

EXPERIENCING COOPERATIVE LEARNING IN COMPUTER APPLICATIONS TECHNOLOGY PRE-SERVICE TEACHER TRAINING: IMPLICATION FOR TEACHER PRACTICE

Elsa Mentz
North-West University
South Africa
elsamentz@nwu.ac.za

Sukie van Zyl
North-West University
South Africa
sukievanzyl@nwu.ac.za

ABSTRACT - This research was informed by Kolb's Experiential Learning theory that provides a holistic perspective on the learning process in which experiences play a central role. We implemented cooperative learning (CL) in pre-service teachers training Computer Applications Technology (CAT) classes over a three-year term, where concrete experiences, reflective observations and abstract conceptualisations played an important role. We aimed to determine the impact of students' experiences with CL on their teaching practice during Work Integrated Learning (WIL) and on their willingness to actively experiment with CL in practice. Since their first year, CAT student teachers participated in regular CL activities. In this interpretive qualitative research we interviewed facilitators who observed the fourth year CAT student teachers' WIL practices. We also analysed students' perceptions of CL in the CAT class through analysis of their own narrative experiences obtained through open-ended questions. Facilitators observed an increase in the use of CL in student teachers' teaching practices during WIL. Student teachers have positive experiences of CL and are willing to incorporate CL in their teaching practice. The implementation of CL in the CAT class resulted in student teachers' willingness to implement CL in their own teaching practice.

Keywords: Cooperative Learning; Self-directed Learning; Computer Applications Technology; Pre-service Teacher Training; Teaching Practice; Experiential learning.

1. INTRODUCTION

In 2013, researchers in the Self-directed learning (SDL) focus area began a longitudinal study through fostering SDL among teacher education students in various subjects, one of these being Computer Applications Technology (CAT). Students studying CAT Education take one module a semester that is related to a topic in CAT and receive guidance from different facilitators for the different modules. We intentionally applied Cooperative Learning (CL) during the first semester of their first year, as well as during the second semester of their third year as intervention for fostering SDL. The first-year module was theoretical, about basic computer concepts. The third-year module consisted of theoretical networking concepts and a practical database design component. We applied CL as main teaching-learning strategy throughout these modules and included the five basic elements of CL (Johnson & Johnson, 2014) to all activities. In the second semester of the students' first year, both semesters of their second year and the first semester of their third year, CL was occasionally implemented, but not facilitated by one of the authors of this paper and hence it is not part of the intervention explained in this research.

From their first to their fourth year, education students at North-West University go to schools for Work-Integrated Learning (WIL) each year, where they obtain practical teaching experience. During their fourth year, students are assessed during their practical teaching by facilitators and other qualified mentors. Based on our previous experiences of assessing student teachers during WIL, we knew that most students still used teacher-centred teaching strategies. It is also still common practice in most South African schools. According to Mentz and Goosen (2007), teachers are reluctant to use CL

strategies when they experience discipline problems and difficulties in assessing the individual contribution of learners. It is also common for students in higher education institutions to complain about the implementation of group work in classes; they often complain that one is doing all the work but all group members receive the credit (Owens, 2015).

We had two aims with this research. We first wanted to determine to what extent CAT students were applying CL during WIL. Second, we wanted to determine the impact of students' experience of CL as teaching-learning strategy on their own teaching-learning practice and their willingness to apply CL in their own future teaching.

The following research questions were addressed in the research reported below: (i) To what extent did CAT students apply CL during WIL? (ii) What was the impact of applying CL as a teaching-learning strategy in the CAT class over a three-year term on students' teaching practice and their willingness to apply CL in future teaching?

The next section contains the conceptual and theoretical framework that we developed for the investigation. The section thereafter outlines the empirical investigation. This is followed by the findings and discussion.

