

EXPLORING A COOPERATIVE LEARNING APPROACH TO IMPROVE SELF-DIRECTED LEARNING IN HIGHER EDUCATION

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Abstract

This investigation explores the influence of incorporating five elements (positive interdependence, individual accountability, promotive face-to-face interaction, appropriate social skills, group processing) regarded as essential for effective cooperative learning on students' self-reported levels of self-directed learning, and their views on the influence of cooperative learning on their self-directedness in learning. The research involved a class of ten first-year Information Technology education students and the incorporation of the five elements in their cooperative learning activities in a semester module. Quantitative data regarding the students' levels of self-directed learning were collected in pre- and post-tests by means of a questionnaire. Qualitative data regarding the students' views on the influence of cooperative learning on their self-directedness in learning were in turn collected by means of a post-test open-ended question. The results show that structuring of group work activities to include the five elements reportedly had an influence in the self-directed learning area of evaluation, which is needed to monitor own learning, and interpersonal skills, which are prerequisites for becoming self-directed learners. Other areas that appeared to have been influenced are the students' awareness of factors contributing to becoming self-directed learners, and the use of appropriate learning strategies to become self-directed in learning.

Keywords: Self-directed learning, Lifelong learning, Cooperative learning
Cooperative learning elements, Teaching-learning strategy

1. INTRODUCTION

Most of what people learn is learned in collaboration with other people (Peters & Gray, 2005). Based on this social constructionist view of learning, Peters and Gray (2005) suggest that a model of teaching-learning to promote self-directed learning (SDL) should include collaborative or cooperative learning activities. Cooperative learning (CL) activities require, amongst other things, that students accept responsibility for one another's learning as well as for their own (Slavin, 2009), which is one of the key features of SDL (Knowles, 1975).

2. PROBLEM STATEMENT

“Preparation for self-directed learning (SDL) is essential in 21st century educational institutions because of the unprecedented and exponentially increasing rates of change we all face in all aspects of our lives” (Guglielmino, 2013:2). This statement underscores the necessity for students to be equipped with skills that will enable them to handle and utilise the rapid development of technology and the exponential escalation in the generation and dissemination of information.

In higher education, delivering graduates who have the ability to engage in SDL and are prepared for lifelong independent learning has become a growing concern (Raidal & Volet, 2009). According to Raidal & Volet (2009), this is particularly true of students in professional degree courses, for example education students. This makes it necessary for educators to find and apply strategies to foster development of the skills and attitudes required for moving towards SDL (Guglielmino, 2013). One of the researched teaching-learning strategies that seems to be promising in promoting the development of SDL skills is CL.

The active, student-centred nature of CL as a teaching-learning strategy makes it suitable for the promotion of SDL. Extensive research on CL has revealed numerous advantages of this approach as a teaching-learning strategy, including higher academic achievement (Johnson, Johnson & Stanne, 2000), enhanced critical thinking skills (Cockrell, Hughes-Caplow & Donaldson, 2000), better transfer of learning (Brandon & Hollingshead, 1999) and better-developed social skills, such as communication, presentation, leadership, delegation, and organisation (Cheng & Warren, 2000). However, Mentz, Van der Walt and Goosen (2008) are of the opinion that learning in a group may not be successful if Johnson and Johnson's (2009) five basic elements (positive interdependence, individual accountability, promotive face-to-face interaction, appropriate social skills, group processing) are not incorporated. Research involving post-secondary students has found that structuring of CL activities to incorporate the five elements has led to enhanced achievement, both socially and academically (McWhaw *et al.*, 2003; Mentz *et al.*, 2008). No evidence however could be found in the literature regarding students' level of SDL where CL activities had incorporated the five elements. The question that therefore surfaced was what the influence of incorporation of the five elements of effective CL in group work activities would be on students' level of SDL and their consequent views on the influence of CL as a teaching-learning strategy on their self-directedness in learning.

This article reports on research that was done to explore the influence of incorporation of the five elements regarded as essential for effective CL in group work activities on students' self-reported levels of SDL, and their views on the influence of CL on their self-directedness in learning.

In order to achieve this aim, the remainder of the article has been structured as follows: the next section contains the conceptual-theoretical framework; this is followed by an outline of the empirical investigation, and then a discussion of the findings and recommendations.

