material. In the activities of providing an explanation of the basis of the spectrophotometric method, Lambert-Beer law and the appropriate measurement method, conducted by lecture method followed by question and answer. The teacher is given the opportunity to explore questions related to problems that may arise during the analysis process, such as errors due to the presence of other compounds besides the measured analytes, analytes that are not detected in the flame, to the cathode lamp whose ability is sometimes not optimal again.

In addition, the teachers are also given training materials in the form of printouts so that they can be read in advance by the teacher. At the stage of explaining basic knowledge material about how ions compound in a flame, the ability of the mnochromator functions to sort light according to specific wavelengths, to the photon energy generated in the sample compartment, participants are very enthusiastic and interested in learning new knowledge given. This is evidenced by the many questions and suggestions / input during the explanation of the material takes place. The question posed relates to how the proper destruction techniques for the characteristics of the sample, the solution if the flame is not optimal and the advantages and disadvantages of AAS compared to other sophisticated instruments for metal analysis.

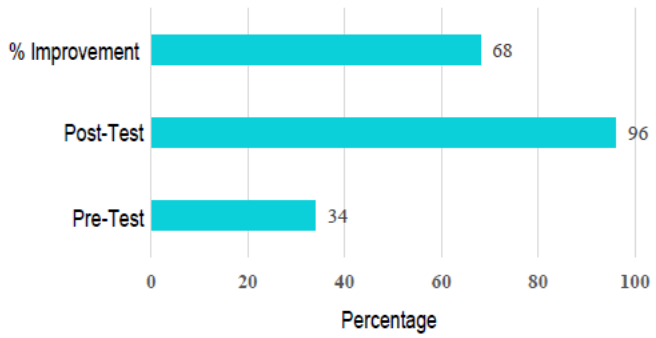

Figure 2. Improving Teacher Skills in Using AAS Instruments

The fulfillment of AAS instrument facilities for learning in each Industrial Chemistry Vocational School became a quite lively discussion due to the price of AAS which ranges from hundreds of millions so that the ability of schools to purchase these instruments is minimal and possible solutions can be made by seeking grants to the Ministry of Education and Culture or other private parties. The results of the pre and post test analysis showed an increase in teacher skills by an average of 68% which can be seen in Figure 2. The value is quite large because most teachers do not yet know the basic concepts of using AAS while some teachers have previous experience because they have worked in the chemical industry before become a teacher. Teachers have long since left the basic science of chemical waste analysis that has rarely been used in learning materials in vocational high schools. This case study provides a new experience of the teacher in teaching chemical waste analysis material using AAS instruments which later on the teacher's learning experience can be applied by students in the workplace.

3.3 Video production in the metal preparation and analysis process using AAS

The third stage of this study is preparation, trial and error. At this stage, before an explanation of the AAS operational method is given to the teacher, it is necessary to condition the AAS to be suitable for use, including the orientation of determining the standard series and sample to be analyzed. AAS orientation is needed so that teachers do not encounter problems in their use (Figure 3).

Figure 3. Making a video in operating AAS

The research team prepared Standard Operating Procedures (SOPs), worksheets and required literature. Lead metal (Pb) and Cadmium (Cd) standard solutions have been made before, along with a series of concentrations to be measured to obtain a caliberation curve. Coordination with laboratory assistants is needed for equality of perception and correctness of procedures during the presentation and technical implementation of the training participants. Based on the orientation results, the concentration series for Pb metal is obtained namely 1; 5; 10; 15; 20 mg / L, while for the Cd metal that is 0.05; 0.1; 0.2; 0.5 mg / L.

The teacher is asked to write the results of the work during the activity on the worksheet that has been provided. The work preparation procedure starts from calculating the concentration of Pb and Cd metal mother liquor, determining and calculating the concentration of the standard series before and after the grade correction, and calculating the linearity of the standard series for determining metal content. The teacher is very serious and responds to every detail of information submitted by the research team. At the beginning of the activity, the teacher was very difficult to use a calculator as a tool to calculate the value of R (linearity) standard series, a small number of teachers thought it was easier to use Excell facilities than a calculator. The research team allowed the use of any media because it did not affect the results of the analysis. Teachers are also given the opportunity to enter samples into the AAS instrument and manage data related to the analyzed sample. The instrumentation chemistry analyst provides direction and technicality related to the use of AAS in the form of demonstrations and is practiced directly by the teacher. The teacher is very procedural in carrying out every stage of the analysis. This is evidenced by the questions raised at the time of the activity shortly before the next stage.

