

Teacher Competency and Perception in Lesson Planning using a Software Prototype

Dasrieny Pratiwi¹, Herawati Susilo², Fatchur Rohman³

¹Doctoral Student of Postgraduate Program, Biology Education, Universitas Negeri Malang, Indonesia, ¹Department of Biology Education, Universitas Muhammadiyah Metro, Kota Metro, Sumatera, Indonesia, ²Biology Department, Faculty of Mathematics and Science, Universitas Negeri Malang, Indonesia, ³Biology Department, Faculty of Mathematics and Science, Universitas Negeri Malang, Indonesia

Email: dasrienyp.1703419@students.um.ac.id,

herawati.susilo.fmipa@um.ac.id, fatchur.rohman.fmipa@um.ac.id

The use of software technology in lesson planning for teachers is explored in this research. The purpose of this study is to determine the competence of teachers in creating lesson plans and their relevant perceptions when using a software prototype as the learning medium. The subjects of the research are biology teachers with at least four semesters of teaching experience (n=32) and NVivo 12 Plus was used to analyse collected data. Results indicate that teachers had a spread of competence and that the current efforts in training teachers to achieve lesson planning competence do not meet contemporary learning needs which are characterized by technology integration. Further, tertiary education courses must embed digital pedagogy as essential practice for prospective teachers (Sendurur, 2018), as the quality of the learning process for the teacher candidates predicts the quality of education provided by these undergraduates when they become teachers (Baaki & Luo, 2019).

Keywords: Media, biology teacher competence, prototypes, software, teacher perceptions biology, biology teacher candidates.



Introduction

The teacher's task is not only to convey knowledge, but to understand 'the what, when, and how' of their students' learning (Zundans-Fraser & Auhl, 2016). According to Mthethwa-Kunene, Onwu, and de Villiers (2015), there are three concepts of competency for the teacher: mastery of content taught, knowledge of how to interpret the material (pedagogy) and understanding the difficulties that would potentially impact learners when studying the content. Developing appropriate teaching plans is part of the pedagogical competencies required of teachers to achieve nominated learning objectives.

A learning plan (RPP) designed by the teacher, is one of the critical success factors of student academic captitla. The importance of the learning plan is in its provision of opportunity for the teacher to understand the identified needs of the students and adapt teaching and learning as relevant (Alves et al., 2017; Taylan, 2018), such that the teacher focus is on preparing for the teaching and learning strategies and activities that will have a positive impact on student learning outcomes (Chizhik & Chizhik, 2018; Ruys et al., 2012). With this perspective, lessons are planned and implemented by teachers to improve the quality of learning. A further considration when designing learning is not only on student learning outcomes that prepare them to resonsd under exam conditions, but to facilitate a learning process that provides experience as an effort to train and develop students mastery of the learning competencies for life in the current times (Barak, 2017; Corebima, 2016).

Debriefing in the context of teacher competence in lesson planning is provided for undergraduate prospective teachers while they are engaged in tertiary study. However the lack of development in designing lectures in these tertiary education courses, has resulted in the poor quality of student teachers with regards to lesson planning (Chizhik & Chizhik, 2018; Lim et al., 2018; Namdar & Kucuk, 2018; Taylan, 2018). Prospective teachers indicate that after completion of their Teacher Education courses, they have difficulty applying the theory of lesson planning in specifically in terms of the capability to determine the appropriate learning strategies, describe the steps of learning activities and identify indicators of competency achievement and learning objectives as well as the determination of the evaluation. As a result (Sendurur, 2018), student teachers tend to use teacher-centered learning. This fact is supported and reinforced by the results Taylan's (2018) research which found that prospective teachers do not include learning objectives nor evaluate (Beyer & Davis, 2012)difficulties in teaching practice. As we know, the alignment between learning goals, learning activities and assessment will determine the success of student learning (Chizhik & Chizhik, 2018). Thus competence in planning education units for teacher undergraduates to produce qualified teachers, is an identified need for Education lecturers.