3. CONCEPTUAL-THEORETICAL FRAMEWORK

Researchers in SDL are not in agreement about a definition for SDL. In what seems to be the most-cited definition, Knowles (1975:18) describes SDL as “a process by which individuals take the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes”. Other researchers (e.g. Guglielmino, 1978) have focused on the characteristics of self-directed learners rather than on the process of SDL. Brockett and Hiemstra (1991) argue that “self-directed learning” refers to the instructional process and “learner self-direction” to the characteristics of the learner. Brockett and Hiemstra (1991) maintain that “self-direction in learning” includes both the instructional process (external characteristics) and the learner (internal characteristics).

The different stances on SDL may emanate from different viewpoints regarding the meaning of SDL, and whether it is related to learning in educational settings, productivity in economic contexts, or the broader context of society (Bolhuis, 2003). However, important commonalities in the different viewpoints and definitions of SDL are that the self-directed learner takes the initiative in the learning experience, accepts responsibility and accountability for achieving learning goals, exhibits the ability to learn independently, learns from and with others, and prepares for lifelong learning, all of which are encompassed in the view of SDL recognised in this article.

Growing into a self-directed learner can contribute to the fulfilment of learners' need for self-determination, which leads to the intrinsic motivation to perform tasks because they enjoy doing them. According to the self-determination theory (Deci & Ryan, 2002), individuals need to experience feelings of competence, relatedness (connection), and autonomy to be intrinsically motivated (Gagné & Deci, 2005). SDL offers the opportunity to experience mastery of tasks and to learn various skills (competence), to interact with others and feel connected and accepted (relatedness), and to feel in control of their own behaviours, goals, choices and interactions (autonomy) (Guglielmino, 2013).

Research has shown that development of SDL skills and independent learning can be promoted by implementing relevant activities and strategies in teaching-learning events (Francom, 2010; Thornton, 2010).



Educators' intentional development of their students' SDL skills not only contributes to equipping the students for their educational endeavours, but also contributes towards opportunities beyond their formal education (Dyan, Cate & Rhee, 2008), and towards their ability to engage in lifelong learning (Guglielmino, 2013).

Self-direction in learning does not exclude learning from and with others (Skiff, 2009), and also involves interaction with tutors, mentors, and peers (Knowles, 1975, 1990). For this reason CL appears to be an effective teaching-learning strategy for promoting self-directedness in learning. CL is grounded in both the social constructivist and social constructionist theories of learning. Social constructivism focuses on individuals' construction of knowledge as a result of their interactions with others. Social constructionism focuses on learning to learn, the artefacts (projects, assignments, reports, solutions) that are created in group activities, and how discussions in the group contribute to promotion of SDL (Ackermann, 2001).

To ensure that CL is meaningful and effective, specific basic elements have to be incorporated into group work activities (Johnson, Johnson & Holubec, 2007). The five basic elements, according to Johnson and Johnson (2009), are positive interdependence, individual accountability, promotive face-to-face interaction¹, appropriate social skills, and group processing. Incorporation and promotion of these elements depend on purposeful actions, encouragement, and the educator's support, and need to be done over an extended period of time. Students should be trained to incorporate the elements, and then allowed opportunities to exercise the processes related to the elements, while they are monitored (Oliver & Omari, 2001).

Positive interdependence involves the acknowledgement by individual group members that the group can only be successful if every individual is successful (Johnson & Johnson, 2009, 2103). The higher the degree of interdependence, the better the group will operate as an entity, thus promoting the relatedness (connectedness) aspect of the self-determination theory. When students are granted the opportunity to formulate their own learning goals and translate their learning needs into learning objectives, they can take ownership of and manage their own learning, which contributes to the development of their self-directness in learning.

Individual accountability involves individual group members taking responsibility for successfully contributing to the group activity (McWhaw et al., 2003). The opportunity to make your own decisions about how and when to do it, promotes the autonomy aspect of the self-determination theory.

¹Promotive face-to-face interaction occurs when students are engaged in explanations of their learning processes or sharing their knowledge with other members, exchanging resources, challenging one another's reasoning, and acting in trusting and trustworthy ways (Johnson & Johnson, 2013).

Expecting of students to assume specific responsibilities and holding them accountable may contribute to the promotion of their self-directedness in learning.

