Effects of mentoring and feedback on the cognitive task performance of Nigerian undergraduate students

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Abstract

This study examines whether the strategies of mentoring and feedback enhanced the cognitive task performance of students in a university faculty. The sex of the respondents was a significant control variable, suggesting that it is an important factor to be considered. The findings reveal that type of mentoring (formal and informal) as well as feedback (positive, negative, no-feedback) results in comparable levels of cognitive task performance. Also, the results reveal a significant interaction effect of mentoring and feedback on cognitive task performance, laying a foundation for the theory that feedback and mentoring interface. The practical implications of findings are discussed.

Key words: mentoring, feedback, students, informal mentee, formal protégé.

Introduction

Cognitive task performance is the extent to which an individual carries out a task that requires mental processes and adequate cognitive functioning. Studies (e.g. Grudnik & Kranzler, 2001; Jensen, 1987) have shown that performance on such tasks corresponds with general intelligence. The focus on cognitive task performance is occasioned by the interplay of the intricacy of the contemporary syllabus and the increasing pressure on students to perform well. Students in the Nigerian university system are increasingly faced with the task of managing the complex academic environment occasioned by the modernisation of curricula and teaching methods. Empirical evidence in the literature suggests that as cognitive load increases in this manner, task performance by individuals tend to decrease (Pitkanen, Mantysaari, Nielsen, Aamand, Madsen & Lidauer, 2012; Van Merrienboer & Sweller, 2010). For this reason, the need for an intervention to avert a potential slide in the academic performance of students cannot be overemphasized. Accordingly, stakeholders are increasingly interested in ways by which the cognitive resources of students can be enhanced to cope with expansion in academic expectations. One of the two strategies which are increasingly embraced is mentoring; practiced in some units as a formal relationship where students are assigned to faculty members for tutelage or as an informal relationship encouraged through an interpersonally flexible student-faculty atmosphere. The other is performance feedback, an approach that is designed as a separate intervention from mentoring to provide students with prompt information on academic performance.

Although this two-pronged approach has potential, the basis for envisaging an effective connection between these practices and an enhanced performance among students in the concerned units is typically logical and conceptual rather than empirical. Therefore, the present study examines the effects of mentoring and performance feedback on cognitive task performance in an experimental framework to provide context-specific information on the extent to which these initiatives are effective. The present study is justified to the extent that it attempts to narrow notable gaps in the literature such as the dearth of experimental studies on mentoring in the Nigerian setting, inconclusiveness of the extant literature on feedback, and the largely untested assumption regarding the interaction of mentoring and feedback.

Mentoring is a complex human development relationship between a younger, less experienced person, the mentee, and a more experienced adult, the mentor (Kram, 1985). It is a developmental and collaborative relationship in which the mentee avails him/herself of the full range of a mentor's superior experience, knowledge and skills in all spheres of human endeavour (Okurame, 2011). Two types of the relationship which exist in the extant mentoring literature are informal and formal mentoring. Informal mentoring is the traditional form of the relationship that is created spontaneously from shared values, interest, admiration, and perceived competence (Kram, 1985). Formal versions, where mentor-mentee pairs are deliberately created through planned matching or assignment, are designed to replicate the benefits of the traditional type and to ensure that mentoring reaches all (Ragins & Cotton, 1999). Although, mentoring may not necessarily be a bed of roses for individuals in marginal or negative relationships, the acclaimed benefits of positive mentoring experience are derived from the support resources and role modelling that the relationship offers (Kram, 1985; Rhodes, Spencer, Keller, Liang & Noam, 2006).

While learning is the primary purpose of all mentoring relationships, there are different roles which are emphasized across different settings (Eby, Allen, Evans, NG & DuBois, 2008). At the community level, youth mentoring which involves a relationship between a non-parent adult and a child, adolescent or young adult, focuses on undesirable behaviour, detrimental peer relationships and academic setbacks arising from socioeconomic and/or family circumstances (DuBois, Holloway, Valentine & Cooper, 2002). In the workplace setting, where the relationship is between a senior and a junior employee, mentoring gives emphasis to the career and professional growth of the protégé (Kram, 1985). Mentoring in a higher educational institution setting or academic mentoring (which is the focus of this study) typically involves a faculty/student relationship where the former facilitates the academic and personal development of the latter (Jacobi, 1991).

