

## Chapter 5

### Conclusions and recommendations

#### 5.1 Introduction

Because of the introduction of Outcomes Based Education in South Africa, learners have been required to make a change from a teacher-centred learning environment to a learner-centred learning environment. The researcher's observations of a select group of learners in classroom situations indicated that learners do not *automatically* reap the benefits of learner-centred education. This study attempts to identify the factors that should be kept in mind when making the transition so that learners can reap the benefits of learner-centred learning.

The researcher engaged in a case study of one specific group of learners and observed their reactions to the transition from a teacher-centred to a learner-centred model of learning.

In order to identify the factors that influence the learners' performance in the learner-centred computer-rich learning environment, the researcher used the factors of learner-centred learning as described by the APA as a framework.

These factors are:

- cognitive and meta-cognitive factors of learner-centred learning
- affective and motivational factors of learner-centred learning
- social and developmental factors of learner-centred learning
- individual factors of learner-centred learning

Chapter 1 seeks to provide a framework for the study. It attempts to place the research in context, and discusses the background, rationale and research methodology. In chapter 1, research questions are also defined and the limitations of the study are noted.

Chapter 2 of this study examines the available literature with a view to providing a theoretical background and highlighting the tools that the literature suggests for discussing classroom events.

Chapter 3 describes the classroom events. These comprise (for the purposes of this study) the reactions of learners to the transition to a learner-centred learning environment.

The researcher provides an analysis of these classroom events in chapter 4. The issues that relate to assessment and the planning of the learning events, as well as the reactions and performance of the learners in a more learner-centred learning environment, are discussed within the framework provided by the factors of learner-centred learning as they are defined by the APA.

This chapter will endeavour to answer the research questions that the researcher formulated in chapter 1. The chapter will also include a summary of the research and a discussion of the results which will highlight what has been learned from the research and what recommendations might be made for further research and practical adjustments. The discussion is structured in terms of the framework provided by the APA's principles of learner-centred learning.

## **5.2 Summary of the research**

Since most learners in South African High Schools need to make the transition from a teacher-centred to a learner-centred learning environment, information about those features of learner-centred learning that influence a learner's transition would prove valuable to both teachers and planners of the curriculum. As has been noted, the research questions were based on the principles of learner-centred learning as identified by the APA ( Lambert & McCombs, 1998).

The research questions that the researcher asked are set out in the table below:

Table 5.1: Research questions: the main research question and sub-questions

<p><b>The main research question:</b></p> <p>What factors of learner-centred learning – as identified by the APA (American Psychological Association) – should be taken into consideration if learners are to make a successful transition when they move into to a more learner-centred learning environment?</p>			
<p><b>Factors of learner-centred learning under investigation: sub-questions and component elements of sub-questions</b></p>	<p><b>Cognitive and metacognitive factors</b></p>	<p>What cognitive and metacognitive factors should be taken into consideration?</p>	<p>How did the cognitive and metacognitive factors of learner-centred learning affect the learners' performance in the learner-centred classroom?</p>
	<p><b>Affective and motivational factors</b></p>	<ol style="list-style-type: none"> <li>1. What affective and motivational factors should be taken into consideration?</li> <li>2. Which factors should be kept in mind when designing projects for use in the learning-centred classroom?</li> </ol>	<ol style="list-style-type: none"> <li>a. How did the intrinsic motivational factors affect the learners' performance in the learner-centred classroom?</li> <li>b. How did the extrinsic motivation factors influence the learners' performance in the learner-centred classroom?</li> </ol>
	<p><b>Developmental and social factors</b></p>	<p>What aspects of developmental and social factors need to be considered?</p>	<p>How did these factors influence the learners' readiness to learn in a more learner-centred learning environment?</p>

	<p><b>Individual difference factors</b></p>	<p>What aspects of individual difference need to be considered?</p>	<ul style="list-style-type: none"> <li>a. To what extent do individual approaches influence the learners' readiness to learn in a more learner-centred learning environment?</li> <li>b. Is there a difference between the reactions of boys and girls to the transition to a more learner-centred learning environment?</li> <li>c. Does the language of tuition affect learner reaction to the transition to a learner-centred learning environment?</li> <li>d. Does the level at which learners are studying Computer Studies (as a school subject) influence the learners' transition to a learner-centred learning environment?</li> </ul>
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The researcher's case study followed the reactions of one group of learners to the transition from a teacher-centred to a learner-centred computer-rich class environment. Learners were required to complete three types of projects. These projects reflected different levels of learner-centredness. The researcher collected the data in three main ways: (1) participant observation, (2) interviews and focus-group discussions, and (3) the analysis of the assessment results on the projects.

