Why Learners Found Transfer Pricing Difficult? Implications for Directors

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Abstract

A recent survey of Australian directors conducted by the Financial Reporting Council found that directors require a detailed understanding of technical accounting issues. With the aim of understanding learner difficulties in learning and applying higher learning material relevant to directors, this study explores the transfer pricing topic taught as a case presentation in an undergraduate accounting program at an Australian university. Before intervention with improvements, this study invited 25 students to take part in the study after they had learned the topic and been given one week to understand it. By adopting a transfer pricing problem presented in their essential reading and interviewing those students to gain further insights, the study found that learners experienced conceptual difficulties at various stages in attempting to learn. Intervention to ease learning difficulties was addressed through instructor training. The intervention improvements included using guided workbooks to develop a better understanding of concepts among learners, and representing the problem at hand with diagrams. After intervention with improvements, this study repeated the same procedures with 25 students who had not taken part in the previous study and found that interventions increased the learning. Results have implications for most directors, who are novices to the detailed technical accounting issues of transfer pricing.

Keywords: Accounting, Interviews, Learning, Transfer Pricing.

JEL Classification Code: I21, J49, M49.

1. Introduction

A survey conducted by the Financial Reporting Council in Australia to determine the financial literacy of Australian directors asked financial professionals about directors' financial literacy and found that these professionals rated directors' knowledge about more technical accounting issues as less than adequate (CAANZ, 2016). This is a concern because directors require a quite detailed understanding of technical accounting issues such as transfer pricing in making sound decisions affecting organisational economics, efficiency, and effectiveness.

Transfer pricing has to do with setting the price of goods and services sold within multi-divisional, multi-office, or multi-national firms. The efficient setting of transfer pricing allows each division, office, or firm within a group of firms, to function as a profit centre with the aim of maximising overall profits of the enterprise. An enterprise can also set transfer price to transfer profits from a high-tax jurisdiction country to a low-tax jurisdiction country. Governments lose tax revenue from companies due to transfer price arrangements and have established various rules a firm should follow in setting a transfer price for cross-border transactions within a group of firms. Transfer pricing is a challenging issue for directors because setting inappropriate transfer prices can increase government scrutiny and potential prosecution (Power, 2012).

Knowledge about transfer pricing requires understanding a nexus of accounting concepts and their application to determine the appropriate transfer price. Hence, learners have reported that transfer pricing is a difficult to topic to understand. This difficulty becomes evident from students' consistently poor examination performance on this question.

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Transfer pricing decides the selling price for transactions of goods and services between divisions within a firm. Firms can label their divisions as investment centres or profit centres. This labelling allows directors to evaluate profits or investments made by the divisions. Because directors measure how well divisions perform by profits and investments made, each division can tend to increase its profits and investments while ignoring how this influences the firm. Transfer prices are internal selling prices; they form revenue for the selling division that increases profits, and cost to the buying division that decreases profits (Langfield-Smith, Thorne, & Hilton, 2006). The divisions measure the financial performance using some measure of profit.

This study explored why students have difficulties in understanding transfer pricing, a topic taught in the management accounting course unit of the undergraduate course at an Australian university. Investigating student learning difficulties in the transfer pricing topic helps us to understand difficulties facing novice students in learning topics of higher-order thinking which demand a sound understanding of lower-level thinking. Many directors who do not have a strong accounting background and are new to how transfer pricing works will also experience similar difficulties and become equivalent to novice-students of transfer pricing.

This study presents how we overcame student difficulties in learning transfer pricing. The next section outlines cognitive load theory and the relevant literature. Section 3 reports the data collection including problem presentation. Section 4 presents results and discussion, as well as implications for teaching transfer pricing to directors.

2. Theory and Literature Review

Cognitive load theory states that instructional design must guide learners to discover and build knowledge. It explains the association between knowledge and learning, and how instructional design can help to foster the building of knowledge (Moreno & Park, 2010). Learning requires exerting cognitive load, but instructional design can moderate this load. Cognitive load arises from consuming the working memory or short-term memory in learning new information. According to cognitive load theory, the human cognitive architecture has a limited short-term memory and a large long-term memory (Kahneman, 1973; Miller, 1956). The short-term memory makes meaning out of information by thinking, and long-term memory stores information for later use (Schneider & Schiffrin, 1977). A role of learning is to transfer an organised pattern of thought or behaviour (schema) developed in the working (short-term) memory to long-term memory so that the learner becomes familiar with

finding solutions to any similar problems. The transfer of an organised pattern or thought from working memory to long-term memory frees up working memory for further learning (Sweller, 1994). Novices use more working memory because they lack previously formed thought patterns and behaviours relevant to solving a given task and therefore they must think more to solve the task. Experts use less working memory because they can access solutions to the problem by calling on previously formed thoughts and behavioural patterns deposited in long-term memory (Sweller, Ayers, & Kalyuga, 2011, p. 21).