Specifically, experienced faculty members who serve as mentors in academic mentoring intellectually support and challenge students, guide them through the degree acquisition process up to completion and provide significant benefit to students in terms of academic outcome (cited in Lancaster, Lenz, Willis, Brownlee, Smith & Omura, 2016; Nettles & Millett, 2006). They act as the gateway for giving curriculum orientation to students, toning down the difficulties that a novice student may face in school, and giving valuable advice on collegiate life and career options (Payne, 2006). Generally, mentors are trusted guides and advisers who facilitate the transfer of skills and create opportunities for their mentees to learn and make productive use of knowledge (Dawley, Andrews, & Bucklew, 2008; Hunt & Micheal, 1983; Okurame, 2012a). Mentors serve as confidants who provide friendship to mentees in ways that enhance self-worth and self-confidence (Okurame, 2008; Ramaswani & Dreher, 2007) which have been identified in the literature as crucial for mental capacity and for better insights into complex and

autonomous tasks (Cottrell, 2011; Okurame & Fabunmi, 2014). The different forms of support provided by mentors work in concert over time to activate cognitive development processes which equip the protégé with critical thinking skills to better deal with academic and personal challenges (DuBois, Portillo, Rhodes, Silverthorn & Valentine, 2011). To the extent that mentoring enhances the cognitive capacity of protégés (Rhodes et al, 2006), it is logical to expect that mentoring will promote a higher level of cognitive task performance.

While informal and formal relationships are expected to deliver the benefits of mentoring (Cureton, Green & Meakin, 2010), discrepancies have been reported in the literature on the extent to which they achieve this purpose. Studies have shown that informal mentoring provides more benefits than formal mentoring (Chao, Walz, & Gardner, 1992). Informal mentoring achieves this dominance because, compared to the formal version where goals and duration of contact between partners are specified, partners in the informal context meet freely and the mentee's needs form the crux of the relationship's goal (Kram, 1985; Ragins & Cotton, 1999). Again, findings show that mentors in formal relationships are usually less motivated and this results in lower levels of reported mentoring support by their mentees (Chao et al, 1992; Ragins & Cotton, 1999). Consequently, it is logical to expect that the cognitive task performance of students in informal relationships will be significantly better than those of their formal mentoring counterparts. Accordingly, the present study formulated and tested the hypothesis that:

H_1: Students involved in informal mentoring will be significantly better on cognitive task performance compared to their counterparts in formal relationships.

Although, the provision of feedback is typical within a mentoring relationship, it is treated as a separate intervention in the present study because it is also taken apart in the study setting. The importance of feedback for task performance is derived from the natural tendency of individuals to seek feedback on their activities and to aspire to rank well relative to others (Kuhnen & Tymula, 2011). Importantly, empirical evidence suggests that students painstakingly seek feedback to facilitate favourable learning outcomes and feedback significantly influences cognitive task performance (Hounsell, McCune, Hounsell & Litjens, 2008; Katz, 2013). Defined as the provision of information on an individual's task performance within a learning context (Hattie & Timperley, 2007), feedback provides an avenue for informing individuals about the quality of their performance and creates the opportunity for them to redirect efforts and to meet the challenges of task expectations (Fishbach, Eyal, & Finkelstein, 2010; Grant, Ballard & Glynn, 1990). It affords an individual the opportunity to learn about shortfalls in different task situations, clarify roles and prevent future mistakes, and makes task performance easier (Ansell, Lievens, & Levy, 2007; Maxwell, 2013). Indeed, empirical evidence suggests that giving feedback helps to improve task performance and productivity (Atwarter & Brett, 2006; Katz, 2013; Kuhnen & Tymula, 2011).

Despite the fact that feedback is strongly linked to enhanced task performance in the literature, a number of studies have reported negative performance outcomes (Kuvaas, 2011). Findings show that feedback may not always enhance performance and indeed may impede performance in complex tasks if it has a negative impact on the individual's self-esteem (Kuhnen & Tymula, 2011). Taken together therefore, findings in the literature on the influence of feedback on performance suggest that feedback is differentially effective as a tool for improving performance. Indeed, researchers have argued that the effects of feedback on performance are highly variable and may not uniformly improve performance since

in some conditions (Hattie & Timperley, 2007); it improves performance, while in others it inhibits it and yet in others, it has no effect. Therefore, the effect of feedback on performance is not clearly known, and creates a gap in the literature that requires empirical attention.