The respective tertiary institution is responsible for creating the capacity for prospective teachers to build pedagogical capability and consequently lesson planning competence



(Prachagool et al., 2016), through a focus on lesson plan creation. However, the reality is that in completing assigned course tasks, undergraduate teachers do not approach the lesson planning activities with an aim to improve their personal teaching competence but rather, look for shortcuts in order to complete the task on time. Research conducted by Sawyer & Myers (2018) states that when planning lessons, teacher candidates tend to seek instant results and for convenience, search the internet to source existing examples of what they are planning and do not perform the analysis desired in planning for teaching and learning.

Lim et al. (2018) state that there are three patterns in preparing lesson plans; offloading, adapting, and improvising. The research indicates that offloading is the most evidenced method to create a lesson plan and is achieved by using existing lesson plans with any improvement on the design constituting, if at all, a very small part of what is delivered. Adapting involves using the original lesson plan with only the essential elements replaced to deliver to a different cohort of students. Improvising is a method of creating learning plans as they are needed and is the least preferred option for teachers to engage with teaching and learning design. Lim et al.'s research found that teachers relied more on offloading and adapting methodologies in lesson planning as compared with improvising.

It is incumbent on universities to ensure that undergraduate teacher courses are appropriate to the contemporary teaching and learning context and produce suitably qualified teachers. Education programs have a responsibility and duty to create capacity for student teachers to develop capability as educators who can develop teaching and learning programs tailored to their students' identified needs and enhance their potential achievement as 21st Century teachers (Lim et al., 2018; Urbani et al., 2017).

Changing times necessitate education that graduates school students who are competent and capable according to identified needs (Anderson, 2010, p.33). The use of technology must be enculturated as a strength in the current age of learning (Bakir, 2016) and thus, integrating technology as a knowledge medium is an essential aspect in the required competence of undergraduate teacher students (Cydis, 2015). The evidence indicates that currently, from the initiation of learning, classroom teaching and learning must incorporate use of the overhead projector and computer software learning materials to assist in explaining subject matter and demonstrate the application of learning through related activities and assessment. Consequently, the development of teacher technological capability, particularly information and computer technology is paramount. Technological developments have and will continue to bring change to the world of education and necessitate a shift in the paradigm of teacher and prospective teacher learning and teaching skills requisite for the 21st century (Naidoo & D'Warte, 2017).

As a case in point it is observed that Education lecturers guide prospective teachers in planning for learning by giving them practice sets using a hard copy worksheet or template (MFIs) as a



medium to create a lesson plan. The disadvantage in this practice is that when the student enters information on the worksheet and then wants to edit/add/correct, they must return to the start and reformulate the learning objectives, as these are indicators of competency achievement and determine the learning strategies as well as the lesson parts. Examination of the resultant lesson planning from this type of task found a propensity for mismatch between the selected learning strategy and the activities planned for students in the learning experience (Lim et al., 2018).

Thus this research found that the current efforts in training prospective teachers to achieve lesson planning competence, do not meet contemporary learning needs which are characterized by technology integration and further, that tertiary education courses must embed digital pedagogy as essential practice for prospective teachers (Sendurur, 2018). In particular, focused effort must be made to ensure Education lecturers are competent to model and facilitate undergraduate teacher learning about lesson planning (Koehler et al., 2019) such that prospective teachers acquire instructional design capabilities for a technologically fueled knowledge economy. However, this research has not revealed the use of instructional media in promoting and training competence in preparing lesson plans.

The use of software technology explored in this research as a lecture medium for undergraduate teachers, is specific to its intended function as an exemplar or model in lesson planning. This use of software is expected to overcome the problems faced by prospective teachers in the process of planning a lesson. Additionally, the use of software is a more flexible learning medium for prospective teachers as it allows for repeated application as and when necessary (Cairncross & Mannion, 2001) unlike the use of an MFI, which as a paper based planning medium is limited and more vulnerable to damage and loss etc.