For learning to occur, the cognitive load imposed by the task should not exceed the total working memory available. Three types of additive cognitive load (intrinsic load, extraneous load, and germane load) impose the burden on working memory. Intrinsic load arises from inherent difficulty of a task that requires interrelating different ideas. Extraneous load arises from poor design of the teaching methods used in helping students to learn a task. Germane load arises from the learner effort exerted on the task (Sweller & Chandler, 1994, p. 192).

Although previous studies agree that instructional design can decrease the cognitive load, mixed findings exist for intrinsic cognitive load. Some findings suggest that instructional design can decrease the intrinsic cognitive load, by presenting items of information (that is, elements) sequentially, and combining similar items in the instruction (Lee, Plass, & Homer, 2006; Pollock, Chandler, & Sweller, 2002; van Merrienboer, Kirschner, & Kester, 2003).

Learning various topics can invoke different types of thoughts and behavioural patterns (that is, schema). Some topics require building a simple schema, whereas for others a complex schema must be built. Learning accounting requires building a complex schema (Blaney, Kalyuga, & Sweller, 2010). Learning accounting topics requires learning many new concepts and formulas (that is, elements) and simultaneously combining them. The complexities lead to students using too much of their working memory, and this can decrease learners' capacity to build a schema to increase learning (Sithole, Chandler, Abeysekera, & Paas, 2017). The transfer pricing topic is a case in point, where students need to learn and simultaneously combine new ideas and formulas to build from a basic to a complex schema.

Figure 1 summarises five order levels of the understandings the learner must develop in order to learn transfer pricing. The first order shows the basic concepts in transfer pricing. The second-order concepts build upon the first-order concepts. It is essential that students understand the first-order concepts, to understand the second-order concepts. Each higher order level builds upon the understanding of lower-level concepts and understanding

the fifth-order concepts requires understanding all other lower-level concepts. Solving a problem about transfer price requires decision-makers to simultaneously process information relating to all order levels. It is essential to understand the conceptual difficulties experienced by learners, to ease learning difficulties in mastering transfer pricing. We assessed learners' written answers against the marking guide prepared at the time of formulating the problem. We conducted interviews while students were attempting the problem, to understand the learning difficulties they experienced.

We stated and tested the alternate hypotheses according to order-level mastery, and expected that improvement-interventions diagnosed from the pre-intervention stage would improve the learning at the post-intervention stage. The learning was measured by assessing scores against the marking guides, and statistical significance is measured using Pearson Chi-Square (goodness-of-fit) test at 5 percent significance level.

H1: Interventions improve learning at first-order and second-order levels (Part A of the problem).
H2: Interventions improve learning at third-order and fourth-order levels (Part B of the problem).
H3: Interventions improve learning at the fifth-order level (Part C of the problem).

3. Methodology

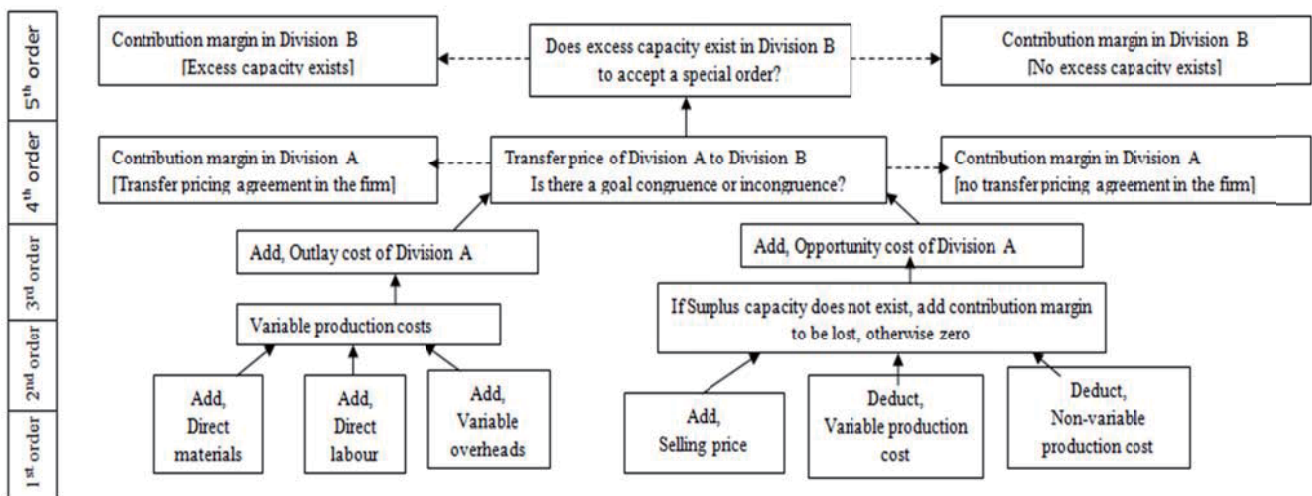This study was conducted in three phases (Figure 2).

3.1. Phase 1: Problem Design

The first phase, pre-intervention, investigated learner difficulties in learning transfer pricing. Phase 2 conducted a workshop for instructors to inform about learner challenges and develop strategies to overcome them. Phase 3, the post-intervention phase, implemented the agreed strategies to overcome learning difficulties to a future cohort of learners.