2. CONCEPTUAL AND THEORETICAL FRAMEWORK

The research was informed by Kolb's Experiential Learning theory that provides a holistic perspective on the learning process in which experiences, combined with perceptions, cognition and behaviour, play a central role (Kolb, 2014). According to Kolb (1984, p. 38), "experiential learning is the process whereby knowledge is created through the transformation of experiences". Learning is seen as a four-stage cycle consisting of concrete experience, reflective observation, abstract conceptualisation and active experimentation. These stages are *closely* related to the four action words, *feeling, observing, thinking and doing* (Konak, Clark & Nasereddin, 2014). The action word *doing* refers to *trying out what you have learned*.

When looking at CL as a teaching-learning strategy that consists of five basic elements (positive interdependence, individual accountability, social skills, face-to-face promotive interaction and group processing) (Johnson & Johnson, 2014), it can closely be linked to the action words of experiential learning. Students should combine their own experiences of implementing CL (*feelings*), working closely together (*doing*) on a mutual task (Johnson & Johnson, 2014) to construct and create new knowledge (*thinking*), observe and reflect on the task (*observing and reflecting*) through group processing in order to assess their work and plan how to use the acquired knowledge in new situations (*doing*). In the case of student teachers, they should also actively experiment with these strategies during their own practical teaching opportunities (*doing*). According to Wilmot and Merino (2016), the process of experiencing a skill enables students to realise its value. From an experiential learning perspective, successful experiences of CL should then result in successful implementation of CL by students in their own classes.

Strong evidence exists that students working cooperatively outperform students working individually when looking at the development of knowledge, higher order thinking skills and social skills (Michaelson, Davidson & Major, 2014). Cooperative learning is a form of active and social learning that builds on theories of Social Constructivism (where students construct their own meaning by working together, sharing knowledge, observations and beliefs through dialogue) (Tsay & Brady, 2010; Satterthwait, 2010), Socio-cognitive development theory (where students work together and the interaction stimulates reasoning) (Vygotsky, 1978; Shea & Bidjerano, 2010) and Social Interdependence theory (where the accomplishment of each individuals' goal is affected by the actions of others)

(Johnson & Johnson, 2011), to name only a few. During cooperative learning students are required to work together in small groups to accomplish a common goal (Johnson & Johnson, 2014). There should be positive interdependence between the members of the group in order for them to experience that working together is individually and collectively beneficial and their success depends on the participation of all the members (Johnson & Johnson, 1994; Johnson, Johnson & Holubec, 2008; Kishore, 2012). Group members can be held individually accountable for their part of the task. The process is characterised by face-to-face promotive interaction. Good social skills are essential. Research on CL indicated that it motivates students in their own learning and results in students discovering new learning strategies while constructing their own knowledge (Hmelo-Silver, 2004; Tan, Sharan & Lee, 2007). These attributes link closely to the characteristics of a self-directed learner (Guglielmino, 2013). As self-directed learning was defined by Knowles (1975) as a process in which individuals take responsibility for their own learning with or without the help of others, one can assume that CL could assist in the promotion of SDL. The next section outlines the empirical investigation that was conducted to answer the research question.

3. EMPIRICAL INVESTIGATION

3.1. Research Design

We selected a qualitative research method, within the interpretive paradigm, using a generic qualitative research design (Merriam, 1998).

To realise the first aim of the research, focus group interviews were conducted with facilitators who had assessed students during WIL. To reach the second aim, we collected narratives by means of three open-ended questions (Creswell, 2009) regarding students' experience during WIL and their willingness to implement CL in their classes.

We used a focus group interview for the first interview as we wished to encourage the sharing of different points of view (De Vos & Strydom, 2011). We used homogeneous purposeful sampling for this (Creswell, 2009) by selecting participants who had assessed CAT students during WIL. We invited facilitators of the subject group Computer Science Education (N=5) to the focus group interview as they had met all criteria. The members of this group knew one another and regularly engaged in discourse.