Promotive face-to-face interaction exists when the members of a CL group encourage and support each other in their endeavours to achieve the common goals set for the activity (Johnson & Johnson, 2013). For face-to-face interaction to be promotive, the element of appropriate social skills is necessary. Group members need to display the skills of active listening, conflict management, good communication, leadership, decision making and trust building, all of which may contribute to development of their self-directedness in learning.

The fifth essential element, group processing, entails self-evaluation of individual group members' cooperation, and of how well they achieved their goals as a group (Johnson & Johnson, 2009). The group can now celebrate its successes, thus promoting the competence aspect of the self-determination theory. The opportunity to do self-assessment and self-reflection at the same time develops some of the psychological aspects involved in SDL.

CL, if implemented with incorporation of the five elements, offers the opportunity for both individual learning and learning from one another, as advocated by the social constructivist and social constructionist theories. From literature it appears that CL can also contribute to learners' feelings of competence, relatedness, and autonomy, as advocated by the self-determination theory, and as embodied in SDL.

Theoretically, it seems as if the implementation of CL, with incorporation of the five elements, will influence students' self-directedness in learning. The following sections contain a report on the empirical investigation.

4. EMPIRICAL INVESTIGATION

4.1 Research design

Following a pragmatic approach to better understand different aspects of the same problem, both quantitative and qualitative methods were implemented (Ivankova, Cresswell & Plano Clark, 2007). For the quantitative part of the research a one-group pre-test post-test experiment (Babbie, 2007; Leedy & Ormrod, 2005) was implemented to determine how students' self-reported levels of SDL are influenced if the five basic elements of effective CL are incorporated into their group work activities. The qualitative part of the research was a basic qualitative approach (Merriam, 2009) to determine the students' individual experiences of incorporating these elements into their CL activities and their views on the influence of CL as a teaching-learning strategy on self-directedness in learning.



4.2 Participants

The participants were a class of ten first-year South African students who were being trained as secondary level Information Technology teachers. This was a convenient sample since the researcher was the lecturer for the specific module where the intervention was implemented. Four of the participants were female and six were male, all were in the age group 18-20 years, and they represented different race groups. Two participants did not have full command of the language of teaching and learning, but they were accommodated through translation into English. All the students who had previous experience with group work indicated that their earlier group work experiences had not addressed the five elements of effective CL at all.

4.3 Ethical considerations

Informed consent was obtained from all participants after ethical clearance for the project, of which this research is a part, had been obtained from the relevant research ethics committee. The participants had the right not to complete the questionnaire and/or the open-ended question, without any consequences. The researcher assured them that all data would be treated confidentially. Data collection occurred during class time in order not to cause inconvenience to the participants.

4.4 Instrumentation

The following instruments were used for the collection of data:

4.4.1 Williamson's (2007) Self-Rating Scale of Self-Directed Learning (SRSSDL)

The SRSSDL was developed for use in higher education (Williamson, 2007) to assess SDL behaviour, indicating the level of self-directedness in learning. The 60 items of the questionnaire were categorised into five broad areas of SDL: awareness (of factors contributing to becoming a self-directed learner), learning strategies (which need to be adopted to become self-directed in learning), learning activities (which one needs to engage in to become self-directed in learning), evaluation (which is needed to monitor own learning), and interpersonal skills (which are prerequisites to becoming a self-directed learner). Each area included 12 items. Responses were rated on a five-point scale, where 1 represented "never", and 5 represented "always". The maximum score for each of the five areas was 60, and the maximum total for the questionnaire 300. Construct validity was established for the questionnaire (Williamson, 2007). Acceptable Cronbach alpha coefficient values confirmed the reliability of the questionnaire as well as the five categories (Williamson, 2007).

The validity of the questionnaire for the South African context has been established (e.g. Golightly & Brockett, 2010) and it is used frequently in SDL research in South Africa. The reliability of the questionnaire for this research supports the reliability of the SRSSDL instrument developed by Williamson (2007).