Students were invited to take part in the research study by advertising it in tutorial classes as a research project examining learning difficulties in transfer pricing, according to the ethics agreement. A researcher randomly selected 25 students from those who expressed interest in taking part. Students enrolled in this course unit had attained a 56 percent average mark and had an average 1.94 Grade Point Average. The t-tests confirmed that these averages were not statistically different from the total average mark and GPA of students of this management accounting course unit, establishing their representativeness of the class. The study used a common teaching instructor for all students to eliminate the effect of instructor difference. Students had completed the transfer pricing topic before the mid-term break and we invited them to take part in the study in the first week after the break. We gave students a typical problem they had faced in learning transfer pricing, from their essential reading textbook written by Langfield-Smith et al. (2006) (Table 1). The problem had three parts to be answered as Part A, Part B, and Part C.
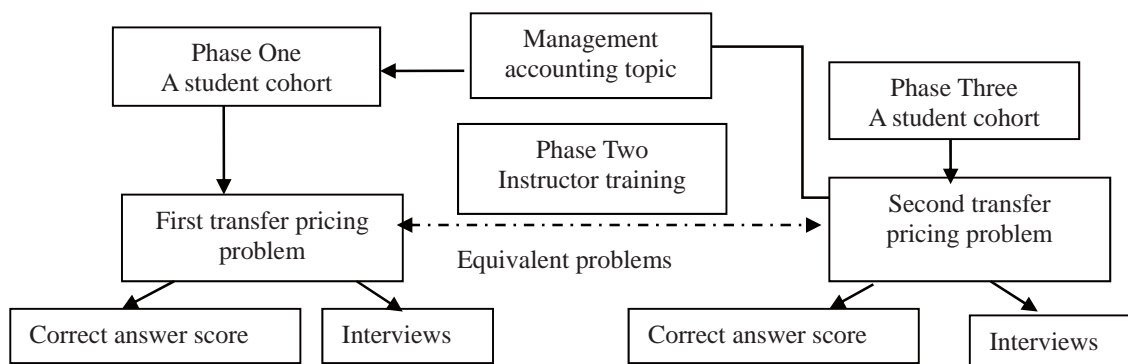

Figure 1: Transfer price calculation

Figure 2: Research design

3.1.1. Part A of the Presented Learning Problem

Part A required problem solving at the first-order and second-order levels. In Part A, students conducted the activities in the following order.

(i) Calculated the contribution margin (difference between selling price and variable costs) from each unit produced, for each of the divisions, based on the transfer pricing rules of the firm. Part A also required students to know the meaning of contribution margin as the difference between selling price and variable costs. They were required to know that variable cost is adding direct material, direct labour, and variable overhead. This transfer pricing problem needed students to make four separate calculations.

(ii) Calculated selling prices for the two divisions in the firm: Division A and Division B.

(iii) Calculated total variable costs for the two divisions separately.

(iv) Included the transfer price of Division A, as a buying cost in Division B.

(v) Calculated contribution margins for the two divisions in the firm, Division A and Division B.

3.1.2. Part B of the Presented Learning Problem

Part B required problem solving at third-order and fourth-order levels. Learners were required to calculate the minimum transfer price that Division A would accept for selling to Division B if market forces influenced the transfer price. Understanding the meaning of transfer price requires understanding the meaning of several other concepts as follows.

(i) Know that outlay cost means variable costs incurred in production.

(ii) Know that opportunity cost means giving up a monetary benefit for choosing one course of action over another.

(iii) Be aware that excess capacity means the unused production quantity that remains after including production needs from internal and external customers.

(iv) Be mindful of the fact that transfer price of an item produced is an addition of outlay cost of an item and the opportunity cost of that item.

(v) Be aware of how to use these meanings and formulas simultaneously, to calculate outlay costs of Division A, and to calculate the opportunity cost of Division A.

3.1.3. Part C of the Presented Learning Problem

Part C required problem solving at the fifth-order level. Part C asked students to decide the overall impact of accepting or rejecting a special order received from a customer named Socceroos, on firm-wide profits. Answering Part C required students to know the following.

(i) Meaning of goal congruence, as a decision made by a division to make the most profit possible for the organisation, and not for the division itself.

(ii) Meanings of incremental revenue, incremental costs, and incremental profits. Incremental revenue is the extra revenue resulting from choosing one course of action against another. Incremental costs are the extra costs resulting from choosing one course of action against another. Incremental profit is extra profits resulting from choosing one course of action against another.

(iii) Know the connections of these meanings to calculate and decide whether the firm should accept or reject the special order.

   a. First, calculate extra revenue earned by the firm.

   b. Second, calculate extra costs incurred by division A for selling products to Division B because of the agreement between divisions.

c. Third, students needed to calculate extra costs that Division B incurs because of accepting the special order from a customer.

d. Fourth, students needed to calculate extra costs that Division A must incur in selling finished goods to Division B to meet the special order.

e. Fifth, they needed to calculate the opportunity costs that Division B must bear for accepting the special order.

f. Sixth, they needed to calculate extra profits earned by the firm.