The questions raised are related to the alternative of dilution of standard solutions, the process of destruction of the sample in the middle of the analysis to the need for dilution before the sample is inserted into the AAS instrument. The practicality factor of reagents and reagents used is interesting enough to be discussed by the research team and teachers, because if not careful in calculating the standard series or the use of reagents that are not as needed will cause analysis failure and even severe impacts can damage the AAS instrument. Based on the analysis results, obtained Pb metal content of 9,734 mg / L with a correlation coefficient of 0.999891 and a Cd metal content of 0.091 mg / L with a correlation coefficient of 0.999068.

4. Conclusion

The implementation of SBM makes the school more effective. Schools are becoming more effective because of four things: (a) Leadership is getting stronger; (b) the teacher is more competent and characterized; (c) Increased focus on learning; (d) Responsibility for better results. In the context of this implementation, Teachers of Industrial Chemistry have increased pedagogical and professional competence in the use of AAS instruments for the analysis of chemical waste metals. The teacher is able to make a Learning Implementation Plan (RPP) and Atomic Absorption Spectroscopy Practicum Guide for Vocational Chemistry with the concept of a dry laboratory. Students have sufficient ability to work in the chemical industry after graduation.

5. Recommendation

Program feedback through filling out questionnaires and interview participants produced positive responses. Upgrading and updating of metal analysis technology is expected to be sustainable through training of other sophisticated instruments such as Gas Chromatography (GC).

Acknowledgements

Thank you to LP2M UNNES through the 2019 DIN UNNES research funding, all members of the research team, and the support of partner schools in the Semarang city area in this research.

References

Buć, S., & Divjak, B. (2015). Innovation diffusion model in higher education: Case study of e-learning diffusion. Proceedings of the International Conference on E-Learning 2015, E-LEARNING 2015 - *Part of the Multi Conference on Computer Science and Information Systems* 2015, (2), 205–207.

Depdikbud. (2003). Undang – Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional. Jakarta: Departemen Pendidikan dan Kebudayaan.

Dooley, K. E. (1999). Toward a Holistic Model for the Diffusion of Educational Technologies: An Integrative Review of Educational Innovation Studies. *Educational Technology & Society*, 2(4), 35–45.

Eden, W.T., Harjono. (2019). Pelatihan Strategi Pembelajaran dan Penggunaan HPLC pada Guru SMK Farmasi Industri Kota Semarang. *Abdimas Dewantara*, 2 (2), 74-84.

Eden, W.T., Nurhayati, S., Supardi, K.I. & Sumarni, W. (2017). Pelatihan dan Pendampingan Penggunaan Indikator Ekstrak Bunga Rosella untuk Praktikum Titrasi Asam Basa bagi Guru Kimia SMK Farmasi Se-Kota Semarang. Prosiding Seminar IPA VIII ISBN 978-602-70197-3-7. Semarang: Jurusan IPA Terpadu Universitas Negeri Semarang.

Kemendikbud. (1997). Keputusan Menteri Pendidikan dan Kebudayaan Nomor 323/U/1997 tentang Pendidikan Sistem Ganda. Jakarta: Kementerian Pendidikan dan Kebudayaan.

Mulyasa. 2002. *Manajemen Berbasis Sekolah*. Bandung: PT Remaja Rosdakarya.

Ningsih, S.S., Saputro, S. & Utomo, S.B. (2015). Pengembangan Modul Kimia Berbasis Inkuiri Terbimbing pada Materi Identifikasi Gugus Fungsi Kelas X SMK Kimia Industri. *Jurnal Inkuiri,* 4 (3), 51-59. Surakarta: FKIP UNS.

Nurkolis. 2006. *Manajemen berbasis Sekolah*. Jakarta: PT Gramedia Widiasarana Indonesia.

Sudarwan Danim. 2005. *Visi Baru Manajemen Sekolah*. Jakarta: PT Bumi Aksara.

Sutikno, A., Ariani, S.R.D. & Saputro, S. (2013). Profil Pelaksanaan Pembelajaran Kimia Produktif, Kualitas Produk, dan Minat Berwirausaha Siswa Kelas XI Semester 1 Kompetensi Keahlian Kimia Industri SMK N 2 Sukoharjo Tahun 2012 / 2013. *Jurnal Pendidikan Kimia*, 2 (2), 75-84. Surakarta: Universitas Sebelas Maret.