



# Evaluation of the Effectiveness of Direct Instruction Model on Accounting Problem-Solving Skills at Various Levels of Students' Prior Knowledge

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**Abstract.** Human resource development in the 21st century is directed towards skill development. Problem-solving skills is one of the skills needed in this century. The objectives of this study are, first, to explain the differences in accounting problem-solving skills in the dimensions of the direct instruction model and the conventional instruction model; and second, to explain the effect of instruction models on accounting problem-solving skills at various levels of students' prior knowledge. This experimental study used a pretest-posttest non-equivalent control group design as the research design. This study determined 225 students who were taking the subject of accounting theory and practicum as the access population. A total of 88 students were determined as samples using group random sampling techniques and divided into two groups, namely the experimental group and the control group. The instrument for obtaining prior knowledge data was a multiple-choice test, while problem-solving skills data was obtained through an essay test. All types of data collected were analyzed using descriptive statistics and inferential statistics with a significance level of 0.05. The results: first, there is a difference in problem-solving skills between students who study with the direct instruction model and the conventional model; second, there is an effect between the instruction model and prior knowledge of problem-solving skills.

**Keywords:** Direct Instruction, Prior Knowledge, Problem-Solving

## 1 Introduction

Problem-solving skills are among the key demands of the 21st century. Education in this century must be able to integrate knowledge, skills, attitudes, and mastery of ICT (Salmia & Yusri, 2021). Individuals today need more than just knowledge; they must also possess the ability to process it, thereby becoming critical and innovative individuals. The success of education is highly dependent on the teaching and learning process (Nugraha, 2018). It is essential to note that many elements are interrelated and collectively determine success in the teaching and learning process. These elements are educators, students, curriculum, teaching, and the environment. Universities strive to develop human resources holistically and comprehensively across the cognitive, affective,

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and skills domains (Pratiwi & Hayati, 2021). In reality, there are numerous problems in education, particularly in measuring the quality of education, which is still predominantly assessed based on learning outcomes. This condition will cause a lack of students' ability to solve problems. Problem-solving ability is a skill or potential that a person has in solving problems and applying them in everyday life (Siagian et al., 2019). Problem-solving ability is highly dependent on the learning model implemented. Learning models that facilitate students in constructing knowledge can enhance problem-solving (Özden & Yenice, 2020). Learning experiences that activate learners during the learning process can improve problem-solving skills (Shieh & Chang, 2014). Problem-solving ability is measured in several components. (Polya, 1973) stated that there are four components of problem-solving: (a) understanding the problem, (b) devising a plan, (c) carrying out the plan, and (d) looking back.

Students' prior knowledge is heterogeneous, and this condition requires special attention in the learning process. The learning process involves designing adequate instructions to cater to the diverse learning styles and varying prior knowledge of students. Prior knowledge is acquired through the process of observation and experience, where it is constructed. Individuals themselves build prior knowledge, and they often have ideas before entering the learning process. However, their ideas are based on personal knowledge and do not yet demonstrate scientific knowledge. Such ideas are referred to as alternative knowledge or naive conceptions (Galili & Hazan, 2000). Their ideas need to be considered in the learning process. This statement is clarified by (Ausubel, 1978), who stated that learning that does not take into account the ideas that students already have will make their misconceptions more complex and stable. Based on the explanation above, prior knowledge is very strategic in attaining learning objectives, so it needs to be considered and is essential to study.

One of the learning models that has a systematic syntax is direct instruction, unlike the learning models that have been applied so far (conventional instruction). This learning model is specifically designed to enhance the acquisition of well-structured factual knowledge, which can be taught in a step-by-step manner. This instruction model is also intended to help students master the procedural knowledge needed to perform various complex and straightforward skills (Arends, 2014). This learning model has been in place for a long time and is widely regarded as effective in facilitating the learning process. (Rosdiani, 2013) stated that direct instruction is a learning model that prioritises effective learning strategies to expand knowledge of teaching materials. Direct instruction model also plays a very important role in increasing student motivation (Nur et al., 2023) and statistically the application of direct instruction is very beneficial for the experimental group (Yaghmour & Obaidat, 2022). The direct instruction model employs a clear and systematic approach in its application. This instruction model is believed to be able to overcome student problems in learning, especially in solving transaction recording problems.