Table 1 shows the transfer pricing problem provided to students in Phase 1 of this study. The problem had three parts (Part A, B, and C) to answer. Table 2 outlines the interview guide which explored students' understandings of concepts.

Table 1: Transfer Pricing Problem

Spike Sports has several divisions. However, only one division transfers products to another internal division. The Polyfabric Division produces a special fabric, Sweatless, which is then transferred to the Sportswear Division. Each unit of the Sweatless fabric is further processed to make tracksuits (each unit of Sweatless fabric makes one tracksuit) by the Sportswear Division, and the tracksuits are sold to customers at the list price of $250 per unit. Under the existing internal agreement, the Polyfabric Division can only sell to external customers after they have supplied the Sportswear Division with all of their requirements. The existing agreement also stipulates that the Sweatless fabric must be supplied to the Sportswear Division at standard manufacturing cost plus 10 per cent. Assume that unlimited quantities of Sweatless fabric can be purchased and sold on the open market at $100 per unit.

The following table shows the detailed standard unit cost structure for each division:

Standard Manufacturing Costs	Polyfabric (Division A)	Sportswear (Division B)
Direct material	$25	$20^
Direct labour	$25	$55
Manufacturing overhead	$10*	$25**
Total standard manufacturing cost per unit	$60	$100

^ Not including transfer price for Sweatless fabric.
* Manufacturing overhead cost in the Polyfabric Division is 50% fixed and 50% variable.
** Manufacturing overhead cost in the Sportswear Division is 60% fixed and 40% variable.

Required:
(Part A)
What is the contribution margin per unit for each division under the existing transfer pricing agreement?
(Part B)
Assume that the existing transfer pricing agreement was cancelled and the managers of each division could act autonomously (including buying and selling on the open market). Use the general transfer pricing rule to calculate the lowest transfer price per unit of Sweatless that would be acceptable to the Polyfabric Division.
(Part C)
Assume that there is *excess capacity* in the Sportswear Division and assume that the Sportswear Division has received a special order from the Australian Soccer Team (Socceroos) urgently requiring 100 tracksuits at $200 each for their World Cup campaign in Germany. The Public Relations department has directed the Sportswear Division to accept the special order. From the perspective of the Spike Sports company as a whole, do you agree with the decision to accept the special order? Justify your answer.

3.2. Phase 2: Evaluating Answers to Ascertain Interventions and Conducting Interviews

3.2.1. Evaluating Answers

Students' answers to the transfer pricing problem were evaluated against the model answer prepared during the research design stage (Table 2).

Table 2: Model Solution
Model Solution for Part A

Information item (element)	Polyfabric Division A ($)	Sportswear Division B ($)
Selling price	66	250
Variable costs:		
Direct material	25	20
Direct labour	25	55
Manufacturing overhead	5	10
Transfer price	–	66
Unit contribution margin	11	99

Model Solution for Part B

Using the general transfer pricing rule:
Minimum transfer price = Outlay cost + Opportunity cost

$$= (\$25 + \$25 + \$5) + (\$100 - \$55 - \$15)$$

$$= \$55 + \$30$$

$$= \$85$$

Therefore, the general rule yields a minimum acceptable transfer price to the Polyfabric Division (Division A) of $85.

Model Solution for Part C

Information item (element)	$
Incremental revenue (per unit)	200
Less: Incremental cost of fabric (Division A)	55
Less: Incremental cost of tracksuit (Division B)	85
Less: Opportunity costs (Division A)	(30)
Incremental profit to firm	30

The findings from the previous semester assessments and student interviews led to the following improvements to decrease learner cognitive load.

(i)   Provided a *Transfer Pricing Workbook* that students downloaded as prerequisite reading from the course learning site. The *Workbook* contained explanations of all the concepts required to learn transfer pricing in this course successfully. In contrast to the previous semester, the concepts about transfer pricing were covered in the prerequisite course as essential learning outcomes.

(ii)   The *Transfer Pricing Workbook* provided students with blank pages where they were also asked to represent the problem using diagrams.

(iii)   The lecturer highlighted the common misconceptions diagnosed in the previous semester evaluation.

(iv)   The lecturer drew diagrams at each stage of problem solving to visually show the how the solution is researched.

(v)   The lecturer gave students time to complete the examples before providing the solution. These activities provided students with opportunities for incidental learning.

3.2.2. Conducting Interviews and Documenting Feedback on Learning Difficulties

The interviews held with students revealed that students' wrong answers for Part A arose due to five reasons (see Appendix for interview excerpts with feedback from students). First, presenting information as numbers wherever possible, rather than as text, decreased the cognitive load. Second, students made mistakes because of conceptual misunderstandings. For example, they did not understand the difference between selling price (for Division A) and the market price. Third, students could not combine lower-order concepts with higher-order concepts and simultaneously use them. For example, in the Phase 1 findings for Part B, calculating contribution margin of Division A needed a student to interact with several items of information simultaneously. Fourth, interacting with these items of information cascaded over three levels, making learning to calculate contribution margin difficult. At the first-order level, students needed to know the meaning of direct materials, direct labour, and variable overheads. At the second-order level, students had to know that these three types of cost make up variable production costs. At the third-order level, they should be aware that variable production costs become outlay costs for transfer pricing calculation. Students also should be aware the meanings of selling price, variable production costs, and non-variable

production costs. At the second-order level, they should also understand how the existence of surplus production capacity can influence the opportunity costs. At the third-order level, they should be aware of the meaning of opportunity costs, and the information items that comprise these costs. At the fourth-order level, students should be aware that the outlay costs and opportunity costs of Division A production make up transfer pricing. When students reach the fifth-order level, they should be aware of goal congruence. They should explore whether the firm has a transfer pricing agreement to perform goal congruence, and accordingly calculate the contribution margin (Figure 1).