3.2. Sample

The narratives were provided by 4th year CAT students (N=28). A purposeful sample was drawn based on the criterion that a student had to have been a member of the CAT class since the first semester of 2013, when we first applied CL as a teaching-learning strategy in their first year. As one student did not fulfil the condition, the sample population consisted of 27 students, of which 21 completed the narrative.

3.3. Ethical Considerations

The research conformed to the ethical requirements of the North-West University. All participants signed a consent form and voluntarily took part in the interview. For the students' narratives, the purpose of the study and ethical implications were explained to them and they voluntarily completed informed consent forms to participate in the research. The purpose of the narratives, voluntary clause and confidentiality declaration were explained to them. They were assured that they would by no means be penalised if they did not partake in the narratives, or made negative comments. Student's personal details were not included in the narratives. It was however possible to link students to narratives, should the necessity of follow up interviews arise.

3.4. Data Collection and Procedures

An electronic recording was made of the focus group interview. Narrative questions to be answered were placed on the university's online student learning management system. Students logged into this system with their own unique IDs. They submitted the narratives online.

Questions for focus group interviews with facilitators

1. *How did you experience the quality of CAT students' WIL lessons?*
2. *Is there a change noticeable with regard to the quality of CAT students' lessons compared to previous years and if there is (positive or negative) what do you attribute this to?*
3. *To what extent was CL used in the lessons that you observed?*

Questions for narratives

1. *To what extent did the CL that you implemented in the CAT class influence you with regard to your own learning? Substantiate.*
2. *To what extent did the CL that you implemented in the CAT class influence you with regard to the planning and presentation of your lessons during WIL? Substantiate.*
3. *To what extent do you think the implementation of CL in the CAT class will influence your future use thereof in education? Substantiate.*

3.5. Data Analysis

Recordings of interviews were transcribed and language edited by independent persons. The researchers checked transcripts and coded them using the software programme Atlas.ti. All names and references to individuals were removed. Codes were developed inductively (Friese, 2012) while reading through transcriptions and narratives. The researchers did the coding independently but discussed their views and interpretation of the data together.

3.6. Reliability and Validity

Dependability was assured through the use of two researchers working independently as well as together, analysing data through critical discussions and consensus making. Confirmability was established through the indication of direct quotes of interviews and narratives to support findings. Transferability was established through a complete explanation of participants and context of the research.

4. RESULTS AND DISCUSSION

In this section the results of the two research questions will be discussed, firstly by attending to the results from the focus group interview and secondly by attending to the results from the narratives of the students.

4.1. Results from the Focus Group Interview

Four themes emerged from the data: (i) learner-centred lessons; (ii) implementation of CL; (iii) challenges; (iv) student willingness to implement CL. Data indicate that student teachers applied learner-centred lessons; they were willing to incorporate CL in their lessons, despite some challenges. There are also clear indications that students emulated their facilitators when trying to incorporate CL elements in their lessons. According to the facilitators, learners were willing to participate in CL and put in much effort in the planning of their CL lessons. They viewed student teachers as more self-directed in their planning of lessons than before. These findings will subsequently be discussed.

Participants reported that lessons were active and/or student-centred. However, one participant reported that the fact that students were actively involved in their own learning did not necessarily imply that the lesson was learner-centred or innovative.

For me it was really striking this WIL period how they [student teachers] just tried to be active, to be more learner-centred. [P2]

They [students] made several plans to get everyone [learners] involved. [P3]

... it was learner-centred, the teacher said “click” and they clicked here, then she said “there, drag this and drag that” so the fact that it was learner-centred did not imply they were active, innovative learners. [P5]

In relation to the implementation of CL, facilitators were of the opinion that students put exceptional effort into the planning and presentation of their lessons and this resulted in exceptionally good lessons. There were however some concerns about the effective incorporation of the five elements of CL.