4.4.2 Open-ended question

At the end of the intervention period, the participants completed an open-ended question consisting of five sub-questions. The question was aimed at determining the participants' views on the influence of CL that emphasised the incorporation of the elements in their self-directedness in learning. The five areas of SDL behaviour that were addressed in the sub-questions were based on Knowles' (1975) definition of SDL. The question that the participants had to respond to was *"Did the implementation of group work in this class (with incorporation of the five elements positive interdependence, individual accountability, face-to-face promotive interaction, interpersonal skills and group processing) have an impact on you regarding*

- *your ability to identify your own learning needs (what you want to learn)? Motivate your answer.*
- *your ability to formulate your own learning goals? Motivate your answer.*
- *your ability to identify human and material resources for learning? Motivate your answer.*
- *your ability to choose and implement appropriate learning strategies? Motivate your answer.*
- *your ability to evaluate the extent to which you have reached the learning goals that you formulated for yourself? Motivate your answer."*

4.5 Data collection

Participants completed the SRSSDL at the beginning of the semester (pre-test). They then completed a CL problem-solving activity without any guidance on how to structure it. Afterwards the students reported on their collaboration in the group, which revealed a number of negative experiences, e.g. that not all group members contributed to solving the problem. This was used as the point of departure for discussion on the fact that specific elements have to be incorporated in group work to ensure effective CL.

The intervention was implemented for the following ten weeks, during which time different CL methods such as Jigsaw, Note-taking-pairs, Cooperative graffiti and Think-pair-share were used. The intervention started out with the researcher and participants discussing and modelling incorporation of appropriate social skills and promotive face-to-face interaction, to explain the

purpose of incorporating these two elements into CL activities and to prepare the participants for their own application thereof in their CL activities in the weeks to come. Participants incorporated these two elements into their subsequent CL activities. This was followed by a discussion and modelling of positive interdependence and individual accountability, after which participants incorporated these two elements into their subsequent CL activities. Finally, group processing was discussed, modelled, and incorporated into the subsequent CL activities. The students worked in different groups during each CL activity.

At the end of the semester the participants completed the SRSSDL and the open-ended question in the post-test.

4.6 Data analysis

Due to the small size of the data set, there was not sufficient power to test the assumption of normality. Therefore, the non-parametric Wilcoxon signed-rank test was used to determine if there were changes in SDL levels in each of the five areas over the period of intervention. The Cronbach alpha coefficient was calculated to determine the reliability of the questionnaire.

The data derived from the responses to the open-ended question were transcribed and, where necessary, translated and language-edited. The transcribed data were analysed by applying the principles of content analysis, and then coded into themes and subthemes (Merriam, 2009). Themes that appeared to be dominant were identified. This process aimed at gaining an impression of the participants' views regarding the influence of incorporation of the five elements of CL into their CL activities in their self-directedness in learning. A combination of a priori (Nieuwenhuis, 2007) and other emerging codes were used. The a priori codes were the five aspects of Knowles' (1975) definition relating to participants' ability to identify own learning needs (what one needs to or wants to learn), formulate own learning goals (what needs to be done to fulfil the learning needs), identify resources for learning (e.g. text book, Internet, peers, educator, etc.), choose and implement appropriate learning strategies (e.g. group work, role play, simulations, concept mapping, summaries, etc.), and evaluate attainment of learning goals (e.g. reflecting, monitoring, peer-assessment, self-assessment, etc.). Other emerging codes were allowed for in order to gain better understanding of the participants' views and experiences.

Trustworthiness of the analysis of the qualitative data was established by having the transcripts, translations, and coding cross-checked by another expert in the field of study but not involved in the research.

5. FINDINGS

5.1 Williamson's (2007) Self-Rating Scale of Self-Directed Learning (SRSSDL)

The scoring range of totals and associated levels of SDL used to indicate the participants' self-rated level of SDL were: high(H): 221-300, moderate(M): 141-220, and low(L): 60-140. In Table 1 the pre-test and post-test results of the participants' self-rating in the five broad areas of SDL are represented, The participants are divided into two groups: those who rated their level of SDL to be "high" and those who rated their level of SDL as "moderate" in the pre-test. The calculated p values and effect sizes for each group are given. Individual increases or decreases of five or more points are shaded.