A literature review provided the theoretical background for the study as well as a tool that the researcher could use to analyse the classroom events and

assessment results. The events in the classroom were analysed in terms of a structure extrapolated from the literature review, and considered (in turn) the cognitive and meta-cognitive, affective and motivational, social and developmental and individual factors of learner-centred learning.

Table 5.2 below summarises the research questions and the resultant answers to those questions collected and processed by the researcher.

Table 5.2: The sub-questions answered: a summary

<p><b>APA factors of learner-centred learning</b></p>	<p><b>Sub-questions implied by the APA factors can be reduced to the following areas of concern:</b></p>	<p><b>Answers to such implicit sub-questions are contained in the following statements that have been assembled as a result of the research:</b></p>
<p><b>Cognitive and meta-cognitive factors of learner-centred learning</b></p>	<p>Planning, analysing and forming strategies</p>	<ul style="list-style-type: none"> <li>• Learners need guidance to plan projects.</li> <li>• Being positive about a project and seeing it as a challenge facilitates the ability to plan a project.</li> <li>• Learners who cannot plan the project are frustrated about and uncertain of their abilities.</li> <li>• Anxiety about recalling prior learning does not prevent a learner from attaining skills.</li> <li>• Being in different to the skills needed to complete a project may prevent a learner from mastering those skills needed to solve a problem.</li> </ul>
	<p>Monitoring, self-reflection, taking ownership and validation of the learning</p>	<ul style="list-style-type: none"> <li>• Learners' reflection on how significant the project is to learning influences the likelihood of a satisfactory completion of the projects occurring.</li> <li>• Learners' views about how relevant the topic is to them personally does not affect the outcomes.</li> </ul>

<p><b>Affective and emotional factors of learner-centred learning</b> (continued on following page)</p>	<p>Intrinsic motivation</p>	<ul style="list-style-type: none"> <li>• If learners perceive that a project is to some degree personally relevant to themselves, they will complete a project.</li> <li>• Learners who perceive that a project is not personally relevant to themselves are unlikely to complete the project.</li> <li>• Anxiety about personal ability to complete the project does not hamper learning.</li> <li>• The discrepancy between expectation and reality undermines intrinsic motivation.</li> </ul>
	<p>Extrinsic motivation</p>	<ul style="list-style-type: none"> <li>• High-stakes examinations and year-end results undermine a learner's intrinsic motivation to complete the project.</li> </ul>
<p><b>Developmental and social factors</b></p>	<p>Self-authorship</p>	<ul style="list-style-type: none"> <li>• Development of self-authorship facilitates learner-centred learning.</li> <li>• The project and the level of the learners' development must be compatible.</li> </ul>
	<p>Cooperative learning</p>	<ul style="list-style-type: none"> <li>• Cooperative learning must be "managed" if it is to be successful.</li> <li>• Learners must learn to cope in cooperative learning situations.</li> </ul>
	<p>Social environment</p>	<ul style="list-style-type: none"> <li>• Learners learn to use the social factors of a class situations to solve problems.</li> </ul>
<p><b>Factors of individual difference</b></p>	<p>Individual approaches</p>	<ul style="list-style-type: none"> <li>• Individual choices made by the learners influence their performance in a learner-centred class.</li> </ul>

	Gender	<ul style="list-style-type: none"> <li>• Girls are more likely to express anxiety.</li> <li>• Gender does not influence a learner's performance in the projects.</li> </ul>
	Language	<ul style="list-style-type: none"> <li>• Language does not influence the learners' transition to a more learner-centred learning environment .</li> </ul>
	Level at which the subject Computer Studies is taken (HG or SG)	<ul style="list-style-type: none"> <li>• Learners who take Computer Studies as a subject on the higher grade are more likely to perform well in the learner-centred learning environment.</li> </ul>

### 5.3 The lessons learned from the research

In this discussion of the lessons learned from the research the following structure is used: (1) The lessons learned from each research question and sub-question are described; (2) This is followed by a discussion of the methods used and the results obtained (when compared to other research results), and (3) the contribution that they make to the body of knowledge we have about the transition from a teacher-centred to a learner-centred learning environment. Since the research methodology was discussed in detail in chapter 1, this discussion focuses on the shortcomings of the data collection methods for each research question.