...the students put more effort into their lessons this year. It was not just simply a lesson. You could see there were very good planning and I was actually so surprised. [P1]

I observed two lessons and personally I think they were generally good lessons. There were also exceptional lessons. [P2]

I observed three CAT students’ lessons, one was a good lesson and the other two were excellent, really. [P3].

They made all kinds of plans to involve everyone...by giving roles, or stating that anyone can be requested to report back... [P3]

I think they can be quite inclined to more normal group work. Quickly divide in groups and you and you and you are going to work together. [P4]

Where they let two-two learners work together, it worked better than, say, five people. [P4]

And I think the one [element] that most of the time passes by, is the group evaluation at the end. It is the one [element] that does not happen most of the time. How did we work together in the group? What did we learn from this? What was my contribution? It is the one thing that I quite missed. [P3]

The participants agreed that it was not always easy for students to implement CL, but they nevertheless put effort into dealing with the challenges. Participants also reported that although students’ lessons still lacked some of the five elements, they tried to incorporate them, and reflected on their own experiences.

It was a bit difficult...the learners are not used to group work, they don’t generally do group work in school. [P4]

Participants reported that students displayed a willingness to apply CL in their lessons and had a preference for CL despite some challenges. Even though the student teachers were inexperienced, a range of skills was observed, from participating in group work to creative, high level group activities.

We see just how these learners enjoy it [CL] and the students do not want to go a different way...no matter that the teachers said they must not do group work, they wanted to prove them wrong..[P1]

...this is now but really their first and their second lesson... So I think they try to do all these things [5 elements of CL], [P3]

...they want to try group work and they want to actively involve the learners...[P4].

These results indicated that CAT student teachers were more inclined to apply group work and specifically CL than in past years. Although students were inexperienced and lessons often lacked one or more of the five elements of CL, it was evident that students were aware of these elements and attempted to integrate them in their lessons. The fact that the students were not formally instructed how to design CL lessons suggested that they modelled CL from their own experience, despite challenges that occurred.

4.2. Results from Student Teachers' Narratives

We also wished to determine students' own experiences of CL and its impact on their own teaching practice as well as their willingness to apply CL in practice. The students' experiences of CL were overwhelmingly positive. Three main themes emerged from the data: (i) willingness to use as teaching-learning strategy (ii) advantages of CL and (iii) implementation of CL.

Regarding students' willingness to use CL, they indicated that CL was their preferred teaching-learning strategy and that they would be able to apply it in their own classes as teachers, because they had experienced it hands-on, both as a learner in class, as well as a teacher during WIL.

I shall definitely use this method of learning [CL] in my classes. I will incorporate Cooperative Learning from the beginning, to let them [learners] get used to this method of learning. [P18]

I will definitely remember some of the applications and use it in my class one day. I will in future remember the value that Cooperative Learning had for me and do my best to transmit those values to learners in my class. It [CL] also motivated me to incorporate Cooperative Learning in my WIL lessons [P16]

Cooperative Learning influenced me in such a way that I thought it should be incorporated in each lesson. [P17]

I as teacher have already been exposed to it [CL] and will obtain the necessary knowledge to apply Cooperative Learning effectively. [P1]

I will use it [CL] in my class as much as possible, but I realise that it has to be done very structured to be successful in practice. [P9]

Students indicated that they would implement CL in their own classes as they had experienced its value for themselves. Based on their experiences they concluded that CL had many advantages for learners.

...because learners learn from each other, [P18],

...because I saw that it worked well [P15],

... as it gives the students a much better and broader perspective [P9];

The experiences and implementation of CL not only helped them as future teachers to be able to implement it in their own classes but also equipped them with essential life skills for the workplace.