Table 1: Students' self-rated level of SDL in the pre- and post-tests

	Student	Test	Awareness	Learning strategies	Learning activities	Evaluation	Interpersonal skills	Total	Level of SDL
Pre-test High	Student 3	Pre	55	48	50	49	52	254	H
		Post	51	47	50	49	47 [#]	244	H
	Student 5	Pre	49	42	42	47	47	227	H
		Post	49	38	43	39 [#]	43	212	M [#]
	Student 10	Pre	48	43	50	49	47	237	H
		Post	46	40	38 [#]	38 [#]	49	211	M [#]
	p value			0.18	0.11	0.66	0.18	0.29	0.11
Effect size			0.42	0.51	0.14	0.42	0.34	0.51	
Pre-test Moderate	Student 1	Pre	47	41	39	36	51	214	M
		Post	46	42	40	36	47	211	M
	Student 2	Pre	43	45	42	40	38	208	M
		Post	48*	44	46	44	49*	231	H*
	Student 4	Pre	41	41	45	41	43	211	M
		Post	40	38	34 [#]	42	45	199	M
	Student 6	Pre	40	38	36	38	39	191	M
		Post	45*	45*	44*	44*	45*	223	H*
	Student 7	Pre	50	41	39	33	28	191	M
		Post	41 [#]	35 [#]	39	35	36*	187	M
	Student 8	Pre	42	38	39	30	39	188	M
		Post	40	34	36	33	35	178	M
	Student 9	Pre	39	39	42	33	41	194	M
		Post	36	37	36 [#]	39*	43	191	M
	p value			0.61	0.35	0.75	0.27	0.24	0.87
Effect size			0.16	0.29	0.10	0.70	0.38	0.05	
Average	Pre	45.4	41.6	42.4	37.6	42.5			
	Post	44.2	40.0	40.6	39.9	44.0			

Three of the ten students rated their level of SDL in the “high” category in the pre-test, while the other seven rated themselves in the “moderate” category. Two students moved from the “moderate” to the “high” category in the post-test, but at the same time two of the three students who initially rated themselves in the “high” category moved to the “moderate” category. Table 1 further reveals that not all students experienced the influence of the intervention similarly in each of the five areas. The areas which seem to have been influenced most are learning activities, evaluation, and interpersonal skills. Only one student (student 6) rated all areas to have increased, while no-one rated a decrease in all areas. Table 1 reveals, on average for all students involved, a decrease in the three areas of awareness, learning strategies, and learning activities, with increases in the areas of evaluation and interpersonal skills.

The p values for both the "high" and "moderate" groups do not reveal statistical differences between the pre- and post-tests for any of the five areas. For the "high" group the effect sizes reveal a practical difference of large effect in the learning strategies area ($d=0.51$), and differences of medium effect in the areas of awareness ($d=0.42$), evaluation ($d=0.42$), and personal skills ($d=0.34$). However, all of these differences relate to a decrease in averages. For the "moderate" group the effect sizes reveal a practical difference of large effect in the evaluation area ($d=0.70$), and a difference of medium effect in the area of interpersonal skills ($d=0.38$), both relating to increased averages.

5.2 Open-ended question

Tables 2 to 6 reflect examples of participants' responses to the five sub-questions of the open-ended question. Links to SDL that could be identified from participants' specific responses are indicated. These links were categorised into Williamson's (2007) five broad areas of SDL to allow for comparison with the results obtained from the questionnaire. In the following paragraphs, any reference to CL will imply the incorporation of Johnson and Johnson's (2009) five elements.

5.2.1 Ability to identify own learning needs

Seven of the ten participants were explicit in their opinions that CL had a positive influence on their ability to identify their own learning needs, as illustrated in Table 2.

Table 2: Examples of students' responses regarding identifying own learning needs

Responses	Links to SDL	Areas of SDL
Listening, negotiations in group work and communication, how the questions were answered both in the class discussions and group work, working with others to find an agreeable outcome, all helped me to identify my learning needs.	<ul style="list-style-type: none"> • Diagnose own learning needs (Knowles, 1975) • Effective interpersonal and intrapersonal communication (Williamson, 2007) • Effective collaboration with peers (Knowles, 1975) 	<p>Awareness</p> <p>Evaluation</p>
Yes, you became more responsible to help the whole group pass, each one has to do their part; it also motivated you to do your best because of the people who are dependent on you. So I had to identify exactly what I had to learn.	<ul style="list-style-type: none"> • Take responsibility for own learning (Knowles, 1975) • Diagnose own learning needs (Knowles, 1975) • Effective collaboration with peers (Knowles, 1975) • Being competent in knowledge and skills of the task (Bolhuis, 2003) 	<p>Interpersonal skills</p>

Linking the examples in Table 2 to SDL seemed to indicate that CL might promote SDL in terms of identification of own learning needs, effective collaboration with peers, effective communication, and taking responsibility for own learning. Aspects of SDL that emerged from other responses on this sub-question pertain to listening to other's opinions, being competent in knowledge and skills of the task, and sharing of knowledge. Categorisation of these aspects relates to influence in the SDL areas of awareness, evaluation, and particularly interpersonal skills.

