Multimedia-Based Professional Development:
Striving Towards Self-Directed Learning

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Abstract

Teachers in South Africa have to cope with new challenges in their teaching careers daily. Information Technology (IT) teachers are challenged even further with the regular changes brought about regarding the programming language taught. The only way teachers are able to keep up with these changes is by being committed and in doing so applying the principles of self-directed learning (SDL). In this article, a multimedia-based professional development programme is proposed as a possible tool for promoting SDL. Three IT teachers completed the programme and commented on the overall value of the programme. From the data gathered in the interviews and reflective journals given to teachers, it was gathered that teachers’ SDL could be promoted by using multimedia-based professional development.

Keywords: Professional development, Multimedia, teacher training, self-directed learning, Information Technology teachers.

Introduction

In 2012, the Curriculum and Assessment Policy Statement (CAPS) was introduced in South Africa (Department of Basic Education, 2012). With this change, teachers were faced with the implementation of a new programming language for Grade 10 learners called Scratch. Teachers had not been introduced to this software previously and therefore were challenged to acquire the necessary knowledge and skills to teach the new programming language. Even though once-off training sessions were provided by the Department of Basic Education, teachers could not rely on this training only to become competent in teaching the new programming language. Bowker et al. (2009: 20) confirmed that this type of professional development did not cater for teachers’ needs; therefore, teachers still lacked sufficient knowledge and skills to teach the new programming language. As self-directed learners, teachers needed support and encouragement to take responsibility for their own learning in order to implement the new programming language successfully. To support teachers in their endeavour to tackle the challenge facing them, we proposed a multimedia-based professional development programme (MMPDP) to IT teachers. This MMPDP was provided in the form of a DVD as IT teachers do not all have a computer with adequate software at home, but they all, however, have a DVD player at home making it possible for them to complete the professional development programme at any time that suits them – at home or at work.

The research question for this article was: To which extent, if any, does the proposed multimedia-based professional development programme (MMPDP) promote self-directed learning (SDL)?
Theoretical framework

Guglielmino and Long (2011) note that SDL is the ability and skill to manage all learning situations of life. Dynan et al. (2008) argue that SDL forms the basis of lifelong learning. Self-directed learners are willing to take responsibility for their own learning. Malcolm Knowles (1975: 18), the most widely quoted researcher in SDL defines SDL as a process where individuals:

- take initiative in diagnosing their learning needs;
- formulate their learning goals;
- identify human and material resources for learning;
- choose and implement appropriate learning styles; and
- evaluate their learning outcomes.

As these characteristics, as described by Knowles (1975), are widely accepted as the basis of SDL, it will be accepted as the definition of SDL for this article.

Professional development can be defined as an on-going process (Pillay, 2011: 353; Rage, 2006: 8), which provides an opportunity for any professional (like teachers) to acquire the necessary knowledge and skills (Chikoko, 2008: 75) to develop themselves holistically and to improve their work practice positively (Blazer, 2005: 1). An effective professional development programme should eventually create lifelong self-directed learners (Helterbran, 2005). In the development of such a programme for teachers, specific steps should therefore be taken to support the teachers to manage their own learning. King (2002) notes that professional development should include reflection, facilitation, lifelong learning skills and proper use of resources, all of which Guglielmino and Long (2011) and Knowles (1975) connect to SDL.

Kennedy (2005: 236-237) explains that several professional development models exist, of which the traditional training model (most popularly used) is but one option. The transformative model for the implementation of professional development is guided by the constructivist approach to learning (Dickerson et al., 2007) and therefore creates an opportunity for teachers to construct their own knowledge rather than memorising what is taught. Furthermore, the transformative model describes professional development as a process focused on developing teachers holistically (Kennedy, 2005), which implies that it is suitable for lifelong learning, a term very closely connected to SDL (Dynan et al., 2008).

