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The Effectiveness of a Multi-Dimensional Teaching Strategy on Students' Attitudes and Level of Learned-Helplessness

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Abstract

Background: Learned helplessness can become a persistent problem that develops in response to a student's lack of confidence and frustration with a certain course of study.

Aims: This study examined the effects that a teaching strategy that was designed to trigger intrinsic motivation components had on students' attitudes toward an unpopular scientific subject and students' learned helplessness as a general characteristic.

Sample: The participants consisted of 157 female undergraduate students.

Method: A teaching strategy that consisted of multi-dimensional intrinsic motivation components was delivered to one neuropsychology class of students, while a second class was taught exactly the same concepts via a traditional lecturing strategy. Two dependent variables were assessed: Attitude toward the neuropsychology course and learned helplessness. The self-rating scales were administered twice: Once at the beginning of the course and once at the end. An analysis of variance ANCOVA was used to compare the results of the two groups of students.

Results: The performance of the students in the experimental group was higher than that of students in the control group in terms of course grades. Furthermore, these students exhibited a more positive attitude to neuropsychology than the students in the control group. Learned helplessness decreased in the experimental group, and this was indicative of the fact that the new teaching strategy had a positive effect on motivational levels.

Conclusion: A teaching method that incorporates the components of intrinsic motivation can enhance students' performance on a specific course and can improve their attitude toward completing that course.

Keywords: attitude, autonomous motivation, feedback, learned-helplessness, multiple-presentations, teaching strategy

1. Introduction

Feeling incompetent and failing to understand the materials presented in class are antecedents to task avoidance (Seifert & O'Keefe, 2001). Feelings of inadequacy and worthlessness can persist and subsequently characterise students, thereby creating a self-fulfilling scenario in which the student becomes a helpless learner (Jensen, 1998; Mikulincer, 1994).

Learned helplessness is a coping strategy that some students adopt in response to feeling that they lack control in a difficult situation (Barraza & Silerio, 2012; Clayton & Zusho, 2016; Haraldbalae, 2001; Mikulincer, 1994; Seifert & O'Keefe, 2001). Failures and frustrations in the learning context can be a source of stress and students may choose to avoid situations of this nature by failing to attend classes and exams or mentally avoiding the work that accompanies a given course. They may decide to be passive and negative because they think they lack control of the situation and there is a risk their effort will not translate to results. Students in this situation may adopt maladaptive behaviours to cope with the stress of feeling helpless. Mild maladaptive behaviours include adjusting goals so that they are aligned with the amount of effort the student is willing to invest in the course of study, while severe maladaptive behaviour involves avoidance (Mikulincer, 1994).

To facilitate students' learning, teachers should strive to keep cognitive load to a minimum (Kalyuga, 2014; Sweller, 1988; Sweller & Chandler, 1994). Multiple representations are a common strategy by which educators attempt to reduce the cognitive load on students. This strategy focuses on providing students with an opportunity to combine information, remove redundant information and amend their understanding of complex concepts and relationships (Ainsworth, 1999; Sunyono & Yuanita, 2015; Wong, Yin, Yan, & Cheng, 2011).

Students need to use reasoning skills to apply, analyse and synthesise concepts and knowledge (Hamza & Wickman, 2009; Schwab, 1978). A study by Utay and Calik (2016) examined the effect of student-centred learning strategies on conceptual learning in chemistry. They assessed students' grasp of key concepts both pre- and post-module. The results revealed that student-centred learning improved the participants' test performance more than a traditional teaching approach. This was attributed to the positive effect of linking knowledge to the real world, which helped the students to value the material and more readily engage in deep learning. A similar study by Miller (2010) employed a three-step model through which students studied an example of a solution to a problem, reflected on it and then applied what they had learned to solve a similar problem. The results revealed that this approach was successful in the context of undergraduate mathematical courses in that it improved students' grades and reduced the number of drop-outs. However, White et al. (2014) found that student-centred learning is only effective when students value class activities. They concluded that learning is not based on technique, but on the strategy that is employed to make learning useful. For instance, to improve students' motivation to learn, activities should encourage meaningful repetition and should incorporate feedback and debriefing (Jensen, 1998).