Furthermore, since feedback is either positive or negative, its ability to influence performance derives from the effect of making people feel good or bad (Baumeister, Vohs, DeWall & Zhang, 2007). However, findings in studies which have compared the influence of negative and positive feedback on performance have been mixed and inconsistent (Bjorn, Sabine & Andreas, 2013). While some studies have found that positive feedback significantly improved post-feedback task performance, others reported better results with negative feedback. Proponents of negative feedback contend that it is a stronger trigger of better performance because it signals a lack of progress and this drives better task-directed behaviour (Carver & Scheier, 1998; Fishbach, Dhar & Zhang, 2006; Higgins, 1987). Negative feedback spurs us on to make better efforts and performance because people dislike falling below expectations, feel bad about it, and try harder to do better in order to rank well relative to their peers and improve their self-image (Kuhnen & Tymula, 2011).

On the other hand, some studies have reported that positive feedback enhances task performance more than negative feedback (Fishbach et al, 2010). They suggest that positive feedback creates a pleasant experience and induces a feeling of strong commitment to task performance (Fishbach et al, 2010). This view is strengthened by the argument that positive feedback increases self-efficacy to a level that effectively drives goal attainment behaviour (Bandura & Cervone, 1983; Ryan & Deci, 2000). It is argued that giving positive feedback makes an individual want to work harder to continue to receive positive feedback, since this will make him or her experience a positive mood (Carver & Scheier, 1998; Higgins, 1987). The foregoing review of the literature does not provide a clear direction on the effects of positive versus negative feedback on performance. Consequently, researchers have warned against a universal answer to the effects of positive or negative feedback on task performance (Fishbach et al, 2010). Accordingly, the present study formulated and tested the following hypothesis:

H_2: Type of feedback will significantly distinguish participants on cognitive task performance

Regardless of the lack of explicit provision by the literature for the basis of expecting an interaction effect of mentoring and feedback on task performance, this possibility seems apparent and reasonable. Studies (e.g. Burks, Carpenter, Goette & Rustichini, 2010; Falk, Huffman & Sunde, 2006) have shown that individuals with self-confidence seek feedback and are motivated to act on such feedback to enhance their performance. Since enhanced self-esteem/self-confidence is a core benefit obtained in mentoring (Kram, 1985; Ragins & Cotton, 1999; Ramaswani & Dreher, 2007) and reported benefits differ among mentees in formal and informal relationships (Chao et al, 1992), it is logical to expect that the type of mentoring will interact with feedback to affect task performance. To study this untested assumption, the following hypothesis was formulated and examined.

H_3: Mentoring type and feedback will significantly interact to influence cognitive task performance levels of participants

The literature suggests that some demographic variables may be important in cognitive task performance. Studies (e.g. Schroeder & Salthouse, 2004; Weber, Skirbekk, Freund & Herlitz, 2014) have

demonstrated that significant age-related and sex differences exist in cognitive task performance. Other studies have found that students' year of study is significantly related to cognitive abilities and engagement (Finkelstein & Fishbach, 2009; Tollefson, 2000) and that beginners and advanced students differ in their feedback seeking behaviour. Consequently, age, sex, and year of study of participants were considered extraneous variables and their effects controlled in study analysis.

Methodology

Research Design

This study utilized a between-subjects factorial design. The independent variables of the study which were measured on a nominal scale are types of mentoring and feedback while the dependent variable, cognitive task performance, was a continuous measure. Mentoring was examined at the two levels of formal mentoring and informal mentoring, while feedback was at three levels of positive, negative, and no feedback. The research design allows for an assessment of how students assigned to formal mentors and those involved in informal mentoring relationships compare on cognitive task performance, and permits the comparison of cognitive task performance across the three levels of feedback. More importantly, it also makes it possible to determine if the effect of type of mentoring on cognitive task performance changes across the levels of feedback administered in the study.

Setting

The experimental study which involved two related social science departments was conducted in the laboratory of a faculty in a University located in South Western Nigeria. The departments used in the study were chosen for two reasons. First, the two departments are closely related disciplines. Second, both departments operate contrasting types of mentoring relationships. While one of the departments operates a formal mentoring scheme for its students, the other has no formal arrangement but fosters informal relationships. This makes respondents information-rich cases for the examination of whether or not students with formal mentors perform better in cognitive tasks than their counterparts with informal mentors.