#### 5.3.1 What elements of the cognitive and meta-cognitive factors of learner-centred learning should be considered when making the transition to a learner-centred learning environment?

The following factors were identified as having influenced the progress of the learners in a more learner-centred computer-rich learning environment:

- a. The learners had never before attempted to vocalise an assessment of their own work, nor had learners ever talked about how they learn. Some learners responded well to discussions that aimed at making them think about their own learning processes. There wasn't much evidence to suggest that learners were beginning to use this

knowledge to learn more efficiently. The learners only considered the way in which they were learning.

- b. Learners seemed to be conditioned to seeing the total assessment of their work in the form of *marks* received at the end of an assessment. For this reason, they were not interested in learning for the sake of learning, and they did not seem to regard their own assessment of their work as important. Marks were regarded as definitively important. Because learners did not think that their own assessment of their progress was at all important, they did not want to spend any time on it.
- c. Learners performed better on the class projects than on the FutureKids and CASS projects. This indicates that learners do not automatically have the skills to plan and structure the content of the projects. Learners who are used to working in a more instructivist computer-rich environment may need much more guidance if they are to learn how to plan and structure the learning events for themselves.
- d. Some learners were more able to plan their projects and identify what was needed to solve their problems and use appropriate strategies to solve the problems. These learners had the following in common:
  - They saw the project as a challenge.
  - They liked applying their skills in a way that they could control.
- e. The learners who had problems in this area had the following in common:
  - They expressed feelings of frustration and uncertainty.
  - They asked the teacher to take over the planning, and they wanted the teacher to provide the strategies they needed to solve the problem.
  - They expressed the opinion that it is the teacher's job to do the planning and devise the strategies to solve the problem.
- f. The recall of prior learning is a way in which learners can analyse their skills in relation to the problem. The concept of the recall of prior learning was initially greeted by three attitudes:
  - They were happy to confirm that they had the skills they needed.

- They were anxious because they had not yet mastered the skills properly.
  - They were blasé and indifferent, and felt that it was a waste of time to make sure that they had the skills they needed.
- g. Learners who were happy to revise could generally apply the skills. Learners who were anxious about their skills learned the skills needed. Learners who were blasé and indifferent could either show that they had indeed mastered the skills or had problems completing the project because they lacked skills.
- h. The projects made different demands on learners.
- The projects that were low in intrinsic motivation did not need a great deal of planning from the learners.
  - The CASS project and FutureKids Project needed a great deal of planning and strategising from learners.
- i. Monitoring their own progress on a project required self-reflection.
- Learners had not reflected on their own learning before.
  - Learners had very different views about whether or not they were learning by doing the projects. These views ranged from the view that they had learned a great deal to the view that they had learned nothing.
  - Learners who felt that they had learned nothing were most likely not to complete the projects.
  - Learners who felt that they had learned a great deal by doing the projects completed it on a satisfactory level.
  - The results of the assessment show that learners who felt that the projects had no personal relevance for them were less likely to complete the projects.
  - It was evident from the fact that they asked the teacher to solve their problems and prescribe content that some learners had not adopted adequate ownership of their work.

### **5.3.1.1 Discussion of the methodology used in this study to answer the question asked in section 3.1**

When considering the answers to the questions noted above, certain implications of data collection methods are discussed.

Learners were not assessed in terms of their levels of skill and knowledge prior to the study. The researcher made the assumption that they were all on more or less the same level because they were all in the same academic class at school. The influence of learners' prior knowledge on their performance in the learner-centred classroom was not controlled.

The prior experience of the learners that may have influenced their approach to problems was not taken into account. It is not clear whether the learners' inability to plan was the cause or the effect of the frustration and anxiety that they expressed.

Being unconcerned about analysing the skills that they needed for the task could indicate that the learners concerned had mastered the skills and knowledge they needed – and that they were bored by being asked to revise skills they had mastered or else that they did not know whether they had mastered the skills or not. No attempt was made in this study to determine whether or not learners had reflected on their skills prior to recalling the skills they needed, and the reaction of the learners is therefore not adequately explained.

Focus group discussions with learners was the only method that the researcher used to determine the degree of learner self-reflection. Additional data-gathering on this topic might yield more information about whether learners are indeed thinking of their learning – and not just verbalising their thoughts. Additional information could also point to ways in which learners might be stimulated to consider their learning and thinking processes.