It is also possible to reduce learned helplessness, increase intrinsic motivation and deepen learning by diminishing the threat of failure. For example, frequent, smaller exams reduce the stress associated with completing one big exam and increase students' feelings of competence (Kim & Diamond, 2002). Furthermore, continuous feedback helps students to regulate themselves and engage in deep learning (Butler, 1995). When students receive consistent, positive feedback, they become more competent, and their expectations increase. This encourages them to employ deep learning strategies (Ryan & Deci, 2000). However, some studies have found that deep learning is not always correlated with the GPA of college students; for example, that of Campbell and Cambrera (2014). This could be because the assessment tools that are used to measure deep learning are not fit for this purpose (Yuretich & Kanner, 2015). For example, assessments that place a specific focus on memorisation encourage students to adopt a surface learning strategy. Furthermore, they can lead to the perception that a course has a heavy load. On the other hand, alternative performance assessments, such as project-based evaluations, may help the students to develop positive perceptions of the learning process and engage in deep learning (Kember, 2004). For a review of the effect of different feedback strategies on students' learning, see Mayer (1986). Hence, a teaching program that incorporates methods by which deep learning can be facilitated, encouraged and enhanced should also employ a useful assessment strategy.

However, different types of achievement motivation can elicit different learning outcomes (Albert, 1977; Atkinson & Feather, 1966; Ryan & Deci, 2000; Seifert & O'Keefe, 2001). When achievement motivation targets performance goals, such as securing high grades, it encourages participants to adopt surface learning strategies and avoid challenges (Seifert & O'Keefe, 2001). On the contrary, mastery-oriented goals, such as developing an enhanced understanding, increases students' engagement in learning activities and encourages them to adopt deep learning strategies (Ryan & Deci, 2000; Seifert & O'Keefe, 2001).

Classroom climate and teaching strategies can evoke or dampen a particular type of achievement motivation (Fryer, Ginns, & Walker, 2014; Seifert & O'Keefe, 2001; Wang & Guthrie, 2004). Daphne, Monique and Paul (2006) found that collaborative learning is correlated with social support and mastery learning, and is negatively correlated with superiority and individual goals. In the same realm, Ames and Archer (1988) indicated that, when teachers focus on mastery goals, students exhibit positive attitudes toward learning, accept challenges and believe that effort, not ability, is key to success. Collaborative learning also incorporates the provision of social support, and this strengthens students' intrinsic motivation (Ryan & Deci, 2000). Additionally, in terms of the cognitive benefits of collaborative learning, Lau, Liem and Nie (2008) found that collaborative learning leads to students employing deeper learning strategies. For instance, Yuretich and Kanner (2015) implemented a collaborative learning approach that utilised team-based tasks in a college science course that was delivered to two different groups of students, and their course evaluations and scores were compared with a previous active learning course. The responses the students gave on the course evaluation form indicated that they were satisfied with the team-based strategy, their attendance was higher than that of the previous active learning course and they achieved higher grades. This indicates that the collaborative learning can boost the achievement and motivation of students.

Students with autonomous intrinsic motivation are more interested in learning and value the learning process more than those who are extrinsically motivated (Clayton & Zusho, 2016; Vansteenkiste et al., 2006). They invest more effort in their studies, feel more competent and are more willing to learn. Their confidence and prior experience increase their expectations and belief they will be successful (Bandura, 1994; Ryan & Deci, 2000). Additionally, Fryer et al. (2014) found that internally regulated goals were predictors of deep learning and were negatively correlated with effort deficit in undergraduate Japanese students. For a comprehensive review of the different effects intrinsic and extrinsic motivation on college students, see Lei (2010).