Participants

Data were collected from 120 registered undergraduate students who volunteered to participate in the study. They comprised 57 (47.5%) male and 63 (52.5%) female students whose ages ranged from 17 to 30, with a mean age of 21.8 years (SD = 5.4). Respondents were from two departments that operate contrasting types of mentoring relationship; one that operates a formal mentoring scheme for students (n = 50, 41.7%) and another that utilises informal relationships (n = 70, 58.3 %). All of the respondents were in an ongoing mentoring relationship and were on a four-year programme in their respective departments. Their level of study varied thus: 18 (15%) were first year students, 20 (16.7%) were second year, 29 (24.2%) were third year and 53 (44.2%) were fourth year students.

Procedure

Participants for the study were undergraduate students in two related social science disciplines of a Nigerian University. Participation in the study was solicited from undergraduate students across the four levels of study in the two departments used for the research. They were told that participation in the

experiment was voluntary, required the signing of an informed consent form, and attracted benefits in terms of refreshment. From an initial pool of volunteers, a random list of 150 participants (75 students involved in formal mentoring relationships and 75 students involved in the informal type of the relationship) was drawn for the study. Subsequently, the selected participants were contacted and invited for the experiment. At the beginning of the experiment, participants were required to pick one wrapped sheet of paper from a basket that contained 150 of such papers numbered 1, 2 or 3. A respondent was assigned to the positive feedback group if he or she picked 1, negative feedback group if 2 and no-feedback group if 3.

In order to make the eventual positive or negative feedback more believable, all participants were asked to take two trials of a speed test that required them to circle out figures of single digits between 0 and 9 that were identical to the one presented in bold parenthesis for each row in a table of random numbers. The speed test is a reliable and a valid manual task which has been used among the current population of study in a previous investigation (i.e. Ehigie, 1993). While the positive feedback group were given 60 seconds to enhance the chances of doing well on the task, the negative feedback group were given 30 seconds to inhibit performance. The no-feedback group were allowed 30 and 60 seconds respectively for the first and second trials. Regardless of the actual figures correctly circled, participants in the positive feedback condition were told that their performance was very impressive and that it ranged between 80 to 90 per cent. Conversely, and irrespective of their real speed test performance, participants in the negative feedback condition were told that they performed very poorly and that their performance ranged between 30 and 40 per cent. Participants in the no-feedback group were not given any feedback.

Subsequently, all participants were handed the study questionnaire to respond to questions bordering on demography, mentoring status/type and experiences. Thereafter, participants took the Purdue pegboard test (cognitive task) after they were informed about its procedure. While the Purdue pegboard is equipped with pins, collars and washers, only the pins were used for this study. Participant's scores were recorded as the total number of pins correctly fixed with both hands into the holes within 60 seconds. At the end of the test, participants were served refreshments as compensation for their time. Although a total of 150 students were invited for the study, only 132 (a preliminary response rate of 88%) were available for the experiment. However, data from 12 participants who reported simultaneous involvement as a protégé in both formal and informal mentoring relationships in the sampled university were eliminated, resulting in 120 respondents with complete data for analysis and a final response rate of 80 per cent.

Measures

Control variables: The demographic information of respondents includes sex, age, year of study and marital status. Students' sex, age and year of study were considered potential covariates in this study because previous studies (e.g. Finkelstein & Fishbach, 2009; Schroeder & Salthouse, 2004; Tollefson, 2000; Weber et al, 2014) have associated them with cognitive task performance. Consequently, the effects of sex, age and year of study were controlled in study analysis. Sex was coded 0 if a respondent was a male, and 1 if a female. Age was measured as a continuous variable but was re-coded as young (less than 21.8 years, coded as 0) and old (above 21.8 years, coded as 1) using mean age of respondents. Year of study was coded 1 if a respondent was in his or her first year of study, 2 if in second year, 3 if in third year and 4 if a fourth year student.

Type of Mentoring: Screening questions were used to elicit responses on different issues of mentoring. For the present investigation, participants were asked questions about their mentoring status and type of on-going mentoring relationship in the faculty. They were required to indicate the type of mentoring relationship on a nominal scale of formal, informal or both. To ensure that respondents understood the difference between formal and informal mentoring, formal mentoring was defined as a relationship with a mentor that was formed through official assignment to a mentor by a student's department or other units of the university, while informal mentoring was described as a relationship with a mentor that developed spontaneously.