The incorporation of multimedia into a model for professional development has, according to Thibeault (2004), the advantage that teachers can actively engage in learning activities and in doing so construct their own knowledge. Multimedia refers to the use of various media like text, audio and
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Mayer (2001: 184) notes that seven specific design principles need to be included when using multimedia in an education setting. These principles are developed in such a manner that the incorporation of multimedia in a teaching/learning setting improves learning (Mayer, 2001). These principles will briefly be discussed in the section focused on the specific development of our proposed professional development programme.

According to Galvis (2004), multimedia-based professional development has become the new way of implementing teachers’ professional development. Incorporating multimedia in learning hold the following advantages:

- learning activities can be scheduled anytime due to the accessibility of multimedia DVD (Shihong et al., 2008);
- multimedia allows active learning (Thibeault, 2004);
- different learning styles are accommodated (Allison, 2007);
- professional development can be made possible to teachers in rural areas (Cauble and Dinkel, 2002); and
- it saves costs normally incurred during professional development (Fisher et al., 2010) as teachers do not have to travel to workshop venues, and costs for making a multimedia-based professional development programme are less than those for hosting a face-to-face professional development programme.

In their study on the Teaching and Learning International Survey (TALIS) dataset on teacher professional development, Scheerens et al. (2010) found that teachers’ professional development needed to infuse lifelong learning. Furthermore, they found that teachers from rural areas are in need of professional development that includes multimedia aspects.

Several researchers (Marx et al., 1998; Maor, 2000; Vrasidas & Zembylas, 2004) have investigated multimedia-based professional development by means of online distance instruction. Studying two online multimedia-based professional development programmes (STAR Online and TLO platform), Vrasidas and Zembylas (2004) found that these proved to be successful professional development programmes; however, they also noted that careful attention should be given to how these professional development programmes are designed. Some of the aspects they highlight as being important when designing multimedia-based, online professional development programmes is that teachers should be encouraged to take ownership and responsibility in the learning community. Furthermore, they noted that self-reflection during the professional development programme should also be encouraged (Vrasidas & Zembylas, 2004). Although online professional development, which incorporates multimedia, is shown to be successful (Vrasidas & Zembylas, 2004), the question remains as to whether this is viable in the South African context where teachers do not always have
access to the internet and therefore cannot access online professional development programmes regularly.

In South Africa, traditional in-service training for the professional development of teachers is mainly used. There are few examples of multimedia-based professional development programmes. One example, the Shoma project, implementing a multimedia approach to professional development of teachers, proved to be successful. However, teachers from this project still complained that the training was not accessible to all as they had to travel to a Shoma centre and the costs incurred by either the Department of Education or the school to have teachers attend these programmes were quite high (Capper, 2002: 48).

In the current study, we incorporated multimedia into a transformative model of professional development in the form of a DVD, accessible to teachers at any place and time. The development of the professional development programme will subsequently be discussed.

**Developing a Multimedia-Based Professional Development Programme**

When designing the professional development programme for teachers, attention was given to certain aspects which proved to have an influence on the success of a professional development programme (Bailey, 2013). These aspects will be discussed in the next section.

**Mode of delivery**

Professional development can occur in either the face-to-face mode of delivery or the distance mode of delivery (Johnson & Steven, 2003; Smith & Kritsonis, 2006). In South African context, teachers expressed a discomfort with the face-to-face mode of delivery as it implied that they were expected to travel to training centres, leave their learners without a teacher and spend some days away from home (Conco, 2004). To address this concern, it was decided to make use of the distance mode of delivery rather than the face-to-face mode of delivery.

The distance mode of delivery can be applied either by means of online instruction (Wang & Sun, 2000; Johnson & Steven, 2003), compact disc (CD)/digital versatile disc (DVD) read-only memory (ROM) as described by Syed et al. (2004) or DVD (De Sousa, 2008). By making use of a DVD, teachers were able to complete the professional development programme either at home or at school, at a time and pace that suited them. Another reason for using a DVD format instead of working online or using a CD/DVD ROM is the fact that not all teachers possess the necessary equipment or software; however, DVD players are very commonly found in most households and if teachers do not have a DVD player, a portable DVD player can be purchased at a very low cost (De Sousa, 2008).
Another advantage of DVDs is the possibility of incorporating multimedia in the professional development programme (Bailey, 2013).