Since intrinsic motivation to learn is linked to deep persistent learning (Donche, De Maeyer, Coertjens, Van, & Van, 2013; Michou, Vansteenkiste, Mouratidis, & Lens, 2014; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005; Vansteenkiste, Lens, & Deci, 2006) and intrinsic mastery motivation is the result of being able to control oneself in the learning situation and engage in a meaningful experience (Seifert & O'Keefe, 2001), it is arguable that mastery achievement eradicates the negative effects of learned helplessness. Therefore, it may be possible to reduce learned helplessness by engaging in meaningful learning that links the learning materials and processes to students' real lives (Jensen, 1998).

Competence and meaningful learning can also engender positive attitudes toward learning (Ames & Archer, 1988; Seifert & O'Keefe, 2001) and reduce task avoidance (Elliot, 1999; Elliot & Thrash, 2001; Way, Liem, & Nie, 2008). Furthermore, a positive attitude is a crucial component of learning. Scholars have theorised that emotions are responsible for readiness to learn (Mikulincer, 1994) and self-efficacy (Bandura, 1994).

Several studies have found that there is a positive relationship between teaching methods that emphasise autonomous learning and students' attitudes toward scientific subjects; for example, that of Katung, Johnstone and Downle (2006). Korur, Toker and Erylmaz (2016) employed interactive online-based programs to enhance student's literacy of scientific concepts and to improve their attitude toward the subject. They found that the use of an online interactive strategy had a positive impact on students' conceptual learning and their attitude toward the subject.

Several studies have employed a multifaceted approach to transform students' negative attitudes toward unpopular subjects. For example, Zahorec and colleagues (2014) examined the hypothesis that multimedia interactive presentations help to eliminate students' negative attitudes to science subjects; in particular, physics. Their findings supported the claim that, when used as an aid to teacher explanations, multimedia can reduce students' negative attitudes to physics. Similarly, in the study by Everingham et al. (2013), students who were completing a compulsory interdisciplinary course were asked to fill in a questionnaire that elicited information about their attitudes toward, and confidence in, mathematics. The questionnaire included questions related to engagement, confidence and anxiety. The students' responses were employed to develop an intervention course that aimed to increase their level of engagement by enhancing the role of supporting groups during the classes. The assessments were also conducted on a more frequent basis throughout the term (i.e., more short assignments and tests). This assessment method was designed to reduce any anxiety the students experienced ahead of larger, less frequent assessments. The relevancy of the course was also increased by linking the materials to other subjects. The findings revealed that the new course design made the curriculum more relevant and reasonable, enhanced students' confidence and level of engagement with the course material and reduced the anxiety associated with assessments (Everingham et al., 2013).

Macleod, Shajahan, Razul and Powell (2015) found that undergraduate physics students viewed astronomy courses as difficult and irrelevant. To address this, they develop a course that employed the Socratic method of questioning, targeted different levels of Bloom's taxonomy and visual animations and videos. These techniques were designed to deepen the students' understanding of the concepts, link the historical and philosophical knowledge and deliver more student-centred learning interventions that linked theory with practice. The study questionnaire revealed that the new course increased students' level of comfort with the teaching material. The researchers concluded that students need to given an opportunity to broaden their understanding of the modules and identify the "why" behind the concepts because this will deepen their understanding of complex science subjects.

In contrast, some studies have failed to capture the positive effect student-centred learning can have on attitude toward learning. This is often due to the fact that the attitude scales focus on distant benefits like the extent to which the course is relevant to future career opportunities (Utay & Calik, 2016). Widyahening and colleagues (2012) examined the effect of evidence-based practice on medical students' knowledge and attitude, and found that the teaching method employed had a significant effect on knowledge but not on attitudes. They attributed this to the limited duration of the intervention.