Fifth, the Phase 1 of the findings also showed that the information presented in the transfer pricing problem required students to split their attention between the text and footnotes. Splitting their attention in order to integrate information to understand the question also increased the cognitive load. The problem question had an asterisk (*), hat (^), and footnotes. These interruptions distracted students from reading the text and forced them to split their attention to find out what those pointers were asking them to read, so as to understand the material. For instance, an asterisk forced them to divide their attention underneath a table to realise that 50 percent of manufacturing overheads do not change, and 50 percent vary with the quantity of production.

3.3. Phase 3: Post-intervention

The same lecturer who conducted lectures in the first semester conducted lectures in the following semester. The lecture covered the theoretical aspects of transfer pricing, followed by practical examples using an overhead projector. The sequence of events mirrored the first semester (pre-intervention phase), with 25 students being invited after the mid-semester break to take part in the study in Phase 3 (post-intervention phase). Students' GPA and average marks were not statistically significant from the Phase 1 cohort. The task required students to solve a semi-structured transfer pricing problem that was conceptually identical to that performed by students in Phase 1. The equivalence was determined by showing the two transfer pricing problems to three academics who had taught transfer pricing, and obtaining unanimous agreement. The marking criteria for the solution to the problem were identical between pre-intervention and post-intervention, moderated by improvements to extraneous cognitive load to ease learner difficulties. The different but equivalent transfer pricing problem given to students in Phase 3 is shown in Table 3.

Table 3: Transfer Pricing Problem in Phase 3

Just Juice has several divisions. However, only two divisions transfer products to other divisions. The Fruit Division produces fresh fruit, which is then transferred to the Juice Division. The fresh fruit is then processed into fruit juice by the Juice Division, and the juice is sold to customers at a price of $16 per litre. The Fruit Division is currently required by Just Juice management to transfer its total yearly output of 500,000 kilogrammes of fruit to the Juice Division at total standard production cost plus 25 per cent. 1 kilogramme of fruit makes 1 litre of juice. Unlimited quantities of fruit can be purchased and sold in the open fruit market for $7 per kilogramme. While the Fruit Division could sell all of the fruit it produces at $7 per unit on the open market, it would incur a variable selling cost of $1 per unit.

The following table shows the detailed unit cost structure for both the Fruit and Juice divisions during the most recent year:

	Fruit Division (A)	Juice Division (B)
Direct material	$1	$1^
Direct labor	$1	$2
Production overhead	$2*	$5**
Standard production cost	$4	$8

^ Direct material does not include transfer price of fruit.
* Manufacturing overhead cost in the Fruit Division is 50% fixed and 50% variable.
** Manufacturing overhead cost in the Juice Division is 60% fixed and 40% variable.

Required:
(a) What is the contribution margin per unit for each division under the existing cost plus transfer pricing agreement?
(b) Assume that the existing transfer pricing agreement was cancelled and the managers of each division could act autonomously (including buying and selling on the external market). Use the general transfer pricing rule to calculate the lowest transfer price that would be acceptable to the Fruit Division.
(c) Assume that there was a flood in the external fruit market and there was suddenly excess *capacity* in both the Fruit and Juice Divisions. Assume that the Juice Division has received a special order for 20,000 litres at $10 per litre. From the perspective of the Just Juice Company as a whole, should the company accept or reject the special order? Explain. Use incremental analysis.

4. Results and Discussion

4.1. Results of Part A

Table 4 provides summary statistics of calculating selling price, contribution margin, and transfer price for Division A and Division B of the firm. The improvements due to interventions are significantly different from pre- to post-intervention ($\chi^2(2)$ =385.53, p<0.05), and support H1. As additional tests, we measured the improvements at item

level, and the intervention-improvements had a statistically significant effect at 5 percent significance level (exceeds the $\chi^2(1)$ critical value = 0.004).