**Design**

The incorporation of multimedia in the professional development DVD implies that learning is taken to a higher and more accessible level. During the development of the professional development DVD, the seven design principles of Mayer (2001) were incorporated. The following screenshots illustrate how these principles were addressed.

**Dual-channel design principle**

The dual-channel design principle refers to the question whether individuals (in teacher professional development) learn better when confronted with words and pictures used together than when they are confronted with words alone (Fletcher & Tobias, 2005: 117; Mayer, 2001: 63).

The dual-channel design principle was incorporated by ensuring that words (narration) and pictures (illustrations) were used simultaneously as much as possible. Screenshot 1 illustrates that the narrator explains the area where the mouse is pointing while it is shown on the screen.
Spatial contiguity design principle
Noting that individuals learn better when words and pictures that are related are displayed closely together on one page denotes the spatial contiguity principle (Mayer, 2001: 81). The spatial contiguity principle addresses the issue of cognitive overload as it reduces the load (Lam, 2007: 3).

Screenshots 2 and 3 illustrate how examples are shown on one screen and in the following screen, the explanation is illustrated.
Temporal contiguity design principle

According to Mayer (2001: 96), the temporal contiguity principle refers to whether individuals learn better when words and pictures are shown simultaneously or when shown successively.

In Screenshot 4, the text is shown accompanied by narration of what is displayed on the screen in order to comply with the temporal contiguity design principle.

Coherence design principle

Overloading individuals with irrelevant material could counteract learning, and thus the coherence principle considers how a student’s learning can be damaged by including irrelevant words and pictures in the multimedia presentation (Mayer, 2001: 113).

The DVD is designed in such a manner that only the necessary pictures and words are used. Screenshot 5 illustrates how no additional animation is incorporated unnecessarily.
Modality design principle
The modality design principle refers to whether animation should be used in conjunction with on-screen text or narration (Mayer, 2001: 134). Animations stimulate the visual channel and thus it is argued that adding on-screen text to the animation will overload the visual channel.

The narrator explains what is illustrated while animation is taking place (see Screenshots 4 and 5).

Redundancy design principle
Mayer (2001: 147) describes the redundancy design principle as the principle that tests whether individuals learn better from a combination of animation and narration than from a combination of animation, narration and on-screen text. Individuals have different learning styles and even though on-screen text might be discussed as accommodating learners with a preference to visual learning styles, the on-screen text is likely to repeat the narrated text, so redundancy occurs, resulting in learning being hampered.

Screenshot 6 illustrates how on-screen text could have been used but due to the redundancy design principle and the fact that animation and narration was already incorporated, it was omitted.
Individual differences design principle

Taking into account the fact that learners differ, Mayer (2001: 161), in his individual differences design principle, states that low-level knowledge learners are more affected by design principles than higher-level knowledge learners. This does not imply that higher-level knowledge learners are not affected by design principles, but rather that they are able to focus beyond the ill-designed multimedia presentation, centring their attention on the more important concepts.

As far as possible, all principles were adhered to, including the individual differences design principle when designing the MMPDP for teachers.

With the seven design principles in mind and considering the teachers’ requirements to enable them to select the section they want to focus on, the DVD design was implemented. The content fitting the design will be described in the next section.

Content

The content of the professional development programme was influenced mainly by the needs of IT teachers as it is one of the aspects that contribute to SDL and which makes a professional development programme successful. This need implied that IT teachers were faced with the challenge of learning a new programming language, namely Scratch, without formal training. The professional development DVD was therefore based on the content of the CAPS (Curriculum and Assessment Policy Statement) document (as it addresses the basic topics of the Scratch programming language) guided by Bloom’s revised taxonomy by Johnson and Fuller (2006: 121). From the content described
in the CAPS and the approach of the taxonomy, the different topics were transformed into sections (combining certain topics to be chosen by teachers) for the professional development DVD.