Students often struggle to master introductory accounting courses, which are prerequisites for subsequent accounting courses in the following semester (Sitompul et al., 2021). Many students experience learning difficulties because its implementation is based on assumptions, concepts, and obstacles faced. Difficulties in learning accounting are primarily attributed to the concept factor, for 19.5% (Juliah & Sukarni., 2019).

Students also struggle with learning general journals and in preparing data to complete the reporting stage. They have difficulty understanding the material and have not mastered the techniques for preparing a trial balance (Melva, 2022). As a consequence of these difficulties and limitations, students' ability to solve problems is not optimal. The purpose of this study is to explain the differences in problem-solving skills resulting from participants following different instruction models. In addition, it describes the interaction effects between instruction models and prior knowledge of problem-solving skills.

## 2 Methodology

The researcher used an experimental research method with a Nonequivalent Control Group Design (Tuckman, 1978). Research design has two basic meanings: (a) providing answers to research questions, and (b) controlling or managing variance. The purpose of factorial design is to investigate the independent and simultaneous effects of two independent treatment variables on an outcome (Creswell, 2012). The analytical design of this study was a by-level design, with the separating factor being prior knowledge. The separating factor was divided into two dimensions: 27% above the group average and 27% below the group average (Arikunto, 2013). The variables of this study are problem-solving skills, prior knowledge, direct instruction, and conventional instruction. Data has been collected using instruments whose validity and reliability have been checked. Prior knowledge data were collected through 50 multiple-choice questions, and data for students' problem-solving skills were assessed with five essay tests. The ideal minimum score for prior knowledge is zero, and the ideal maximum score is 50. While students' problem-solving ideal minimum score is 0, and the ideal maximum score is 100.

The data analysis techniques used are descriptive and inferential statistics. Descriptive statistics are given to calculate the frequency, percentage, mean, minimum, maximum, and standard deviation of a sample (Creswell, 2012). Meanwhile, inferential statistics are used to test hypotheses. Hypotheses were tested using analysis of variance, assisted by SPSS 25.00 for Windows, with a significance level of 5%. Each analysis unit consists of 22 subjects, resulting in a total of 88 subjects. The analysis design is revealed in Table 1.

**Table 1.** Table of analysis design

Prior knowledge	Direct instruction (A <sub>1</sub> )	Conventional instruction (A <sub>2</sub> )
Adequate (B <sub>1</sub> )	A <sub>1</sub> B <sub>1</sub>	A <sub>2</sub> B <sub>1</sub>
Inadequate (B <sub>2</sub> )	A <sub>1</sub> B <sub>2</sub>	A <sub>2</sub> B <sub>2</sub>

### 3 Result and Discussion

#### 3.1 Result

Problem-solving consists of four components: (a) understanding the problem, (b) devising a plan, (c) carrying out the plan, and looking back. Scoring of students' problem-solving skills (SPSS) refers to these four components. Table 2 presents the average SPSS for each instruction model (DIM and CIM) with different levels of prior knowledge (APK and NPK). Table 2 shows that the range of SPSS scores at the APK and NPK is 0-60 (the "very deficient" category). The pretest scores of students who took DIM and CIM were in the same score range (the "very deficient" category). The lowest scores obtained by the group of students with NPK and taking CIM were 48.64. Table 2 also shows that the scores obtained after treatment increased for all analysis units. The highest score of 91.14 (the "very good" category) was received by the APK student group who studied with DIM. However, the lowest score of 83.59 (the "good" category) was obtained by the NPK student group who studied with DIM. Descriptively, it can be said that the APK group is more suitable for learning with DIM, while the NPK group is more appropriate for studying with CIM.