### **5.3.1.2 Comparing the results to those found in the literature review**

A study of the literature indicates that the personal relevance of knowledge to a learner is important for effective learning (Lambert & McCombs, 1998).

Although this study also indicates that the personal relevance to the learner is important, it is interesting that none of the learners found the topics very relevant. Of the 12 learners who indicated that they had not found the topics relevant at all, 8 completed the projects satisfactorily.

Learners are not used to reflect on their own learning or to take responsibility for how and how much they learn. Some learners seemed very reluctant to take responsibility for this and remained unresponsive to any suggestions that they could do so: they felt that how and how much they learned was the teacher's responsibility. This concurs with Teel and De Bruin-Parecki's (2001) statement that learners may be reluctant to accept changes because they have a specific view of the role of the teacher and already feel comfortable with the way in which they have come to believe that the learning environment should operate.

### **5.3.1.3 What have we learned about the cognitive and meta-cognitive factors of learner-centred learning?**

The following factors of cognitive and meta-cognitive factors of learner-centred learning should be kept in mind when learners make the transition to a learner-centred learning environment:

- Learners will need facilitation from the teacher to reflect on their own learning.
- Learners need to learn how to successfully plan and strategise in order to complete projects.
- The incongruence between the learners expectation of the learning situation and the reality of it may cause frustration and anxiety. This may hamper the learners' performance.

### **5.3.2 What are the factors in the affective and motivational elements of learner-centred learning that should be taken into consideration?**

To answer this research question, two sub-questions were considered. They are:

- a. How did the intrinsic motivation factors affect the performance of the learner when making the transition to a learner-centred classroom?
- b. How did the extrinsic motivation factors influence the learners' performance in the learner-centred classroom?

The researcher identified the following factors:

- Learners made the most effort to complete the projects that were the least intrinsically motivating.
- The average performance on the different types of projects indicates that learners performed better on the projects requiring low intrinsic motivation.

**(1) Anxiety**

- Four out of 7 learner who never expressed anxiety completed the projects successfully, while 3 learners who never expressed anxiety did not complete the projects.
- Most learners who did express anxiety completed the projects successfully.
- Two learners expressed anxiety very frequently. One of these learners completed the projects successfully while the other did not.
- Anxiety did not seem to be a predictor of the outcome of the learning.

**(2) Expectations**

- Learners quite frequently expressed expectations that differed from the reality of the class events.

**(3) Relevance**

- None of the learners in this group thought that the projects were personally very relevant.
- Learners who did not see any personal relevance to the projects were less likely to complete the intrinsically motivating projects.
- Learners who perceived some degree of personal relevance completed most of the projects
- Learners performed better and completed the extrinsically motivated projects more often than the intrinsically motivating projects.

### **5.3.2.1 Discussion of the research methodology used to provide the answer to the research question**

The determination of the learners' levels of anxiety, personal relevance and expectation was based on focus group discussions and the observations of the participant observer. Asking the learners to complete questionnaires might yield more detailed data that could be useful for ascertaining levels of anxiety, personal relevance and expectations. This might yield more information about the way in which learners' performance in a learner-centred learning environment is affected by these factors.

Although there was an almost equal chance that learners who did not express anxiety would complete the projects as those who did not complete the project, the number of students in this study is too small to determine the significance of this result. Learners may also have been anxious without verbalising their feelings. Adding a data gathering method that would yield data about the feelings of anxiety without requiring that it be verbalised might show that learners were more (or less) anxious than might be assumed. This study did not attempt to measure the anxiety of the learner in any way other than from the learners' expressions of anxiety.

### **5.3.2.2 Discussion of the answers to the research question in the light of the literature review**

According to the literature, intrinsic motivation is preferable to extrinsic motivation (Mwamwenda, 1994). Motivation can be measured as *effort* (Small, 1997). The motivation to complete tasks adequately was measured in terms of the *observed effort* expended on the projects.