Apart from the DVD, teachers also received a workbook highlighting the main concepts of each section, allowing teachers to make notes while completing each section and giving teachers activities to allow them to reflect on the topic completed and to monitor whether they have successfully completed the section. The implementation of the workbook also underlined the SDL principle of taking responsibility for own learning and reflecting on learning (Simons, 2005).

**Research Design and Methodology**

The research was conducted within a constructivist paradigm bearing in mind that each individual constructs his/her own reality and that there is not only one way of knowing (Vrasidas, 2000). Within the constructivist paradigm, the qualitative research design and phenomenological methodology were used as the researchers were interested in the experience of the participants completing the multimedia-based professional development programme and whether it promoted SDL.

This study formed part of a larger South Africa – Netherlands Program on Alternative Development (SANPAD) project on the empowerment of IT teachers in the North West province (n=23). From these 23 teachers, the IT subject coordinator identified 10 in order to comply with aims set out in the research project (within which the study falls). These teachers were identified, taking into account which schools where they teach could benefit from support granted by the research project. Of the 10 teachers, a purposeful sample of nine were selected for the project (three were selected for teaching–learning support strategies, three for communities of practice support, and three for this study on professional development in Scratch programming). The three teachers for the current study were purposefully selected to include teachers from diverse contexts and backgrounds.

Teachers were given the DVD accompanied by the teacher’s manual and asked to complete the professional development programme. At the end of each section in the teacher’s manual, some reflective questions were given to allow teachers to comment on aspects they found useful or not as well as aspects pertaining to the design of the section.

Apart from the reflection sheets used as research instruments, teachers were also asked to participate in a semi-structured interview after completion of the professional development programme. In the interviews, teachers were asked about their opinion on the overall value of the multimedia-based professional development programme. From the teachers’ answers, the researchers wanted to determine whether aspects of enhanced SDL could be found. The researchers also probed teachers to comment on aspects on the DVD that were distracting and aspects they felt lacking.
The reflection sheets as well the interviews were analysed qualitatively by using a priori codes. The a priori codes were informed by the five characteristics of SDL (Knowles, 1975). From the transcriptions of the interviews and reflection sheets, each of the a priori codes was used to identify notions stemming from the interviews and reflection sheets. Furthermore, an independent peer debriefer also analysed the codes in order to determine whether the researcher had analysed the transcripts appropriately. This step was used to strengthen trustworthiness.

In the next section, the results stemming from the analysis will be discussed.

**Results**

The results from the interviews and reflection sheets, specifically results pertaining to the five aspects of SDL, will be discussed in this section.

**Individuals take initiative in diagnosing their learning needs**

The DVD allows teachers to select which section they want to complete; thus giving them the opportunity to take initiative to determine what their needs of learning are. Furthermore, it became evident from conversations with the participants that they could recognise when a section on the DVD did not meet their learning needs fully and then had the realisation that more information regarding the topic was needed.

**Individuals formulate their learning goals**

For some teachers, the learning goal was to complete the entire MMPDP before starting to teach the subject. For others, their learning goal was to recap a specific topic before teaching it to learners. In both cases, the DVD enabled teachers to set their own learning goals and meet them in a way suitable for their specific needs. As one teacher reported: “It was actually nice for me to have something like this which I could watch [recap] in the evenings.”