5.2.2 Ability to formulate own learning goals

All participants responded clearly about the influence of CL in terms of having to set learning goals, as illustrated in Table 3. This might be due to the fact that CL could only be effective if group members individually accepted responsibility for completing the group task successfully (individual accountability), which required the setting of own learning goals. Another contributing factor might be acknowledging that other group members depended on you for the success of the group as a whole (positive interdependence). Responses to this sub-question generally indicated that CL can contribute to the SDL characteristic of setting one's own learning goals.

Table 3: Examples of students' responses regarding formulating own learning goals

Responses	Links to SDL	Areas of SDL
To make sure that the group work was successful, I learned to formulate my own learning goals and this helped me to achieve what I wanted to know.	<ul style="list-style-type: none"> • Effective collaboration with peers (Knowles, 1975) • Formulate own learning goals (Knowles, 1975) • Goal orientation (Guglielmino, 1978) • Willingness to direct own learning (Fisher, King & Teague, 2001) 	Awareness
Yes, you get pushed to set your goals and to achieve them on time. It leads to more responsible behaviour and punctuality.	<ul style="list-style-type: none"> • Formulate own learning goals (Knowles, 1975) • Goal orientation (Guglielmino, 1978) • Do planning to reach goals (Guglielmino, 1978) • Accept responsibility (Guglielmino, 1978) 	Interpersonal skills

Responses to this sub-question produced evidence that CL may strongly promote SDL in terms of formulation of own learning goals and goal orientation, as well as a willingness to direct own learning. Other responses to the sub-question further yielded links to accepting responsibility, planning to reach goals, and effective collaboration with peers. The aspects of SDL that became evident can mainly be categorised into the area of awareness, and also into the area of interpersonal skills.

5.2.3 Ability to identify human and material resources for learning

Responses to this sub-question displayed general agreement on the value of other group members as human resources for learning. On the other hand, there was a lack of reaction about the influence of CL on their ability to identify or implement material resources. Only two participants responded to the issue of material resources, of which one indicated that she would have used a variety of resources, even if she was not involved in group work. Table 4 shows responses to this sub-question.

Table 4: Examples of students' responses regarding identifying resources for learning

Responses	Links to SDL	Areas of SDL
I gained interpersonal skills while doing group work because at first I couldn't communicate with the students in the class, but as time went by I realised that they are human resources for learning, in the class and outside class.	<ul style="list-style-type: none"> • Effective interpersonal and intrapersonal communication (Williamson, 2007) • Identify appropriate learning resources (Knowles, 1975) 	Awareness
[In groups] you start thinking of ways to help learners understand work easier. You thus learn to use human and material resources more and better.	<ul style="list-style-type: none"> • Identify appropriate learning resources (Knowles, 1975) 	Interpersonal skills

Responses to this sub-question did not yield many links to SDL apart from the identification and use of resources, which links to the area of awareness (in this case of different resources available). The only two other aspects that stood out in other responses were effective communication, and effective collaboration with peers, which link to the area of interpersonal skills.

5.2.4 Ability to choose and implement appropriate learning strategies

Respondents agreed that CL had an influence on their choosing and implementing of appropriate learning strategies, as illustrated in Table 5. The respondents recognised that during the CL activities they learned from one another about different learning strategies and how to use them. One respondent explicitly referred to his individual accountability (taking responsibility to contribute to the success of the task) that led him to take a specific action to ensure that he fulfilled his obligations efficiently and on time.