Feedback type: Participants were randomly assigned to three feedback categories through balloting. These include the positive feedback category for participants who picked the number 1, negative feedback for those who picked 2 and no feedback for 3. Participants in the positive category were told their performance was very impressive and that correctly circled figures were between eighty and ninety per cent. Those in the negative category were told they had performed very poorly and that correctly circled figures were between thirty and forty per cent, while feedback was not provided for the no-feedback category. Previous studies (e.g. Carpentieri, Cerrato, Baldassarre & Matarazzo, 2015; Pyle, 2015) have used this method of administering positive and negative feedback. To make feedback in this study more believable, participants were given feedback after taking two trials of a speed test developed by Ehigie (1993). However, they were assigned to positive, negative or no-feedback categories irrespective of their actual performance on the speed test. The author reported a coefficient alpha reliability estimate of .82 and significant construct validity for the test which has been used among the current population of study in a previous investigation (i.e. Ehigie, 1993).

Cognitive task performance: This variable was measured using the Purdue pegboard developed by Tiffin (1968) to assess gross movement of hands, fingers and arms. The Purdue pegboard demands attention and cognitive control, making scores obtained with the instrument a suitable predictor of an individual's level of cognitive functioning (Malatesha & Hartlage, 1982; Straus, Sherman & Spreen, 2006). Indeed, studies (e.g. Eriksen, 2012; Sunderland, Bowers, Sluman, Wilcock & Ardron, 1999) have associated dexterity with cognition because it requires visual-motor coordination. The instrument is a rectangular board with a flat surface consisting of 50 small holes in 25 pairs and is equipped with pins, collars and washers that are placed in four cups at the top of the board. In this study, participants were required to fix in the pins with both hands as fast as possible within a minute. Performance on the instrument is determined by the number of pins correctly fixed in the holes within the stipulated time of 60 seconds which was kept constant for all participants using a stop-watch. The author reported test-retest reliability coefficients that range from 0.60 to 0.79 for one trial and from 0.82 to 0.91 for three trials (Radomski & Latham, 2008). The instrument has been used among the current population of study in a previous investigation (i.e. Ehigie, 1993). In the current study, the test-retest reliability coefficient was between 0.63 and 0.76 for the first trial and between 0.84 and 0.91 for the second trial.

Results

The aim of this study was to examine the main and interaction effects of mentoring and feedback on cognitive task performance. To enable the control of three covariates (sex, age and level of study) that may confound study findings, the main and interaction effects of mentoring and feedback on

cognitive task performance were tested using analysis of covariance (ANCOVA). The result is presented in Table 1.

Source	SS	df	MS	F
Sex	108.263	1	108.263	4.482*
Age	34.687	1	34.687	1.436
Year of study	2.287	1	2.287	0.095
Mentoring Type (MT)	54.061	1	54.061	2.238
Feedback Type (FT)	111.757	2	55.879	2.314
FT x MT	185.487	2	92.743	3.840*
Error	2680.981	111	24.153	
Total	3272.592	119		

*p= .05

Table 1: Summary of ANCOVA for interaction effects of type of mentoring and feedback type on cognitive task performance

Results of ANCOVA in Table 1 show that the control variables of age (F (1, 111) = 1.436, $P > .05$) and year of study (F (1, 111) = 0.095, $P > .05$) had no significant effects on cognitive performance but the effect of sex was significant, F (1, 111) = 4.482, P < .05. Thus, the mean cognitive task performance of female students (M = 41.6) is significantly higher than that of their male counterparts (M = 39.4). Results in Table 1 reveal that the main effect of mentoring is not significant, F (1, 111) = 2.238, $P > .05$. Therefore, the mean cognitive task performance of students in formal (M = 40.1) and informal relationships (M = 41.5) were comparable. Similarly, ANCOVA results presented in Table 1 show that the main effect of feedback is not significant, F (2, 111) = 2.314, $P > .05$. This indicates that the mean cognitive task performance score of students who received positive feedback (M = 42.2) as well as those who were given negative (M = 39.9) and no feedback (M = 40.5) were comparable. However, the results reveal a significant interaction effect of mentoring and feedback on cognitive task performance, F (2, 111) = 3.840, $P < .05$. The significant interaction yielded six interacting cells whose mean scores on cognitive performance are presented in Table 2.