A number of recent studies reveal the potential benefits in the use of learning media in the form of software (Pardimin et al., 2019; Wiyarsi et al., 2019). While the studies referenced focus on creative content, there has not been much research on the use of software with prospective teachers, especially in the context of their teacher education courses. The use of software training as a medium for prospective teacher competence in creating lesson plans is a single step for change in education, especially in the subject of teacher education, such that the integration of technology in learning is not just about inserting a PowerPoint as a learning and or teaching tool. Rather the aim is for a meaningful learning experience for prospective teachers to enhance their competence, ease and flexibility with the use of software in preference to MFIs, as the research indicates that this learning experience will accelerate prospective teachers capability (Caspersen et al., 2017). The piece of software that is the subject of this study can enable prospective teachers to create lesson plans through a determination of strategy by displaying an alternative option to the standard learning model, and which is directly connected with learning steps in the form of the syntax of the chosen model. An additional advantage of using the software in teacher training to create lesson plans is the resultant compatibility between the learning activities within a selected learning model. Further, an increasing number



of prospective teachers who use the improvising model when lesson plan have found that not only their competence in lesson planning can be trained through practice but also that other competencies, such as creative thinking in lesson planning is highlighting through use of the software.

For this software design to have more leverage, it needs a positive perception from the perspective of the teachers who have gone through the lesson planning process in their higher education degree. This perception is required to ensure that the software becomes the appropriate standard medium in lesson planning training. Based on the teacher experience of the elements of software use in lesson planning, this medium also involves some component parts that are equally challenging for both teachers and undergraduates and require further investigation with regard to teachers' perceptions related to the software. In addition to the teacher's knowledge, software in this study also charted the competence of teachers in designing learning.

Research methods

This research uses a qualitative descriptive methodology. The population in this study were all biology teachers in Lampung, and the sample represents the geographic location across Lampung, including West Lampung, North Lampung, East Lampung, Central Lampung, South Lampung, and Metro City. Purposive criteria determine the research sample respondents as being biology teachers who have taught Biology for at least four semesters. Participants sampled were those that met the requirements and were willing to fill out a questionnaire provided by email. Based on the number of emails received from respondents who completed the survey, the sample group comprised 32 participants; all biology teachers who met the criteria and were willing to participate in this study.

The data analysis studies the data competence of teachers and teachers' perceptions regarding the use of neighbor software to create lesson plans. The data are obtained through the instrument of a questionnaire comprising 34 questions, which consist of 17 categories, specific to identified issues related to teacher competence (3 questions about how to create lesson plans, four questions the use of media, 9 item of learning undertaken the evaluation results with the teacher, and the first-class action research related questions). The survey utilizes a Likert scale (5 point scale) and the 17 categories are related to teacher perceptions regarding the use of software to create lesson plans. Qualitative data analysis is accomplished using NVivo 12 Plus. The results of the study are shown in the picture field, where the vast size of the area determines the selection of participants, the larger the size, the more the extensive area chosen by the participants.

Results

The research data specific to teacher competence in lesson planning was then tabulated and analyzed descriptively. The chronological data obtained by the questionnaire was categorized as 32.90%: Very Good, Good: 15.26%, 14.34%: Enough, 19.20%: Less, and 18.20%: Very Less. The data are presented in Table 1 below. Based on the results of the questionnaire, teachers find it difficult to plan for biology teaching and learning and these difficulties are taken into consideration for teachers when preparing lesson plans in this survey and are presented in Table 2 below.

Distribution of the difficulties can be seen in the pattern in Figure 1. It seems that of the participants who have a problem in making lesson plan choice, the percentage is sequentially decisive: as much as 30.16% of the lesson, 19.05% for the learning model, 14.29% to methods of learning, to formulate a GPA of 14.29%, 7.94% for the evaluation to be used, 6.35% for time allocation, 3.17% for the approach used, 3.17% for the media, and 1.59% for learning, where the section is visible in Figure 1.

Further investigation regarding the selection of the business to be conducted by the teacher to overcome lesson planning difficulties are presented in Figure 2 below. Based on Figure 2, the vast field is the largest Software RPP where RPP Software means that chosen by the participants to overcome difficulties in lesson planning. The next choice after RPP software selected by participants, in order, is to attend workshops, receive guidance from experts learning, follow the training, and the last choice is a guide book. Sequentially percentage is 65.31% for software RPP, 14.29% for the workshop, 10.20% for the guidance of experts, 6.12% to 4.08% for the training, and guide books. More details of this data analysis are presented in Figure 2 below.