Table 5: Examples of students' responses regarding appropriate learning strategies

Responses	Links to SDL	Areas of SDL
<p>My individual accountability helped me to choose and implement appropriate learning strategies, for example I made myself a small notice board where I pasted small papers that were written on what I had to do and when.</p>	<ul style="list-style-type: none"> • Choose appropriate learning strategies (Knowles, 1975) • Implement learning strategies effectively (Knowles, 1975) • Take initiative and responsibility of own learning (Knowles, 1975) • Diagnose own learning needs (Knowles, 1975) 	<p>Learning strategies</p>
<p>Yes, you learn about the benefits of different learning strategies that you didn't know about, and it's a better experience because of the group's learning dynamics.</p>	<ul style="list-style-type: none"> • Choose appropriate learning strategies (Knowles, 1975) • Effective collaboration with peers (Knowles, 1975) 	<p>Awareness</p> <p>Interpersonal skills</p>

Linking responses to this sub-question to SDL throughout pointed to choosing appropriate learning strategies, implementing appropriate learning effectively, and diagnosing own learning needs. Aspects of SDL that emerged from other responses were taking initiative and responsibility for own learning, effective collaboration with peers, and effective communication. These links can be categorised in the areas of learning strategies, awareness, and again the area of interpersonal skills.

5.2.5 Ability to evaluate attainment of learning goals

All participants responded positively about the influence of CL in terms of reflection on their own learning and evaluation of attainment of their learning goals. Table 6 shows responses to this sub-question. Whether CL enhanced their ability to evaluate the extent to which they had reached their goals is uncertain, but they seemingly used the progress and attainment of other group members as a benchmark.

Table 6: Examples of students' responses regarding evaluating attainment of learning goals

Responses	Links to SDL	Areas of SDL
In the face-to-face interactions I could determine if I had achieved my learning goals by looking where the rest of the group was with their work.	<ul style="list-style-type: none"> • Reflect on own learning (Guglielmino, 1978) • Evaluate own learning (Knowles, 1975) 	Awareness
Yes, your learning goals were laid out clearly, and because you dealt a lot with the work of others you are able to determine if you have reached your goals.	<ul style="list-style-type: none"> • Reflect on own learning (Guglielmino, 1978) • Evaluate own learning (Knowles, 1975) 	Evaluation

SDL links that were evident in responses mainly pertained to reflecting on own learning and evaluation of own learning, although the notion of goal orientation was also noticed. These SDL links can be categorised into the areas of awareness, and evaluation.

6. DISCUSSION

Previous research suggests that CL activities could play a notable part in the development of SDL (e.g. Peters & Gray, 2005; Donaghy, 2005). The purpose of this research was to explore the influence of a CL approach that included the incorporation of Johnson and Johnson's (2009) five basic elements of CL on students' self-rated level of SDL. Comparison of the findings derived from the quantitative and qualitative data revealed interesting trends relating to the specific areas of SDL.

Based on the SRSSDL, the students self-rated their level of SDL in the pre-test as either "moderate" or "high". It must be pointed out that in general the students rated their level of SDL very high in the "moderate" level (141–220), indicating that this sample of first-year students considered themselves to be self-directed in learning to a higher than average degree. This trend was also observed with the first-year education students involved in the research of Golightly and Brockett (2010), who pointed out that first-year students in pre-tests rate their levels of SDL based on their learning experiences at secondary school level. This might possibly be a reason for the tendency of first-year students to initially overestimate their levels of SDL. However, this observation is in contrast with the findings of Williamson (2007) and McCauley and McClelland (2004) who respectively found that the first-year nursing and physics students had rated themselves in pre-tests to be at the lower levels of SDL.

The finding from the quantitative results that suggests a general decrease in level of SDL between the pre- and post-tests may possibly be related to students' initial apparent overestimation of their levels of SDL. This tendency may be due to students' realisation of their own limitations once they are involved in cooperative activities where the five elements of CL are introduced. Students may discover that they lack specific attributes, skills and strategies related to SDL. In this research, they reported a decrease in the SDL areas of awareness, learning strategies and learning activities. On the other hand, the overall self-reported decrease in SDL in general is not consistent with the findings of Strods (2010) who reports a perceived increase in students' levels of SDL after being involved in CL activities. It needs to be mentioned, however, that the research of Strods (2010) involved students from first-year to fourth-year level, who might have been more realistic in rating their SDL levels.

Findings from the qualitative data indicate that engagement in CL activities, in which the five basic elements of effective CL were explicitly attended to, positively influenced the students, not only in terms of the SDL areas of awareness and interpersonal skills, but also with regard to learning strategies and evaluation. These findings concur with the findings of the questionnaire with regard to interpersonal skills and evaluation.