To investigate the teaching components that have the most positive effects on students' attitude toward a particular subject, Sonnert, Sadler and Bressoud (2015) asked students to identify the factors they believed had the most positive effect on the attitude college students enrolled in a calculus course exhibited toward learning math. The results showed that the students believed that learning from helpful teachers who administered suitable homework and fair exams had the biggest impact on students' attitudes. In contrast, they did not believe that technology had a significant effect on students' attitudes. Among these factors, the students involved in the study had different perceptions of the value of active learning. Students who had a better knowledge and more positive attitude to learning at the outset of the course benefited more from active learning strategies. On the other hand, active learning had a negative impact, albeit small, on low achieving students' attitudes toward math. These results indicate that different teaching components have different impacts on attitudes and, thus, any teaching program that aims to improve students' attitudes to a subject should incorporate different teaching strategies and approaches. Indeed, the study concluded that several factors impact attitudes to courses, including instructions, class environment and personal background (Walberg, 1984).

Ryan and Deci (2000) stated that inner motivation is impacted by three variables: need of competence, being autonomous and feeling of relatedness. Any teaching design that takes into consideration these three components has a better chance of increasing students' intrinsic motivation to learn and, hence, enhancing their learning outcomes (Niehaus, Rudasill, & Adelson, 2012).

The current study built on Ryan and Deci's theory by examining the effectiveness of a multifaceted approach to teaching that was designed to reduce psychology students' negative attitudes toward an unpopular psychology subject, neuropsychology, and to examine whether a multi-dimensional teaching strategy could reduce students' overall learned helplessness symptoms. The teaching method combined various approaches. It aimed to increase students' sense of control by reducing the cognitive learning load through the application of a multiple representation method. Concrete models were used in addition to photos and videos. The use of 3D models has previously been found to encourage interaction (Serrate et al., 2014). The strategy also focused on making the learning meaningful by engaging students in active learning. It applied the multiple representation models that were developed by Sunyono and Yuanita (2015) whereby students acquired science knowledge through four steps: Orientation, exploration, internalisation and evaluation. Finally, it targeted mastery goals rather than performance goals. During the course, the students were provided with consistent feedback on their work from their peers and completed short exams and assignments. This method of assessment is believed to increase students' feeling of competence and willingness to achieve (Butler, 1995; Kim & Diamond, 2002).

2. Method

2.1 Participants

The participants in the current study were 157 female undergraduate psychology students (M = 22.53, SD = 1.22). All participants were enrolled in the neuropsychology course. Four groups were allocated to the experimental group within which they were taught using the new strategy, and the remaining four groups were assigned to the control group and taught via the traditional approach.

2.2 Data Collection

The students who enrolled in the neuropsychology course were asked to complete two questionnaires: (1) The learned helplessness questionnaire and (2) the attitude toward scientific subjects questionnaire. They completed each questionnaire twice, once at the beginning of the course and once at the end of the course.

2.2.1 The Learned-Helplessness Scale

This scale was developed by Eldowah, Alnajashi and Khalil (in press) to assess four dimensions of learned helplessness: negativity, avoidance, inflexibility and satisfaction with low results. The loading of all four factors into the latent variable was significant according to confirmatory factor analysis of a sample of 560. The scale has previously been found to achieve a high level of reliability, with Cronbach's alpha = .89. In total, the scale included 47 statements that could be administered individually or in groups. The participants were required to respond to each statement by selecting the extent to which they agreed with a statement using a five-point scale that ranged from strongly agree to strongly disagree. It took the participants between 10 and 15 minutes to complete the whole exercise.

2.2.2 The Attitude toward Scientific Subjects Scale

This scale was developed to assess students' attitudes toward the scientific course they had enrolled in and consisted of statements such as "I enjoy neuropsychology classes". The scale initially included 30 statements that were judged by two independent judges. One item was dropped from the scale after a confirmatory factor

analysis was performed, leaving 29 statements in total. Items of the scale and data for the confirmatory factor analysis are available upon request. Cronbach's Alpha for reliability was = .91. Participants were asked to rate each statement according to a rating scale that ranged between 1 and 5.