These results identify difficulties biology teachers have in planning lessons and in the case of overcoming these problems, the following data are significant: offer on the need for software to create lesson plans responded by participants, 100% of participants chose to agree on the use of software to assist them in planning learning. It can also be seen in Figure 2 below that most preferred as a solution to tackle the problem when making plans for education. The reasons for selecting software to create lesson plans in helping to plan the study are shown in Figure 3 below. Note that in the field area of Figure 3, there is a choice indicated, meaning that participant choice to use the software is due to desire to facilitate the work in planning lessons.

Furthermore, the broad field of the second is to reduce workload, meaning that participants chose to use software that can reduce the burden of planning duties as a teacher. The third field is about time saving indicating that participants want, that by using the software, to save time spent on lesson planning. The last is a broad field referencing to the capacity of the software tool to add information to lesson planning through its use by participants. Percentage points

respectively are 60.98% to facilitate the work, 17.07% to reduce the workload, 12.20% to save time and 9.76% to add information, and further data are presented in Figure 3 below which find that participants chose to use software that can reduce the burden of planning.

Biology teachers' perceptions about the criteria required in the software to create lesson plans in the learning plan are shown in Figure 4 below. According to Figure 4, the participant perception is that the criteria: that the software provides the most comprehensive selection fields and is easy to use, indicate a need for the software to provide convenience when in use. Furthermore, the broad area of complete lesson plan components was requested as a full plan development. The next field is the availability of a comprehensive selection of models of learning and the responses indicate that participants chose that software that provides options for users to select their model of choice. Size following the next field is to do the editing, the availability of choice of evaluation, instructional media, materials, and software is made in the form of an interactive CD respectively if presented gained 29.82% in the following order for software that is easy to use and provide a complete RPP component, 17.54% to give a choice of models of learning, 10.54% to do the editing, 7.03% for selection of the evaluation, and 1.75% for media, materials and CD Interactive.

The data in Figure 4 below assist researchers in constructing software that will be made to help prospective teachers to create lesson plans. The data results of the questionnaire were also specific to the biology content and potential remedial or differentiated content to address student needs, and these data is presented in Table 3 below. These data are required for consideration in embedding in lesson planning software, the provision for remedial or differentiated learning strategies. The relevant research regarding this field underpins development of this software and based on Table 3, the content of biological material requiring most significant remediation is presented. Meaningful learning for all students can be realized if teachers plan lessons appropriately.

Discussion

From Table 1, it is clear that the percentage of achievement of biology teachers in planning lessons reached 32.90% on the criteria of Very Good and as much as 15.26% for Good. These results would indicate that the competence of the teacher's plans for biology learning still needs to be improved. As a practitioner of shared responsibility for the quality of education, tertiary institutions must produce more competent Biology teachers.

To further investigate the value 32.90%, the percentage of Biology teachers who responded categorized Very Good in planning learning biology, the data identifies that these are Biology teachers who have more than six semesters of teaching experience. Further, these teachers also have an educational background with a Bachelor of Education degree in Biology. There are more than 50% of teachers who have not been categorized as competent in planning lessons.

This figure should not exist, as these teachers have at least four semesters of teaching meaning they have planned lessons extensively and coupled with their experience in undergraduate coursework this statistic should not exist (Kaçan, 2015). This research finds that there needs to be an effort to increase exercises for prospective biology teachers in planning lessons through the use of software to create lesson plans. This focus on software for lesson planning is in an effort to increase teacher capacity through improving the quality of teaching in universities for prospective teachers (Caspersen et al., 2017; Ulla & Winitkun, 2018).

Results of research conducted by Conderman & Hedin (2014) stated that teachers play a role in determining the learning strategies. Planning learning becomes essential because at the time of designing, the teachers plan learning activities with a picture of what will be done by students during the learning process to equip their competence to achieve the learning objectives. Also, but the teacher determines which media to use and how to use them and evaluates learning that has been designed and delivered to determine the influence on student learning outcomes during the teaching. As such, lesson plans are created to articulate how students can participate in education (Cimermanová, 2018) and teacher creativity has an impact on teaching (Tripathi et al., 2018).

Research conducted by Özdaş (2018) stated that teachers are more likely to plan and implement teacher-centered learning. Teacher centered education minimises student participation and lack of student participation in education results in a less effective learning experience. For maximum learner engagement, teacher learning design prowess is essential.