On the other hand, it is conspicuous that responses to the open-ended question revealed many references to aspects related to the area of awareness, although in the questionnaire this area was not generally rated to have improved. Similarly, the students' responses to the open-ended question displayed that in general they perceived an improvement in their use of appropriate learning strategies, which also did not transpire from the findings of the questionnaire. Another notable finding was that responses to the open-ended question did not yield any references related to the area of learning activities. However, these observations may be attributed to the formulation of the open-ended question that referred to aspects of awareness and learning strategies, while the area of learning activities was not overtly mentioned. This may indicate that the formulation of the open-ended question should be reconsidered for future use.

Theoretically the incorporation of the five elements of CL in group work activities should contribute to the development of certain learning skills, including skills related to SDL. The higher the degree of personal interdependence in CL, the more students should be able to formulate their own learning goals, determine their own learning needs, and display a willingness to maximise their own learning (Johnson & Johnson, 2013), all of which are SDL attributes that were reported in responses to the open-ended question.

Similarly, a higher degree of individual accountability implies that students should have a higher sense of responsibility for their own learning (Johnson & Johnson, 2013), which also surfaced from the open-ended question. The elements of personal interdependence and individual accountability should thus contribute to development of the SDL area of awareness, as defined by Williamson (2007). In turn, purposeful efforts to enhance promotive face-to-face interaction and social skills during CL should develop students' skills in interpersonal communication and collaboration with peers, both pointing to an improvement in the area of interpersonal skills, as were reported in both the questionnaire and the open-ended question. The influence of the fifth element of effective CL, group processing, during which group members have to do self-reflection and self-assessment, is clearly evident in the increase reported in the area of evaluation.

The two SDL areas of learning strategies and learning activities cannot be linked directly to any of the five elements of CL. This may explain why none of the responses to the open-ended question could be linked to any aspect of SDL that relates to learning activities. The only references that were made to aspects related to the area learning strategies were in response to the part of the open-ended question that specifically referred to choosing and implementing appropriate learning strategies. Indications are therefore that purposive efforts will have to be made during CL to develop students' skills with regard to learning strategies that they need to adopt and learning activities that they need to engage in.

7. CONCLUSION AND RECOMMENDATIONS

From the findings it seemed that engagement in CL activities, incorporating the five elements necessary for effective CL, contributed to improvement of certain skills that students need to develop towards self-direction in learning. The results reflected improvement of skills that learners need to be able to evaluate and to monitor their learning process and progress, as well as skills that they need to effectively interact and communicate with others. Although the quantitative results did not reveal improvement in the students' awareness of factors that contribute to development as self-directed learners, nor in the learning strategies they have to implement to become self-directed in learning, the qualitative results furnished evidence about the contribution of CL as a teaching-learning strategy to enhance these attitudes and skills. However, it became clear that CL alone, albeit with incorporation of the five elements, is not sufficient to develop all attitudes, characteristics and skills that typify a self-directed learner. It might also be necessary to simultaneously implement strategies related to metacognition and self-regulation, but this will have to be researched.

The findings of this research have implications for future research on the promotion of SDL through implementation of CL that incorporates the five elements for effective CL. It is recommended that a larger number of participants be included, and that a longer period of time be allowed for the intervention. A longer time-span may lead to better group dynamics in terms of positive interdependence, individual accountability, face-to-face interaction, and social skills. Selection of CL tasks that are of such a nature that group members are definitely dependent on one another's contribution to successfully complete the task, may also enhance the members' levels of SDL. Educators should focus on selecting CL tasks that will actively engage students in the learning activities and learning strategies conducive to the promotion of SDL. Attention should be given to the possibility of expanding the open-ended question by adding a sub-question about the learning activities that students engage in when working cooperatively in a group. Since the current research revealed that the use of qualitative data to gain information on the development of the participants' level of SDL may be of more value than the quantitative data, collection of qualitative data can be expanded by using observations, interviews and individual journals. It is also strongly recommended that the use of a "post + retrospective pre-test" method (Lam & Bengo, 2003:65) should be considered in future similar quantitative research endeavours. According to Lam and Bengo (2003), this method can avoid response-shift bias that results from pre-test overestimation or underestimation, as was noted in this particular research.

The implication of this research for practice is that SDL in educational contexts can be promoted through CL teaching-learning strategies, provided that CL activities incorporate the five elements of effective CL. The results also pointed out that CL should probably be combined with other teaching-learning strategies and approaches, for example problem-based learning and a metacognitive approach to learning, to ensure a holistic promotion of students' self-directedness in learning.

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