Table 4: Correct answers by students in Part A before and after intervention (N = 25)

Information item (element)	Before (N=25)	After (N=25)	(χ2(1) p<0.05)
Step 1 - Selling price (for Division A)	28%	84%	112
Step 2 - Contribution margin (Divisions A and B)	20%	88%	231
Step 3 - Transfer price from Division A is an input cost to Division B	48%	92%	40.3

4.2. Results of Part B

Table 5 reports the proportion of correct answers obtained by solving Part B in Phase 1 and Phase 3. The improvements due to interventions are significantly different from pre- to post-intervention ($\chi^2(1)$ =14.67, p<0.05) and support H2. In Part B, the market forces decided the transfer price from Division A. This part also stated that Division A had extra packaging costs. These costs vary with production quantity and therefore are also variable costs. Below is an example of a common student error in Part B, where students wrongly calculated the transfer price. The transfer pricing rule yields a minimum acceptable transfer price of $85 to Division B. As additional tests, we measured the improvements at item level, and the intervention-improvements had a statistically significant effect at 5 percent significance level (exceeds the $\chi^2(1)$ critical value = 0.004).

Table 5: Correct answers by students in Part B (N = 25)

Information item (element)	Before (N=25)	After (N=25)	($\chi^2(1)$ p<0.05)
Step 1 - Outlay costs	72%	96%	8
Step 2 - Outlay costs (no excess capacity)	60%	80%	6.67

4.3. Results of Part C

Table 6 reports the proportion of correct answers obtained by solving Part C where students should use the transfer pricing rule to calculate the transfer price from Division A. Division B has an excess capacity to meet a special order at $200 per (sportswear) item. Part C assumes that excess production capacity exists in Division A, and Division B has requested a special-order production from Division A. The first step in this section was to recognise the meaning of

goal congruence where divisional performances result in increasing profits of the firm. Forty-eight percent of students lacked such understanding. In answering Part C to calculate incremental profits to the firm, students made the following common errors. The improvements due to interventions are significantly different from pre- to post-intervention ($\chi^2(4)$ =226.76, p<0.05) and support H3. As additional tests, we measured the improvements at item level, and the intervention-improvements had a significant effect (exceeds the $\chi^2(1)$ critical value = 0.004).

Table 6: Correct answers by students in Part C (N = 25)

Information item (element)	Before intervention	After intervenion	$\chi^2(1)$ p<0.05
Step 1 - Goal congruence: Maximise firm-wide profit	52%	96%	37.29
Step 2 - Incremental revenue (company-wide)	68%	92%	8.47
Step 3 - Incremental cost: Division A	38%	84%	55.68
Step 4 - Incremental cost: Division B	52%	84%	55.7
Step 5 - Opportunity cost: Division A	8%	28%	19.69

4.4. Reflections on Teaching Directors about Transfer Pricing

Most directors are novices to learning transfer pricing, and findings from this study using novice learners become applicable to teaching directors about transfer pricing. Consistent with Blaney et al. (2010), these findings led us to design a teaching format that isolated each information item about transfer pricing from lowest order to highest order, and to teach them sequentially. The interrelating of these information items then occurred progressively at higher order levels (Figure 1).

The post-intervention phase of the study attended to three areas: (i) conceptual difficulties were relieved by providing learners with, and guiding them with, a *transfer pricing workbook*, (ii) instructors understood the conceptual and procedural difficulties that learners have in learning transfer pricing, and learning was guided accordingly, and (iii) learners were encouraged to draw diagrams in order to visualise the text.

In adopting these interventions, the study replaced the problem-solving technique with the worked example technique (Chandler & Sweller, 1991). The problem-solving instructions presents learners with a description of the problem and a goal statement but does not provide adequate guidance about the procedures to solve the problem, leading to trial and error or means-solutions analysis strategies, although the learner may eventually find a solution. Worked examples provide learners with not only means-solutions analysis but also steps taken successively to solve the problem and achieve the solution state. Instructions that directs learners on studying worked examples reduces extraneous or ineffective cognitive load on the working memory which can enhance the learning through transfer of learning from working memory to long term memory (Spanjers, van Gog, & van Merrienboer, 2012).

As found in Phase 3, the teaching instruction should also add diagrams to show directors how to interrelate information items in transfer pricing. As found in this study, there are seven sequential instructional visual steps to follow in transfer pricing: 1. Drawing two boxes, one to represent Division A and the other Division B.   2. Drawing an arrow labelled "transfer price" from Division A to Division B, indicating that the transfer price between the divisions was yet to be determined. 3. Drawing a box around Division A and Division B together, to represent their relationship as divisions within the one company, recognising a need for goal congruence. 4. Drawing two boxes external to the company box, labelling the first box "External Market for Division A" and the other "External Market for Division B." 5. Drawing an arrow from Division A out to the external market for Division A and labelling the output with the market selling price. 6. Drawing an arrow from Division B out to the external market for Division B and labelling the output with the market selling price. 7. Drawing an arrow from the external market for Division A into Division B, labelled with the input price if Division B was forced to buy its input from the open market rather than by internal transfer from Division A.