Based on the results of this study, it is found that biology teachers are in need of assistance in the form of software technology to create lesson plans and assist in lesson planning and this is a tool not only for prospective teachers, but also practiced teachers. This need for software to lesson plan is based on a variety of reasons presented in Figure 3 below. From the data presented in this figure, it appears that the most significant reason for choice of lesson planning software is to facilitate the lesson plan; followed by to reduce the workload of teachers; then to save time and finally because the use of software can add information. Since teachers need software to lesson plan, the lectures that create capacity for this competence in creating a learning plan should provide exercises in the use of lesson planning competencies by developing instructional media, one of which may be the software. This opinion is supported by research conducted by Tomczyk et al. (2017), who found that one of the problems in the supply of qualified candidate teachers is the lack of skill in the use of technology to develop instructional media for the times: as both a necessary learning mode and lesson planning tool and as part of the required education innovation.

Software that this research proposes needs to be made is tailored to the needs identified by teachers, as presented in Figure 1 which indicates the primary criterion for this software is accessibility for teachers in their determination of steps as relevant to learning activities,



teaching models, and methods of learning (learning strategies). Furthermore, the determination of competence achievement indicator (CPI), the decision of the evaluation, allocation of time, as well as the resolution of approaches and media, the last goal of learning are considerations. These patterns are common with those observations during undergraduates lectures such that the difficulty faced by teachers in lesson planning are similar to the challenges faced by prospective lecturers, so that the software must be easy for users ranging from early to late career.

The description of the learning objectives define learning strategies (approaches, models, and methods of learning) must work together to describe the steps of the learning activities and time allocation. The next determining medium that is suitable for learning activities are the evaluations that determine the end of learning activities and these must ensure that alignment between the components of a lesson plan determine the success of learning. (Chizhik & Chizhik, 2018).

Software development for planning lessons also mustg considers the results of research on teacher perceptions as presented in Figure 4 below. Ease of use and the availability of choice of learning models must be integrated into the learning steps. The selection of available models is, of course, based on the results of research conducted by other researchers for the content of biology, and preferred materials that have the highest number of participants in each semester remedial actions are found in Table 3 below. Hargrove (2013) and Valtonen et al. (2015), found that a great teacher is one that they can plan to learn by choosing a strategy/learning model and integrate the use of media technologies appropriate for learners. Thus, the need for higher education tuition for prospective teachers to incorporate technology in the form of software as a learning medium teacher candidates to practice the lesson plan must be realized.

RPP's as complete components would be things that need to be considered in designing this software to comply with the applicable laws, and of course standards set. Furthermore, the teacher perception of the software is that it must be capable of editing what has been loaded and must easily determine the evaluation, selection of media, materials, and form of interactive CD (compact Disc). Making the software is expected to facilitate teacher lesson planning, to save time and reduce the burden of the task, as presented in Figure 3.

Lectures which train for competence in lesson planning should be made meaningful by implementing software to create lesson plans. This finding is similar to the results of research by Niiranen (2019) and Aytekin & Rızvanoğlu (2019), who find that the ability of learners has the potential to be developed through the use of educational technology. Through the use of software to create a lesson plan as the content of their lectures, the prospective teachers can continue to practice lesson planning. However, its use should be planned and to form the proper learning environment for competence development in prospective teachers (Baaki & Luo, 2019) as the quality of the learning process for the teacher candidates predicts the quality of



education provided by these undergraduates when they become teachers (Jauhari et al., 2019). Kaçan (2015) states that teachers to improve teacher creativity in presenting lessons, alternative learning about teaching and learning design must be based on doing things better.

Conclusion

This study draws the conclusion that teacher experience does not mean teacher competence in lesson planning. This is evidenced by the difficulties faced by teachers in lesson planning, especially in terms of determining the learning steps and the appropriate teaching and learning strategies for the biological concepts that will be taught. The flawed strategies used by teachers in learning design are believed to have an impact on student learning outcomes and for this reason, it is proposed that the use of software can help in lesson planning across the board in the education field: for both experienced and inexperienced practitioners, undergraduate teacher and lecturers.