Interacting cells	1	2	3	4	5	6	$\bar{X}$	S.D.	N
Positive/ formal mentor	-						41.94	4.77	17
Positive/ informal mentor	-0.45	-					42.61	4.84	31
Negative/formal mentor	2.12*	4.12**	-				37.33	4.96	21
Negative/informal mentor	-0.30	0.09	-3.13**	-			42.47	6.22	15
None/ formal mentor	0.19	0.62	-2.42**	0.47	-		41.58	4.64	12
None / informal mentor	1.56	2.32*	-1.52	1.84*	0.69	-	39.54	4.52	24

*mean difference significant at .05. **mean difference significant at .01

Table 2: Summary of Scheffe's multiple comparisons for interaction effects of type of mentoring and feedback type on cognitive task performance.

Further statistical analysis using the protracted t-test multiple comparison procedure was carried out to locate significant mean differences in the six interacting cells that resulted from the interaction of type of mentoring and feedback type. Results of the post hoc analysis presented in Table 2 showed that the level of cognitive task performance in the positive feedback/formal mentoring combination is significantly different from the negative feedback/formal mentoring combination ($p < .05$). The positive feedback/informal mentoring combination were also significantly different from the negative feedback/formal mentoring ($p < .01$) as well as no feedback/informal mentoring combinations ($p < .05$). Similarly, the negative feedback/formal mentoring combination is significantly different from the negative feedback/informal mentoring ($p < .01$) and the no feedback/formal mentoring ($p < .01$) combinations, while the negative feedback/informal mentoring also differed significantly from the no feedback/informal mentoring combination ($p < .05$). Post hoc analyses of the mean scores of all other combinations were not significantly different. The results suggest that the source of the interaction effects of mentoring and feedback type on cognitive task performance is the significantly low cognitive performance score of the negative feedback/formal mentoring combination, followed by the low mean score of the no feedback/informal mentoring combination. The pattern of interaction which places the foregoing combinations below all other combinations is illustrated in Figure 1. As shown in Figure 1, the worst level of cognitive task performance in the context of formal mentoring is obtained when feedback is negative, while the poorest level in the context of informal mentoring is obtained when feedback is absent. Under conditions of formal or informal mentoring, cognitive task performance is considerably better when feedback is positive than when it is negative or not provided.

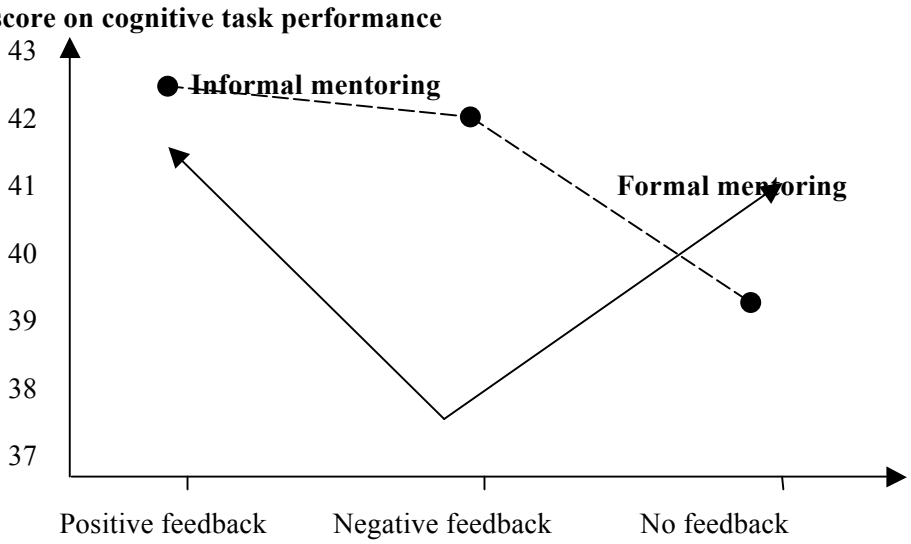

Figure 1: Interaction effects of mentoring and feedback on cognitive task performance