4.5. Limitations and Future Research

In interpreting findings, there are three limitations to be acknowledged. First, it is neither claimed here that cognitive load theory is the only way to explain these results, nor contended that it explains all reasons behind the learning difficulties learners experienced. For instance, cognitive load theory does not consider the influences of psychological reasons such as student beliefs, expectations, and goals (Bannert, 2002). Willingness to invest time and effort in learning the task, and learners' views of achieving personal goals are also not considered here (Thrash & Elliott, 2001). Second, the improved learning outcomes are due to easing out conceptual difficulties, and students transforming the problem from text into visual. This study did not measure the contribution of each improvement-intervention measure

separately and this is a future research proposal. However, the learning difficulties identified in this study can help in improving teaching design to help learners learn complicated topics such as transfer pricing. These topics require learning lower-level and higher-level ideas and inter-relating them, to decrease the cognitive load in working memory. Third, the study randomly selected 25 students from among those who expressed interest in taking part in the study, but omitting those who did not express interest may have contributed to a selection bias. These limitations can be used for future research to deepen the understanding about learning a vital topic such as transfer pricing.

References

Bannert, M. (2002). Managing cognitive load, recent trends in cognitive load theory. *Learning and Instruction, 12*, 139–146.

Blayney, P., Kalyuga, S., & Sweller, J. (2010). Interactions between the isolated–interactive elements effect and levels of learner expertise: experimental evidence from an accountancy class. *Instructional Science, 38*(3), 277-287

Blayney, P., Kalyuga, S., & Sweller, J. (2016). The impact of complexity on the expertise reversal effect: experimental evidence from testing accounting students. *Educational Psychology, 36*, 1868-1885.

CAANZ (Chartered Accountants in Australia and New Zealand). (2016, June 24). *Financial literacy of directors survey results.* Retrieved from http://www.charteredaccountants.com.au/Industry-Topics/Reporting/News-and-guidance-on-regulatory-matters/News-and-updates/Financial-literacy-of-directors-survey-results.

Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction, 8*(4), 293-332.

Kahneman, D. (1973). *Attention and effort*. Englewood Cliffs, NJ: Prentice-Hall.

Langfield-Smith, K., Thorne, H., & Hilton, R. W. (2006). *Management accounting: Information for managing and creating value* (4th ed.). Sydney, Australia: McGraw-Hill.

Lee, H., Plass, J. J., & Homer, B. D. (2006). Optimizing cognitive load for learning from computer science simulations. *Journal of Educational Psychology, 98*, 902-913.

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on capacity for processing information. *Psychological Review, 63*, 81-97.

Moreno, R., & Park, B. (2010). Cognitive load theory: Historical development and relation to other theories (chapter one). In J. L. Plass, R. Moreno, & R. Brunken (Eds.), *Cognitive load theory.* New York, NY: Cambridge University Press.

Pollock, E., Chandler, P., & Sweller, J. (2002). Assimilating complex information. *Learning and Instruction, 12*, 61-86.

Power, B. (2012.) *Transfer pricing: Are borders meaningless?* Retrieved from http://www.charteredaccountants.com.au/News-Media/Charter/Charter-articles/Business-management/2012-09-Are-Borders-Meaningless.aspx.

Schneider, W., & Schiffrin, R. M. (1977). Controlled and automatic human information processing: 1. Detection, search, and attention. *Psychological Review, 84*, 1-66.

Sithole, S. T. M., Chandler, P., Abeysekera, I., & Paas, F. (2017). Benefits of guided self-management of attention on learning accounting. *Journal of Educational Psychology, 109*(2), 220-232. DOI:10.1037/edu0000127.

Spanjers, I. A. E., van Gog, T., & van Merrienboer, J. J. G. (2012). Segmentation of worked examples: Effects on cognitive load and learning. *Applied Cognitive Psychology, 26*, 352-358.

Sweller, J. (1994). Cognitive load theory, learning difficulty, and instructional design. *Learning and Instruction, 4*, 295-312.

Sweller, J., & Chandler, P. (1994). Why some material is difficult to learn. *Cognition and Instruction, 12*(3), 185-233.

Sweller, J., Ayers, P., & Kalyuga, S. (2011). *Cognitive load theory*. New York, NY: Springer.

Thrash, T., & Elliott, A. (2001). Delimiting and integrating achievement motive and goal constructs. In A. Efklides, J. Kuhl, & R. Sorrentino (Eds.), *Trends and prospects in motivation research* (pp.3–21). Boston, MA: Kluwer.

van Merrienboer, J., Kirschner, P. A., & Kester, L. (2003). Taking the load off a learner's mind: Instructional design for complex learning. *Educational Psychology, 38*, 5-13.

Appendix

Interview excerpts with and feedback from learners that led to diagnosing learning difficulties

Part A of the problem (before intervention)

Step 1 - Calculate selling price for Division A and Division B

A common error that students made was using the market price of $100 rather than calculating and using the selling price ($66) for Division A. The problem-question stated the correct selling price for Division A as standard manufacturing cost plus 10%. Most students failed to notice the text concerning standard manufacturing cost and did not use it to calculate the selling price, but instead used the numerically presented market value of $100. All students correctly identified the numerically stated selling price of $250. The following excerpt is from a student interview that typifies this procedural error:

Interviewer (I): Why did you use $100 as the selling price for Division A?

Student (S): Because it says so here (points to the page), unlimited quantities of fabric can be sold on the open market at $100.

I: So is this the transfer price from Division A to Division B?

S: Umm, yes, I think so. Well it is the selling price isn't it?