**Table 2.** Average score of problem-solving skills

Prior knowledge	Instruction model	Mean (pre)	Mean (post)
Adequate (APK)	Direct instruction (DIM)	57.59	91.14
Adequate (APK)	Conventional instruction (CIM)	61.27	84.50
Inadequate (NPK)	Direct instruction (DIM)	50.36	83.59
Inadequate (NPK)	Conventional instruction (CIM)	48.64	85.27

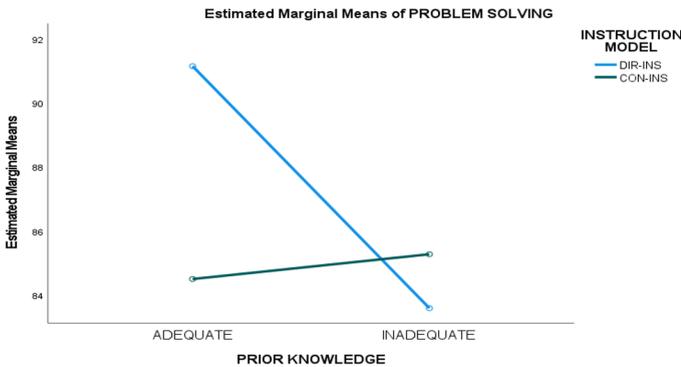
The analysis requirement test was conducted before conducting the hypothesis test. The test aims to obtain empirical facts about data normality and homogeneity of variance. The normality test uses the Kolmogorov-Smirnov and Shapiro-Wilks tests. Data normality analysis on all analysis units showed a significance greater than 0.05. Therefore, the dependent variable data is normally distributed overall. Meanwhile, the purpose of the homogeneity of variance test is to determine whether the variances in each group are equal. Levene's Test of Equality of Error Variances is used to test the homogeneity of variance between groups. The first group is based on the instruction model, comprising 44 analysis units, and the second group is based on prior knowledge, also containing 44 analysis units. The homogeneity test indicates that the data groups originate from populations with homogeneous variances. All hypotheses were tested using 2x2 factorial ANOVA using SPSS 25.0 for Windows. The test results are presented in Table 3 and can be explained as follows: First, the source of the instruction model yielded an F-value of 4.033, with  $\alpha < 0.05$ . These results mean that the instruction model variable has a significant effect on the SPSS variable. Second, the influence of the instruction model and prior knowledge on SPSS with a value of  $F=11.369$ ;  $\alpha < 0.05$ . This result shows that the instruction model can integrate or accommodate prior

knowledge significantly to improve SPSS. SPSS scores are achieved at a higher level in students with APK when DIM is applied. Meanwhile, it will decrease in students with NPK. Furthermore, it can be interpreted that DIM is more appropriately programmed in groups of students with APK. The opposite condition occurs; students with NPK are more suitable to learn with CIM.

**Table 3.** Tests of between-subjects effects

Source	Df	Mean square	F	Sig.
Corrected model	3	255.951	7.646	.000
Intercept	1	652741.375	19500.252	.000
Prior_know	1	252.284	7.537	.007
Instr_model	1	135.011	4.033	.048
Prior_know * Instr_model	1	380.557	11.369	.001

Meanwhile, it will decrease in students with NPK. Furthermore, it can be interpreted that DIM is more appropriately programmed in groups of students with APK. The opposite condition occurs; students with NPK are more suitable to learn with CIM.



**Figure 1.** Interaction profile between instruction model and prior knowledge.

Can be explained that there is an interaction between the instruction model (DIM and CIM) and prior knowledge (adequate and inadequate) in terms of problem-solving skills. The interaction profile is presented in Figure 1.