Discussion

The present study examined the main and interaction effects of feedback and type of mentoring on cognitive task performance in an experimental framework. This was done with a view to providing stakeholders with context-specific empirical information on how the variables are linked and aid the

effective utilisation of feedback and mentoring. The study was guided by three hypotheses: students involved in informal mentoring will be significantly better on cognitive task performance compared to their counterparts in formal relationships (H_1); type of feedback will significantly distinguish participants' cognitive task performance (H_2); mentoring type and feedback will significantly interact to influence cognitive task performance (H_3). The study narrows notable gaps in the literature such as the dearth of experimental studies on mentoring in the Nigerian setting, inconclusiveness of the extant literature on feedback, and the largely untested assumption regarding the interaction of mentoring and feedback.

The main and interaction effects of feedback and type of mentoring on cognitive task performance were examined while controlling the effects of relevant covariates such as sex, age and year of study. Of the three covariates, ANCOVA results revealed that only sex significantly influenced cognitive task performance. Being male or female resulted in significant task performance differences in favour of female students. Results of ANCOVA revealed non-significant main effects of mentoring type on a student's cognitive task performance. This suggests that formal and informal forms of the relationship resulted in comparable levels of task performance. Hence, neither students in formal mentoring nor those in the informal versions were at an advantage in terms of cognitive task performance. This is an unexpected finding because it contradicts previous arguments in the literature (e.g. Chao et al, 1992; Ragins & Cotton, 1999) that informal relationships are more beneficial because formal mentors have limited opportunities for positively impacting protégés.

One probable explanation for the non-significant main effect of mentoring type on task performance in this study is, perhaps, a satisfactory level of mentor support in both forms of the relationship. This argument is plausible because studies have reported that quality and satisfactory mentor support are key factors in a beneficial mentoring relationship (Okurame, 2012b). The current finding lays the foundation for the thesis that both forms of the relationship are capable of meeting the needs of students. This explanation is tenable in the present population for a number of reasons. First, mentoring, whether formal or informal, is increasingly encouraged and supported by academics who have demonstrated high levels of resolve to mentor (Okurame, 2009). Given that research has shown that a mentor's commitment to supporting a mentee is positively associated with quality mentoring outcomes (Lejonberg & Christophersen, 2015), the comparable levels of task performance may be explained by equivalent mentor support in both forms of the relationship. Consistent with this conclusion is further analysis that compared the level of mentor support reported by students in both forms of the relationship and revealed no statistically significant differences. Second, both forms of the relationship are specifically focused on stemming the potential for a downward slide in the academic performance of students and meeting other developmental needs. It is argued in the literature that mentoring assistance focused on the development of a protégé rather than organisational needs tend to result in more favourable mentoring outcomes (Kram, 1985). This makes it logical to expect that both forms of the relationship should result in parallel mentoring outcomes.

The non-significant main effect of feedback on cognitive task performance implies that positive, negative and no feedback conditions resulted in comparable levels of task performance. This finding suggests that positive and negative feedback as well as no-feedback condition do not significantly protect a student from the challenges of cognitive task performance. The non-significant result is consistent with research reports that the effects of feedback on performance are highly variable and may have no significant effect on performance in some conditions (Hattie & Timperley, 2007). Accordingly, a

possible explanation for the current finding is that feedback type may not be a useful independent yardstick for seeing-through differences in the cognitive task performance of the study population.

Results of statistical analysis found significant interaction effects of mentoring type and feedback on cognitive task performance. First, the interaction effect provides an alternative explanation for the non-significant main effects obtained for mentoring and feedback in the study. It implies that feedback is a relevant variable for influencing task performance within the context of mentoring, and vice versa, rather than in isolation. Second, the finding particularly advances the literature by showing that cognitive task performance can be significantly enhanced among students by combining mentoring and feedback interventions, thereby laying a foundation for the theory that feedback and mentoring interface. Further analysis using the post hoc multiple comparison method revealed that cognitive task performance is considerably enhanced by positive rather than negative feedback for students involved in the informal version of the relationship. This result suggests that the argument by some researchers (e.g. Bandura & Cervone, 1983; Fishbach et al, 2010; Ryan & Deci, 2000) that positive feedback enhances self-efficacy and goal attainment is more tenable in the informal context of mentoring. Contrary to arguments in the literature (e.g. Carver & Scheier, 1998; Fishbach et al, 2006; Higgins, 1987; Kuhnen & Tymula, 2011) that negative feedback encourages better performance because people dislike falling below expectations, receipt of negative feedback in the context of formal mentoring relationship significantly reduced the cognitive task performance of students. Indeed, a no-feedback situation, instead of negative feedback, puts students in formal relationships at a more comfortable level of task performance. These patterns of interaction effects may well parallel previous findings (e.g. Fishbach et al, 2010; Hattie & Timperley, 2007) that there are no universal effects of positive or negative feedback on task performance and that these are differentially effective.