2.3 Procedures

The neuropsychology course was taught to the experimental group via a multi-faceted teaching strategy that had three main aims: (1) Increasing students' motivation to learn, (2) increasing students' ability to form concepts and relationships by using multi-sensory representations, and (3) giving consistent feedback to students to enhance their awareness of the strategies that can enhance their performance.

The first exercise aimed to enhance the students' motivation to learn by encouraging them to search the web for the primary concepts related to neuropsychology that are in use in practical research or daily activities in the real world. This method was designed to make the learning experience more meaningful (Korur et al., 2016). Second, it was anticipated that the students' ability to acquire scientific concepts could be improved by multiple representation methods. Such methods could reduce the cognitive load and enable students to integrate new information by linking them to a network of related concepts (Sunyono et al., 2015). To this end, the course combined various approaches to present the course material including relationship diagrams, photos and the animation of concrete concepts.

Third, providing students with continual orienting feedback (e.g., peer feedback, marking class activities and a series of short quizzes during the term) was a crucial component of this strategy. Feedback can encourage students to work hard when they are provided with strategies by which they can improve their performance (for a review see Butler, 1995). Feedback encourages students to monitor their progress and, as such, their learning becomes self-regulated.

Each unit of the course incorporated all three elements (i.e., motivation, multiple representations and feedback). For instance, the unit on neurotransmitters commenced with an activity in which students were asked to search for information about how the human brain stores habits (motivation component). This activity helped them to understand the role the neurotransmitters play in habit formation. The students were then shown a diagram that explained the types of neurotransmitters, and they watched a video that demonstrated how they work (multiple representation components). The students were asked to answer questions related to what they had learned during the class activity, and their responses were marked immediately after the assessment. They also constructed a paper model of neurotransmitter pathways, described these pathways to their peers in a group setting, and studied for a quiz at the end of the unit (feedback component).

3. Results

This study generated data for two cohorts: The experimental group and the control group. The responses to the attitude toward neuropsychology scale and the learned helplessness scale were analysed for both first and second measures to control for the pre-differences between the groups before the course and to generate a better estimation of how both learned helplessness and attitudes toward the subject had changed by the end of the course.

The participants' responses to the learned helplessness rating scale were scored according to a five-point scale. As there were 47 statements in the scale, the maximum total score for each participant was 235. Each participant had four sub-scores for the four dimensions of the scale and one total score. For the purpose of the study and ease of presentation, only the total scores are analysed in this paper.

A one-way analysis of covariance (ANCOVA) was conducted to examine the effect that the teaching method had on students' learned helplessness scores when controlling for the scores of the pre-learned helplessness assessment. See Table 1 for adjusted means, standard deviations and confidence intervals for dependent variables. The analysis revealed that the new teaching approach had a significant main effect on learned helplessness scores after controlling for the covariate, F (2, 154) = 10.362, $p < .001$, $MSe = .313.68$, $\eta^2p = .4$.

Table 1. Adjusted means, standard deviations and confidence intervals for learned helplessness and attitudes toward neuropsychology post-tests

Measure	Group	Adjusted M	Adjusted Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Learned helplessness	Experimental group	83.412.13	2.13	79.2	87.6
	Control group	115.2	2.1	111.1	119.3
Attitude toward neuropsychology	Experimental group	116.85	1.52	113.89	119.85
	Control group	101.96	1.49	99.02	104.91

Further analyses using an independent sample *t*-tests indicated that there was no significant difference between the experimental group (M = 106.44, SD = 31.23) and the control group (M = 103, SD = 30.99) in learned helplessness scores at first measure, $t(152) = .56$, p = ns. However, there was a significant difference between the two groups in learned helplessness scores at the second measure, $t(152) = 9.95$, $p < .001$. Learned helplessness scores for the experimental group (M = 92.30, SD = 17.99) were significantly lower than those for the control group (M = 132.49, SD = 30.54), indicating that the application of the new teaching method reduced learned helplessness.