Step 2 - Calculate contribution margin

Students calculated the wrong contribution margin for three reasons: wrongly decided that selling price is the market price, wrongly calculated variable costs, or both of these. Students did not know what information items made up variable costs, and that led them to wrongly calculating the contribution margin (that is, selling price minus variable costs). The following interview excerpt typifies this error.

I: You have calculated manufacturing overhead as $10. How did you work that out?

S: Well it's here in the table, $10.

I: Why do you think it is marked with an asterisk?

S: (Student reads information underneath table). Oh. It is 50% fixed and 50% variable.

I: Does this information change your answer in any way?

S: Maybe (pause). I am not sure, it may be a trick. I don't know. (No change.)

Step 3 - Transfer price of Division A = Purchase price of Division B

Students who made errors did not know the meanings of absorption costing and variable costing. The errors here fell into three categories presenting the same underlying misconception. The first group of students correctly wrote the transfer price from Division A as $66, which is the selling price, but wrongly wrote the buying price for Division B as $100, which is the market price. The second group of students incorrectly wrote the transfer price from Division A which is $100, but correctly wrote the buying price for Division B as $66. The third group of students did not include any price as the transfer price from Division A. For example:

I: Have you included all of the variable costs in the Sportswear Division?

S: Yes, I think so.

I: What is that hat (^) next to the direct material price of $20 in the Sportswear Division?

S: (Reads footnote under table.) The direct material price does not include the transfer price. Does that mean we should add it to the direct material?

I: What do you think?

S: Now I think we should. Before, I thought it was already done.

Part B of the problem (before intervention)

An example of common student error in Part B:
Transfer price = Outlay cost + Opportunity cost
= ($25 + $25 + $5[1]) + ($100-55 - 0[2] - 15[3]) = $85.

Step 1 - Calculate outlay cost

The student has not removed the fixed manufacturing overhead from total manufacturing overhead. The student wrongly thought outlay cost includes all manufacturing overheads ($10), but it should only include variable manufacturing overheads ($5=$10*50%).

Step 2 - Calculate opportunity cost (no excess capacity)

The interviews provided more evidence that students did not know the meaning of excess capacity, and its association with opportunity cost. For example:

I: Why did you write zero for opportunity cost?

S: Because there is excess capacity. And excess capacity is zero opportunity cost.

I: That's correct, excess capacity is zero opportunity cost. What does excess capacity mean?

S: It is when the supplying division is full. In this question the fabric division [Division A] can sell unlimited quantities to the market and therefore has excess capacity.

Part C of the problem (before intervention)

Students have not removed the fixed cost portion from the total manufacturing overhead, which leads to wrong

calculating the extra cost of fabric [1]. The incremental costs in this problem are equal to the variable costs. The total variable costs in Division A should have been $55 (25 + 25 + 5 = 55) and not $60 (25 + 25 + 10 = 60). Students made the same error in calculating the incremental costs for Division B. These errors also arose in Part A and Part B, because students lacked understanding about variable costs and absorption costs.

Some students correctly included the transfer price of $85 as buying costs for Division B. The same students then took away $85 from Division A, as the transfer price. This error, shown as [2], is an example of the lack of understanding of the transfer pricing rule. (Please see step 3 for [3] explanation.)

Information item (element)	Amount ($)
Incremental revenue	200
Incremental cost of fabric (Division A)	60 [1]
Incremental cost of tracksuit (Division B)	85 [2]
Take away: Transfer price from Division A	85 [2]
Take away: Opportunity costs (Division A)	0 [3]
Incremental profit to the firm	0

Step 2 - Incremental Revenue: Firm-wide
Some students could not evaluate that making use of the excess capacity in Division B can increase profits for the firm. The following interview excerpt typifies this faulty thinking.
I: Why have you decided to reject the special order?
S: Because, $200 per tracksuit is less than the normal selling price of $250, so they must be losing on that.

I: Who do you think is actually losing, Division A, Division B, or the company as a whole?
S: Umm. I'm not sure, I think it is Division B, oh and maybe um the company as a whole.
I: How could you check your answer?
S: (Long pause). I'm not really sure.

Step 3 - Incremental Cost: Division A
This is consistent with errors in Parts A and $B,$ where students did not remove the fixed part from the manufacturing overhead because of lack of understanding of variable costing, shown in error [3]. The incremental costs in this example are equal to the variable costs. The total variable costs in Division A should have been $55 (25 + 25 + 5 = 55) and not $60 (25 + 25 + 10 = 60).

Step 4 - Incremental Cost: Division B
The variable costing method correctly calculates the cost increase as $85 in producing tracksuits in Division A (see Part A). It is direct material ($20), direct labour ($55), and the variable manufacturing overhead ($10). Forty percent of students answered $100, having included the fixed part of the manufacturing overhead ($15), and using the absorption cost method.

Step 5 - Opportunity Cost: Division A
Twenty-three of the 25 students in the sample omitted the opportunity cost of $30 to Division A, and the firm as a whole as shown in error [3]. Many students got it wrong because they could not interrelate ideas learned at a higher-order level simultaneously.