The need to support students in their academic pursuit cannot be overemphasized. This underscores the usefulness of the current study which has a number of practical implications for supporting performance among students in the sampled institution. Therefore, a significant contribution of this study is in the application of findings to improve feedback and mentoring interventions, making the possibility of enhanced outcomes predictable. First, results reveal that mentoring in its formal or informal form leads to comparable levels of task performance. The practical implication of this is that both forms of the relationship can be utilised as useful means for enhancing task performance among students. Thus, the management of the institution would need to embark on a broader implementation of their mentoring intervention. This should involve equal management support and attention for formal and informal mentoring programmes. To this extent, stakeholders will need to make a large pool of good mentors available for formal and informal relationships and take steps to ensure that both forms of the relationship continue to achieve comparable outcomes. Two means by which these can be ensured are training and a reward policy that provides concrete incentives for effective relationships in both forms of mentoring. Findings (e.g. Dancer, 2003; Hunt & Michael, 1983) have shown that training and reward are essential ingredients for good mentoring and favourable mentoring outcome.

Study findings also show that performance feedback alone is not a practical means for enhancing cognitive task performance. First, this assertion is evident in the non-significant main effects of feedback type on task performance. Second, it is reflected in the significant interaction effects of feedback and mentoring which revealed varying levels of usefulness of positive, negative and no-feedback condition in formal and informal mentoring relationships. Therefore, a major challenge for stakeholders

will be to identify and utilise the type of feedback that is most effective for each type of mentoring relationship, and to pay special attention to this when potential mentors are offered training.

Another significant contribution of this study is in its implication for mentoring theory and practice. First, the finding that comparable levels of cognitive task performance were obtained by students in formal and informal mentoring relationships lays the foundation for the value of formal mentoring programmes. This counters other evidence that formal mentoring relationships are less effective. The current findings strengthen an earlier assertion that mentoring is not an 'all or nothing' phenomenon (Okurame, 2012b; Ragins & Cotton, 1999). Second, findings of the present study provide the basis for the theory that mentoring and feedback interplay to influence outcome variables. Third, research on mentoring has progressed with less integration with research in other fields (Scandura & Pellegrini, 2007; Wanberg, Welsh & Hezlett, 2003). Therefore, the present study provides an opportunity to direct empirical attention to integrating mentoring with the literature on cognitive psychology to prompt further research in this area.

Although, the findings of the current study are particularly useful for enhancing cognitive task performance among students, caution should be exercised in the interpretation of results because of study limitations. First, this is an exploratory study. Much of the research on mentoring in higher educational institutions has been conducted among Western samples. Indeed, divergent findings on the type of mentoring may underscore cross-cultural differences in the expectations and process of formal mentoring. Consequently, additional studies are required to ascertain if the current findings can be supported, and to clarify if formal mentoring in Nigeria differs from that in Western cultures. Second, the study examined the main and interaction effects of feedback and mentoring on cognitive task performance after controlling for the influence of confounding factors such as sex, age and year of study. However, results do not imply that cognitive task performance is totally accounted for by the independent variables examined in this study. Indeed, other variables not examined in this study may be similarly relevant in explaining task performance. Additionally, it is important to note that mentoring relationships examined in the study were ongoing. Thus, students in formal and informal relationships were not randomly assigned to mentoring groups and the type of mentoring was manipulated without a control group who did not receive mentoring support. Besides, the study did not consider the influence of other characteristics of the relationship on cognitive task performance. In addition, although the provision of feedback is typical within a mentoring relationship, it was treated as a separate intervention in the examination of its interaction with the type of mentoring, thereby creating a disconnection between the context of mentoring and the administration of feedback. Lastly, the impact of feedback in terms of mechanisms such as style, interpretation and acceptance of feedback and frequency, were not considered in the present study.

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