In terms of the attitude toward neuropsychology rating scale, participants' responses were also scored according to a five-point scale. The scale consisted of 30 statements, and the maximum total score for each participant was 150. A one-way ANCOVA was carried out, and the results revealed that the new teaching approach had a significant effect on students' attitudes toward neuropsychology, F (1, 154) = 60.06, $p < .001$, MSe = 168.41, $\eta^2 p$ = .28.

The follow-up analyses with independent sample *t*-tests indicated that there was no significant difference between the experimental group (M = 94.55, SD = 19.61) and the control group (M = 95.34, SD = 17.57) in their attitudes toward neuropsychology at first measure, $t(155) = .26$, p = ns. However, a significant difference between the two groups in terms of their attitudes toward neuropsychology was found at the second measure, $t(155) = 5.87$, $p < .001$. Students' attitudes toward neuropsychology in the experimental group (M = 114.35, SD = 11.52) were significantly higher than those of the control group (M = 100.03, SD = 18.17), indicating that the implementation of the multiple representation method to present the material for the neuropsychology course had a positive impact on students' attitudes toward neuropsychology.

To explore the relation between learned helplessness and students' attitudes to a certain subject, Pearson correlation coefficient between the two post measures was used. The results reveal significant negative correlations between learned helplessness and attitude scales, r = .26, $p < .05$ and r =.35, p < .01, for the control and the experimental groups, respectively. This indicates that decrease in learned helplessness symptoms is correlated with increase in positive attitudes.

Finally, to analyse the effect of the multiple presentations method on students' achievements in the neuropsychology course, the total scores for the experimental group and the control group were compared. An independent sample *t*-test showed that the participants in the experimental group scored significantly higher grades on the assessment (M = 82.34, SD = 14.72) than the control group (M = 75.30, SD = 16.32), $t(152) = 2.81$, $p < .01$. To rule out the risk that the students in the experimental group were, in general, superior to the control group in terms of their academic level, we compared the accumulative averages for the two groups before they completed the neuropsychology course. An independent sample *t*-test revealed that there was no difference in accumulative averages between the experimental group (M = 3.97, SD = .74) and the control group (M = 3.97, SD = .91), $t(152) = .02$, p = ns. As such, it is reasonable to believe that the participants in both groups were relatively equal in terms of their academic achievement before they started the neuropsychology course.

4. Discussion

The neurological psychology course is one of psychology students' most challenging and least preferred courses. The reasons that are commonly attributed to the difficulties students encounter on this course and their negative attitudes towards it are the scientific nature of the concepts and relationships involved and the students' lack of awareness of how the key concepts are relevant to their field of study. As such, a teaching strategy was developed with the intention of increasing students' positive attitudes toward the course and, through doing so, to generalise their intrinsic motivation to learn other subjects and improve their academic achievement. The

teaching strategy included three elements: (1) Students' motivation to learn the materials, (2) students' ability to form concepts and relationships, and (3) students' awareness of the strategies they can employ to improve their performance. The findings indicated that the adopted multi-strategy approach to teaching had a positive effect on students' attitudes, achievements and their general learning traits, thereby reducing their scores on the learned helplessness scale.

Previous research has found that the techniques used to teach students are not helpful unless they increase students' interest and value of the subject (White et al., 2014). Therefore, this study employed a comprehensive attitude rating scale that was not isolated to the benefits of the course but also included items that specifically targeted close benefits, such as interest and value of the information. This was designed to overcome some of the problems associated with previous studies, which have failed to identify a positive effect for a well-established method that is based on intrinsic motivation on students' attitudes (e.g., Utay & Calik, 2016).