### 3.2 Discussion

The first objective of this study was to describe the differences in students’ problem-solving skills (SPSS) between those who studied with the direct instruction (DIM) model and those who studied with the conventional instruction (CIM) model. As a result, there were differences in accounting problem-solving abilities between students in the DIM and CIM groups. Further results showed that the SPSS score for students in the DIM group was greater than that for students in the CIM group, with a value of  $F =$

4.03;  $\alpha < 0.05$ . The implication is that lecturers, as education practitioners, can apply DIM to improve SPSS compared to CIM. DIM is a learning model that has a systematic syntax and is specifically designed. DIM helps students enhance their understanding of both factual knowledge and procedural knowledge required to perform various skills, ranging from simple to complex. DIM is designed to utilize time efficiently, enabling the material to be delivered widely (Tauhid, 2021). This learning model has been in place for a long time and is believed to be effective in facilitating the learning process. DIM consists of 5 stages: (a) gain attention, clarify goals, and establish set; (b) demonstrate knowledge or skill; (c) provide guided practice; (d) check for understanding and provide feedback; and (e) provide extended practice and transfer (Arends, 2014). In accounting learning, DIM begins with preparing materials and conveying the learning objectives of the journal (general journal). The lecturer delivers the material, and students listen to the lecturer's explanation, paying attention to how to record transactions using the general journal. Furthermore, students record transactions using problem-solving steps. The lecturer provides students with the opportunity to practice problem-solving skills by recording transactions using the general journal. Based on the syntax in DIM, it can be inferred that it can help students overcome their difficulties in problem-solving. Different from students who learn with CIM. This learning model has a teacher-centred learning model paradigm. The learning process is centred on the lecturer, students are passive, and learning activities are monotonous. Learning this course has its own challenges for students and lecturers. Teaching this course is a challenge for lecturers because the learning material covers various transactions (Fang & Slavin, 2015). Learning activities for this course must be designed using the appropriate learning model to achieve learning effectiveness (Gilbert, 2018). Learning with CIM utilizes the transfer concept and the rote learning concept. Learning debit and credit rules have been more emphasised through memorisation methods, such as the mnemonic method and simplification methods using the accounting equation (Zhou & Lamberton, 2020). One of the disadvantages of the memorisation method is the high level of boredom and the potential for excessive cognitive load. Based on the explanation above, a generalization can be drawn that DIM is superior to CIM in developing SPSS. However, there are problems related to problem-solving skills, including: (a) students have not been able to adapt to DIM syntax, so their problem-solving skills are not optimal; (b) generating problem-solving skills takes longer.

The second objective is to describe the interactive effect between the instruction model and prior knowledge of SPSS. The results of the analysis indicate an interaction between the instruction model and prior knowledge on problem-solving skills, with  $F = 11.369$ ;  $\alpha < 0.05$ . This study suggests that the DIM instruction model may not be suitable for all levels of SPSS. DIM is ideal for groups of students who have APK. Meanwhile, groups of students who have NPK learn better with the CIM than with the DIM. CIM is less suitable for implementation in groups of students who have APK. This group of students is not comfortable with the lecturer providing complete guidance. It means that there is an interaction between the instruction model and prior knowledge on problem-solving skills.

## 4 Conclusion

Conclusion: First, students' skills in solving problems differ significantly between those who follow the direct instruction model and those who follow the conventional instruction. The problem-solving skills of students who learn using the direct instruction model are higher than those of students who learn with the conventional instruction model. Groups of students who learn through direct instruction typically develop a comprehensive understanding of concepts, which enables them to develop effective problem-solving skills. Second, the direct instruction model is able to accommodate prior knowledge, thereby enhancing students' ability to solve problems. Students' skills in solving problems with adequate prior knowledge are better when they learn with the direct instruction model. Meanwhile, for students who have inadequate prior knowledge, their ability will increase when they learn with the conventional instruction. It is recommended for educational practitioners to apply the direct instruction model as an alternative model by considering the students' prior knowledge.

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