**Individuals identify human and material resources**

Although teachers were supplied with some resources like examples on the DVD, activities and the teacher’s manual, teachers still went further and identified the necessary help and assistance needed by, for instance, going back and revising difficult sections and in some cases even contacting the facilitator. One teacher remarked: “We communicated with WhatsApp so when I have any problems, I consult with the facilitator so it gets easy for me to understand Scratch.”
Individuals choose to implement appropriate learning styles

With the multimedia-based professional development programme, it is possible to accommodate various learning styles as words, pictures and animation cater for visual as well as auditory-oriented approaches to learning. Teachers are therefore able to implement their chosen learning style by either focusing more on the visual learning (of screen recording and the manual) or auditory learning (of narrations). One teacher said: “So I watched it and I understood what you said and tried everything.”

Individuals evaluate learning outcomes

In the teacher’s manual, reflection sheets were provided as a qualitative research instrument; however, the reflection sheets also provided teachers with the opportunity to reflect on the completed section and to answer questions regarding aspects that were either helpful or unnecessary. Furthermore, the activities teachers were provided with at the end of each section gave them the opportunity to determine whether they had successfully completed the section. Teachers commented that the examples and activities contributed to their learning experience and skills needed to teach the new programming language.

One teacher commented: “What I really enjoyed and which one can maybe have a little more of were the programs so one can specifically see how you do things.” Another teacher added: “DVD is helpful, great and shows everything where it is.”

Discussion

Based on the results described in the previous section, several inferences can be made.

It is evident that the proposed MMPDP on DVD can support the promotion of SDL as it gives teachers the opportunity to take responsibility for their own learning. It allows teachers to determine their own learning goals and gives them a platform to meet these goals by allowing them to focus on specific sections where they still feel they needed some assistance. Teachers were given the opportunity to evaluate their own progress and in doing so either to repeat a certain section they feel still needed working on or skipping a section they feel they have already mastered.

Another aspect contributing to SDL, which is supported by the MMPDP, is the fact that teachers can determine the time at which they want to complete the sections. This implies that they implement time management and self-determination to encourage themselves to complete the programme at a time and pace that suit them.
When teachers attend once-off training sessions, it is sometimes difficult to gather more resources while completing the programme; however, with the help of the MMPDP, teachers have the opportunity to stop the programme and consult other resources before returning to the section.

Lastly, by using this MMPDP, teachers are not compelled to attend facilitator-centred training sessions, but rather take learning into their own hands assisted by a facilitator as the responsibility of learning falls solely on the teacher.

The current study confirmed the research by Capper (2002), which indicated that the use of multimedia enhances professional development. However, the current study provided for an accessible approach to professional development where teachers do not waste time and money to travel to centres where the programmes are implemented. Whereas Williams (2010) is of the opinion that professionals are generally reluctant to take responsibility for their own learning and that specific measurements should be put in place to encourage them to do so, the current study found that teachers are willing to take responsibility for their own learning without any external force or encouragement, provided that the professional development addresses their individual needs, as Bowker et al. (2009) also reported.

**Conclusion**

In our study we indicated that our proposed MMPDP, which is specifically designed to support IT teachers in learning Scratch as programming language, contributed to SDL among those teachers as it made professional development accessible to all and encouraged teachers to take responsibility for their own learning. Interviews with participating teachers indicated that teachers could diagnose their own learning needs, make use of appropriate resources, take responsibility for their own learning and evaluate whether they have attained the goals set out – all of which are indications of self-directed learning.

Future studies could include more IT teachers and could consider incorporating the Self-directed Learning Readiness Scale developed by Guglielmino (1977) in order to quantitatively determine whether self-directed readiness is promoted by the use of the MMPDP.

Furthermore, the current study indicated that multimedia-based professional development on a DVD could provide all teachers with access to continuous professional development, encourage them to take learning into their own hands, and help them to move away from the traditional behaviourist approaches to learning to a constructivist learning environment.
References


DEPARTMENT OF BASIC EDUCATION see SOUTH AFRICA. DEPARTMENT OF BASIC EDUCATION.


RAGE, O.H. 2006. Do school-based teacher professional development programmes work?
Teachers’ perceptions on values of school-based professional development programmes. Durban: UKZN. (Dissertation – MEd).