Without realising it, I learned a lot about presenting my class in the right manner. I only discover it during the formal assessment of my WIL lessons. [P3]

...I now have the ideas and opinions of others...I can present the lesson in such a way that I take those ideas and opinions into account and make the lesson more understandable for learners that need to understand the content. [P9]

Cooperative Learning better prepares me for the life as a working individual. In the work place you cannot choose with whom you would be working in a group. Therefore you need to be able to work with all people in a most suited and effective manner in a group and execute instructions to the best of your abilities. [P13]

It [CL] taught me the importance of planning, as planning is needed to work effectively in the class room. [P21]

It [CL] helped me to accept the responsibility of preparing my lessons ...and to think critically [P2]

It [CL] gives a person ideas and ways how you can apply it and you see the positive and negative aspects of each cooperative strategy. [P8]

I saw which methods work and identified shortcomings in my methods, because we were also learners in class. [P3]

It [CL] helped me a lot, because it broadened my world. [P12]

Regarding the implementation of CL, students mentioned that initially they had not preferred working in groups during their training, or harboured resistance against it, but while they were being exposed to CL, they changed their minds. At first they reported that they experienced some difficulty in implementing it in their own WIL classes, since the school learners were not used to working in groups. Student teachers, however succeeded with this because they persisted with its implementation.

In the beginning I thought it [CL] was stupid, but as time passed I realised that it actually is the way to go... I was the one that did not want to incorporate it, but as I started using it I saw that it worked and used it more and more. [P8]

I know it [CL] is going to be enjoyable in class, but I know I need to implement it from the first lesson, as it was difficult to do it during WIL (the learners were not used to it and some struggled or refused to do it). [P5]

Initially it was difficult because learners were not used to working in groups. The first few times it took me long to explain the roles of the groups to learners. By the end of WIL, learners worked effectively in groups, they were more interactive and participated in contact sessions. [P18]

I learned that the first attempt to plan a lesson is not the best and that it is often necessary to revise the lesson two to three times to obtain a level of perfection. [P19]

Kolb's Experiential Learning Cycle "considers experience as the foundation of learning" (Konak et al., 2014, p. 13), that consists of a four-stage process of concrete experience, reflective observation, abstract conceptualisation and active experimentation. In this study we obtained information on students' experiences of CL during their training and about how these experiences infused their practice. We obtained a holistic perspective of the students' learning with a specific focus on their experiences, as the theory suggested. It was clear that the overwhelmingly positive experiences of CL in their own classes resulted in positive perceptions of CL and resulted in active experimentation and effective implementation in their own practices during WIL as well as a willingness to apply it in their own classes in future. This study can therefore be seen to confirm Kolb's Experiential Learning Cycle in that it supports the notion that positive experiences of CL during students' training results in *positive perceptions* of CL which in turn leads to students' willingness to plan and organise their own classes in this way and to implement CL during WIL. Students learn from their own *concrete*

experiences (implementation in own training), through *reflective observation* of facilitators during CL in order for them to *conceptualise* the practice for their own classes and to *actively experiment* with different types of CL. The study also confirms Wilmot and Merino's (2016) finding that the process of experiencing a skill enables students to realise its value and that students therefore are also willing to use these strategies in their own classes once they graduate as teachers.

5. CONCLUSION

According to the facilitators involved in the assessment of WIL practices, students often applied the principles of CL in their teaching practice, in contrast to past practice where direct instruction had been mainly used. The experiences with CL in pre-service teacher training CAT classes had an influence on students' willingness to apply CL strategies during WIL as well as on their willingness to apply CL in their own classes once they graduate as teachers. The modelling of CL strategies during teacher training instilled in them the confidence to apply it in their own WIL classes. They experienced the learning gained from this in their own training as well as in their WIL (school) classes: CL provided them with a broader perspective of their subject, a deeper understanding of their subject knowledge and it improved and developed their intra- and interpersonal skills. Overall, they felt better prepared for the teaching profession.

This study furthermore indicated that a positive experience of CL strategies during pre-service teacher training could result in increased use of these strategies in schools as well. The importance of good teacher training where students can obtain hands-on experiences with teaching strategies should not be underestimated. The contribution that such strategies could make to the quality of teaching and learning in the school environment have been proven in this research.

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