The learners in this study showed a better performance on the least learner-centred projects. These findings are not what was expected. The literature indicates that learners should be spending more time and effort on intrinsically motivating tasks (Malone, 1981), and that intrinsic motivation is superior to extrinsic motivation (Mwamwenda, 1994). Lumsden (1994), however, points out that extrinsic motivation may erode intrinsic motivation. Other factors that can undermine intrinsic motivation include: personal relevance of what the learner is learning (OLTC, 1996, Ginsberg &

Wlodkowski, 2000, Malone, 1981); feelings of vulnerability and anxiety (Ginsberg & Wlodkowski, 2000, OLTC, 1996); expectations (Teel & De Bruin-Parecki, 2001); and extrinsic motivation.

The two factors that can undermine intrinsic motivation and that played a strong role in this class would be the discrepancy between the expectation of class routine and the teacher's behaviour (on the one hand) and the reality of these factors (on the other), as well as the fact that the results of the least intrinsically motivated projects counted for marks toward the results of a very high stakes year.

### **5.3.2.3 What have we learned about the influence of affective and motivational factors of learner-centred learning on this group?**

The following factors that influence the motivational and affective factors of learner-centred learning should be kept in mind:

- The learners' view of the relevance of the projects was an indicator of performance.
- The discrepancy between the learners' expectation and the reality of the classroom situation may hinder the transition.
- The emphasis on extrinsic motivation erodes intrinsic motivation.
- The expression of anxiety about the ability to complete the projects did not indicate the eventual performance on the projects.

### **5.3.3 What developmental and social factors should be considered?**

To answer the question above, the following sub-question is considered:

#### **5.3.3.1 How did the developmental and social factors influence the learners' readiness to learn in a more learner-centred learning environment**

- Learners' concern that the content of the projects be "correct" indicates that self-authorship was not yet well developed.
- Learners' difficulties in planning and strategising for the learner-centred projects as well as their yearning for "the way things were" (ways that did not require them to plan and strategise), may indicate

that the projects and the learners' developmental levels were insufficiently compatible.

- Learners did not manage to work well in a cooperative learning situation.
- Learners learned to use the social situation in the class as a resource after some months had elapsed.

### **5.3.3.2 Discussion of the research methodology used to answer this question**

The developmental levels of the learners were not measured. Questionnaires and other data-gathering methods to measure the developmental level of the learners might yield data that would assist the teacher in planning a project that would appeal more to the learners because it would then be based on the developmental level of the learner.

Cooperative learning was not successful in this study. The teacher did not control the division into groups in this instance. This factor may have influenced learner performance. Too little time was spent on the group project in class time and the poor outcomes of some groups may be the result of having too little time together to work as a coherent group.

### **5.3.3.3 Discussion of the answers to the research questions in the light of the literature review**

Baxter Magolda (1999) stressed the importance of the development of self-authorship for successful learning. The conclusion about the developmental levels of the learners and the requirements of the project point to the importance of this factor.

Potgieter and Cronjé (1998) concluded that learners must learn how to cope in cooperative learning situations. This may explain the poor performance of the learners in the cooperative learning situations because this was the first time that learners had encountered this kind of learning in groups like these.

#### **5.3.3.4 What have we learned about the effect of developmental and social factors of learner-centred learning?**

- The development of self-authorship facilitates learner-centred learning.
- The project and the level of the learners' development must be compatible.
- Cooperative learning must be managed to be successful.
- Learners must learn to cope in cooperative learning situations.
- Learners learn to use the social factors of the class situation to solve problems in the learning tasks.

#### **5.3.4 What are the individual factors that should be considered?**

Sub-questions attempting to identify the way in which the following individual factors influenced the performance of the learners are discussed:

- Individual approach to the projects
- Gender
- Language of tuition
  - The level at which the learners took the subject Computer Studies (HG or SG)

#### **(1) To what extent do individual approaches influence the learners' readiness to learn in a more learner-centred learning environment?**

- Choices made by the learner, as well as perseverance, are expressed as *effort* in this study. The individual performance and the effort expended show a pattern of concurrence.

#### **(2) Is there a difference in the reaction of boys and girls to the transition to a more learner-centred learning environment?**

- Girls were more likely to express anxiety about their ability to complete the projects
- The performance of the projects was not influenced by gender.

#### **(3) Does language affect the learners reaction to the transition to a learner-centred learning environment?**

- The language of instruction of the learners was not an indicator of performance on the projects.

**(4) Does the level (HG or SG) on which the learners take the subject Computer Studies influence the learners transition to a learner-centred learning environment?**

- The level on which learners studied Computer Studies was an indicator of the outcome of the projects because all learners who were taking Computer Studies on the higher grade performed well in all the projects.