Learning Stops (30,16%)	Learning method (14,29%)	GPA Formulation (14,29%)	
	Learning model (19,05%)	Evaluation (7,94%)	L. Approach (3,17%)
		Time allocation (6,35%)	Media (3,17%)
		L. Object. (1,59)	

Figure 1. Patterns of Learning Difficulties in Planning

Software (65,31%)	Workshop (14,29%)
	Expert Guidance (10,20 %)
	Short training (6,12%)
Guide Book (4,08%)	

Figure 2. Solutions to overcome problems in the lesson plan

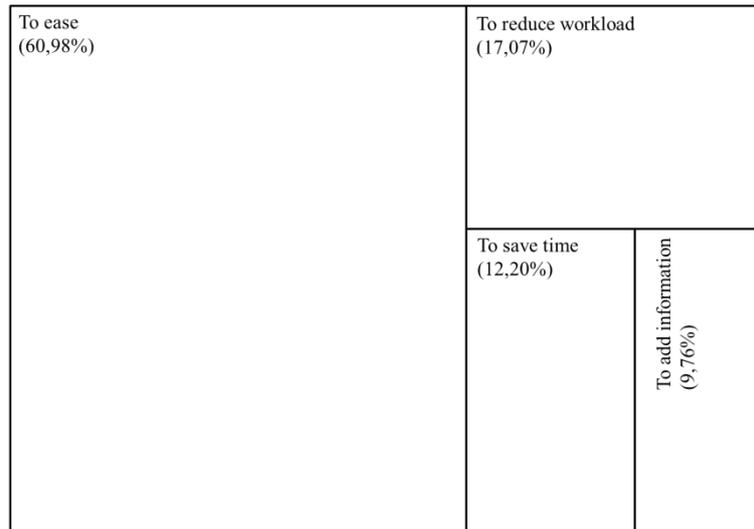


Figure 3. The reason for the need for software to create lesson plans

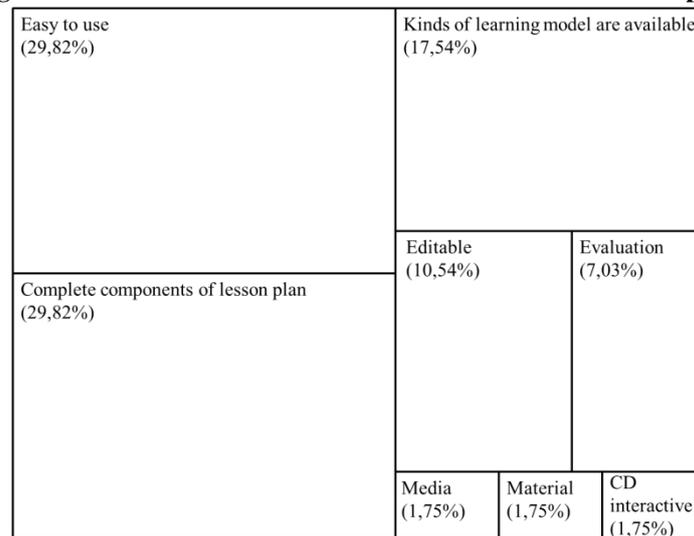


Figure 4. Perceptions Criterion Software for Creating Lesson Plans

Table 1. Results of Teacher Competence

No.	criteria	The percentage (%)
1	Very Good	32.90
2	Good	15.26
3	Fair	14.34
4	Poor	19,20
5	Very Poor	18.20

Table 2. Difficulties in Biology Education Plan

No.	Point of Difficulty
1	Determine the time allocation
2	Indicators and Learning Objectives
3	Learning strategies (approaches, models, and methods)
4	Learning objectives
5	Learning steps
6	Learning media (Tools and Materials)
7	Evaluation (attitude and skills)

Table 3. Content Biology Diremidikan

Biological content with the number of participants remedy	
most	smallest
protists	Biological Scope
archaeobacteria	Growth and Development
Cell	plant Tissue
Genetics	Biodiversity
Virus	excretion System
chemical Components	Biotechnology
animal Tissue	Ecology
metabolism	Environment Change and Preservation
Patterns of Heredity	Digestive System
Regulatory Systems	
Plantae	
Animalia	
Fungi	
excretion system	
immune System	
Heredity	
Evolution	
Coordination	



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