This study did not assess the effect of each distinct component of the teaching strategy on students' attitudes. However, one possible explanation for the improvement that was observed in the students' attitudes toward the course is that the students were more readily able to engage in the class activities and, hence, became more interested in the subject. As they were more engaged in the classes, the students' intrinsic motivation to learn increased and their motivation was enhanced as a result of the consistent feedback they received from their peers and the frequent exams they completed. This drove students to invest much more effort into the classes when preparing for exams and, thus, their attitudes toward the course became positive. The multiple presentation method also improved intrinsic motivation by reducing the load on students. The participants became able to more readily grasp the concepts and relationships addressed in the course and, as a consequence, their achievement in the class increased.

Whatever explanation is applicable, the current research found that provoking intrinsic motivation by linking the key concepts with daily life and continual feedback, and employing meaningful repetitions via multiple representations, had a positive impact on students' learning outcomes and their attitude toward the subject. These findings are aligned with several studies that have employed a multi-strategy approach to teaching to improve students' attitudes and gains from a specific course; for example, those of Ever Ingham et al. (2013), Macleod et al. (2015) and Zahorec et al. (2014).

Furthermore, a general effect of the multiple approach teaching strategy was obvious on reducing scores of learned helplessness scale. We did not assess students' attitudes and learned helplessness levels on a frequent basis during the course. As such, we cannot identify the nature of the relationship between attitudes and learned helplessness. However, the results reveal a significant negative correlation between scores of learned helplessness and students' attitudes, indicating that the decrease of learned helplessness is related to an increase in positive attitudes. These findings are consistent with those of previous research studies that have found that autonomous motivation has a more significant impact on students' readiness to learn than external motivation and that students who are autonomously motivated find learning more valuable and meaningful (Clayton & Zusho, 2016; Vansteenkiste et al., 2006) and engage in deeper learning (Fryer et al., 2014).

There is a distinct possibility that the positive attitudes and improvement in quiz scores that were observed reduced students' avoidance of this course and any negativity they exhibited toward the course. This drove students not to be satisfied with merely achieving the minimum grade required to pass the course.

There is also a chance that the multiple presentations, on-going feedback and linking knowledge enhanced the students' feelings of competence and induced meaningful learning, thereby helping them to develop a positive attitude toward learning (Ames & Archer, 1988; Seifert & O'Keefe, 2001) and reducing negativity and avoidance (Elliot, 1999; Elliot & Thrash, 2001). However, there is no solid evidence of this at this juncture, and further studies are required.

Some scholars have argued that course grades are not always reflective of the students' gains from a given course (Campbell & Cambrera, 2014; Mayer, 1986; Yuretich & Kanner, 2015). This could be due to the fact that some assessment tools are limited to measuring surface knowledge. Nevertheless, the current study used multiple assessment methods that targeted students' abilities to recall, analyse and apply their knowledge in real or virtual situations. The assessment methods employed in the current study evaluated deep learning and, as such, the assessment scores were more representative of the students' gains from the course.

One might argue that the learned helplessness scale and attitude toward scientific subjects that was used in this study was a self-rating scale that employed the now-then technique; i.e., at the time it was completed it corresponded to now experience (first questionnaire) and retroactive experience (second questionnaire). It is feasible to argue that this created bias that influenced the students' perceptions of the effects of the intervention

program; i.e., they were aware of the general aim of the intervention program. Nevertheless, previous research has proven that this now-then technique is valid for testing the effects of learning programs on student's attitudes (Townsend & Wilton, 2003). Additionally, students' beliefs about themselves are at the core of learned helplessness problems. If students start to change their beliefs about their abilities and the effectiveness of new learning methods, this may be reflective of the general improvement in their attitudes. In addition, students in the experimental group showed an overall greater improvement in their final grades for the neuropsychology course than those in the control group.

5. Conclusion

Components of teaching strategies in this study have a positive effect on students' attitudes and learning motivation. Learned helplessness can be reduced by increasing motivation, which, in turn, is directly impacted by the teaching strategies employed. These findings may benefit educators who are responsible for designing and delivering scientific courses to undergraduate students.

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