**5.3.4.1 Discussion of the answers listed above in the light of the research methodology used to answer this question**

The learners' approach to solving the problem presented by the projects in terms of their learning style was not taken into account. Although observations made in the class identified certain approaches, it may be very useful to classify the different approaches formally.

Although gender and language did not seem to influence the learners' reaction to the transition to the learner-centred learning environment, the study was too small to make a definite conclusion in this regard.

Since learners who were taking Computer Studies on the higher grade performed well in all areas for reasons that are not adequately explained, more data is needed to determine the importance of this factor. Factors that may explain this phenomenon could include the approach to the projects, the level of these learners' skills prior to the study, as well as their level of development of self-authorship. More data collected by means of questionnaires and other data gathering methods is needed to provide adequate insight into why these learners performed better. As this group is particularly small, this finding may not be accurate.

**5.3.4.2 Discussion of the answers to the research questions in the light of the literature review**

The literature indicates that specific approaches to learning tasks as well as individual learning styles play a role in effective learning (Kearsly 1998, Blackmore, 1996). Sensitivity towards the learners' divergent backgrounds,

cultures and experiences facilitates effective learning (Baxter Magolda, 1998). The answers to the research question under discussion concur with the view of the literature.

The literature does not provide us with any direct clues about why the performance of the learners on the higher grade is better. Prior experience and the level of their skill and knowledge before the projects started may provide the necessary clues.

#### **5.3.4.3 What have we learned about the effect of the individual factors of learner-centred learning in this study?**

- Individual choices made by the learners influence the performance in class.
- Girls are more likely than boys to express anxiety.
- Gender does not influence the learners' performance in class.
- The language of tuition does not influence the learners' performance in the learner-centred learning environment.
- Learners who take Computer Studies on the higher grade are more likely to perform well in a learner-centred learning environment.

### **5.4 Recommendations**

#### **5.4.1 Recommendations for policy and practice**

The factors of learner-centred learning as discussed in the previous part of this chapter have been identified as having an effect on the performance of learners in a more learner-centred learning environment when the transition is being made to a more learner-centred learning environment. Some guidelines for making the transition to a more learner-centred learning environment easier for the learner and for facilitating effective learning can be derived from these findings. They are the following:

- Learners must be guided when making the transition to a more learner-centred learning environment.
- Teachers should pay attention to the learners' abilities to plan and form strategies when they approach a problem. Some assistance in the planning of projects may be needed. A part of the project could

include formal planning that would facilitate the process of learning by solving problems presented in a project.

- Learners are not used to communicating what they think about their own learning. Many learners do not take self-reflection on their learning seriously. Planning a project to include self-reflection and providing guidelines for self-reflection, as well as showing learners that self-reflection should be taken seriously, may also help to develop this capacity.
- Learners need to take ownership of their work. Teachers can consider various methods in which to encourage ownership.
- As the projects count toward the high-stakes examination at the end of the year, intrinsic motivation is eroded. Teachers and policy makers should consider this and plan for ways to diminish the effect of this extrinsic motivation on the learners. Strengthening the factors that promote learner-centred learning and intrinsic motivation may help to diminish the effects of the extrinsic motivation.
- The development of self-authorship needs attention. With the transition to learner-centred learning, this factor needs to be developed consciously.
- Putting learners into groups does not mean that cooperative learning will take place. The careful planning and management of cooperative learning needs attention. Learners and teachers need to learn how to work effectively in a cooperative learning situation. More training for teachers and learners should help the process

#### **5.4.2 Recommendations for further study**

With the identification of the factors that influence learners' abilities to learn in a learner-centred learning environment, it becomes clear that not enough is known about the dynamics of these factors, nor about how to promote the positive factors or how to diminish the effects of the negative factors.

The following suggestions for further research may be indicated:

- As the development of self-authorship has been identified as a factor that influences learners' performances in a class on an individual,

cognitive, social and affective/motivational level, more research is needed on how to facilitate this development in a South African context.

- Further research on the planning of projects and the preparation of projects to promote intrinsic motivation and effective learning is needed.
- Further research to facilitate the development of meta-cognitive factors is needed. Learners do not know how to plan and devise strategies for solutions to problems presented as projects. The learners also do not take self-reflection seriously and do not apply what they know about how they learn to their learning. Research on this factor and the development of a plan to assist learners in the development of effective meta-cognitive activities are needed.