Dynamics of goal characterization in students’ exams-preparation systemic activity transition processes

Mohammed-Aminu Sanda

To cite this article: Mohammed-Aminu Sanda (2019): Dynamics of goal characterization in students’ exams-preparation systemic activity transition processes, Theoretical Issues in Ergonomics Science, DOI: 10.1080/1463922X.2019.1658243

To link to this article: https://doi.org/10.1080/1463922X.2019.1658243
Dynamics of goal characterization in students’ exams-preparation systemic activity transition processes

Mohammed-Aminu Sanda\textsuperscript{a,b}

\textsuperscript{a}Department of Organization and Human Resource Management, University of Ghana Business School, University of Ghana, Legon, Accra, Ghana; \textsuperscript{b}Division of Human Work Sciences, School of Business Administration, Technology and Social Sciences, Luleå University of Technology, Luleå, Sweden

\textbf{ABSTRACT}

This study examined the influence of students’ goal characterization on their goal-formation processes, as characterized by their goal-classification, the systemic consideration of their activity-strategies and decision-outcomes when preparing for an examination. Using the Structural Equation Modeling approach, a functional analysis underlined by systemic principles was conducted. Firstly, the issue of whether the influence of students’ considerations of activity strategies on their decision outcomes is truly moderated by their activity goal formations, if they set highest-goals, is determined. Secondly, the issue of whether the influence of students’ considerations of activity strategies on their decision outcomes is truly mediated by their activity goal formations, if they set best-goals, is also determined. Based on the findings, the conscious goal-directed processes associated to the emergence of an individual’s thoughtfully mastered learning activity and its consequence on future design of systemic structural activity of individuals will be established.

\textbf{Relevance to human factors/Relevance to ergonomics theory}

Insight is provided on the cognitive effect of tasks’ goal-characterizations on actors’ goal formulation processes leading to their systemic consideration of activity-strategies and decision-outcomes during task preparations. For systemic structural activity system design, Learning is provided on the cognitive implication of prescribed goal-setting on actors’ systemic expectation of performance outcomes.

\textbf{1. Introduction}

At the workplace, actors engage in activities that constitute practices. It is the performance of these activities that leads to actors attaining habitual accomplishment of specific tasks. As such, practices that actors engage in, are influenced by both the social history and rationality of the practices, even though the former is viewed by Jarzabkowski (2003) to be of higher significance than the latter. By implication, the human-orienting activity of actors
cannot be reduced to situation awareness, because it includes both the conscious and uncon-
scious components, and is also responsible for developing a static as well as a dynamic
model of reality (Bedny and Karwowski 2004). Thus, actors interact with the psychosocial
and physical features of the context of their systemic activities (Sanda 2016). This implies
that tasks performed by actors are conducted in both the micro- and macro contexts (Sanda
2016). In the micro-context, actions entailed in the task are deemed as highly localized),
whereas in the macro-context, the commonalities of the localized actions are established
(Bedny and Karwowski 2007; Sanda et al. 2014). Thus, the interaction between a task's
micro-context and its macro-context makes visible the challenges of task uncertainty (Bedny
and Karwowski 2007; Sanda et al. 2014). It is these challenges that provide opportunity for
adaptive practice (Jarzabkowski 2003). Such task uncertainty indicates the complexity and
difficulty characteristics of an organizational activity (Bedny and Karwowski 2007; Sanda
et al. 2014).

Work practices are understood as more or less stable, historically developed and partially
unacknowledged arrays of activity, which are at the basis of successful action in a particular
work setting (Nathanael and Marmaras 2008). Since complexity does not have a subjective
component (Bedny and Karwowski 2007), an actor cannot experience complexity directly,
but can perceive it as a subjective difficulty (Sanda et al. 2014). In this regard, different
actors, depending on the level of their cognition, skills and individual features, can evaluate
the same complex task as either difficult or not difficult (Bedny and Karwowski 2007; Sanda
2017). This implies that an increase in the complexity of an organizational activity could
probably result in an increase in the cognitive effort that an actor will exert (Bedny and
Karwowski 2007; Sanda 2017). As such, understanding an actor's activity as influenced by
the dichotomy of its complexity and difficulty characteristics should be deemed important
in the task design process. As it is noted by St-Maurice and Burns (2018), there are several
reasons to compare and transfer knowledge between complex sociotechnical systems.
Conceptually, understanding system differences in complex environments can highlight
the behaviors, processes, values and training that drive performance and ensure safety
(St-Maurice and Burns 2018). Thus, in the design processes of an actor's activity, it is impor-
tant to identify and distinguish the complexities associated with the activity's cognitive
attributions, as informed by the specificity of its information processing, and its emotion-
al-motivational attribution, as informed by its energetic aspects (Sanda 2017; Sanda et al.
2012). Making visible these attributions of complexity will enable the designers of actors'
activities to understand the practice enhancing strategies used by actors to mediate the
cognitive difficulties and the emotional-motivational challenges inherent in their designed
activities (Sanda 2017; Sanda et al. 2012).

The complexity of human work process is highlighted by the characteristics of its sub-
structure (Sanda et al. 2014). The basic components of such work process, as categorized
by Bedny and Karwowski (2007) include motive-goal, knowledge and skills, abilities and
work actions, both cognitive and motor, which are organized into a structure representing
method of work. While the motive-goal demonstrates the directional and energetic aspects
of the work activity, the knowledge and skills demonstrate the relevance of past-experience
to the work process (Bedny and Karwowski 2007). In this regard, the structure of a work
process is embedded in the concept of knowledge and action (Bedny and Karwowski 2007),
and in the application of mental tools (Bedny and Karwowski 2007; Sanda et al. 2014). Thus,
in preparing for complex tasks, actors must choose appropriate strategies (Sanda 2018),
and must have the ability to attain or at least approach their goals (Locke et al. 1981). This implies that strategy development is motivated by goals (Locke et al. 1981). As such, the strategy development mechanism is cognitive in essence, and involves either skill development or creative problem-solving (Locke et al. 1981).

As it is established in the extant literature, the discovery of goals is essential to true activity. This is because, goals as discrete elements of activities, can be transformed into contradictions, which may demand creative solutions. It has also been argued that goals, which may be expanded and generalized into a qualitatively new activity structure, could be analyzed and connected with their systemic activity contexts. According to Sanda (2018), when an actor is preparing to engage in a pending organizational activity, different neuro-oriented activities occur in the transition of the actor’s conscious goal-directed processes to the emergence of his/her thoughtfully mastered learning activity. The transitional dynamics in such neuro-oriented activities are shaped by the actor’s activity goal formation, as characterized by the psychological qualification of the goal’s orientation as “best” or “highest”. Arguing from the perspectives of Marmaras and Nathanael (2005), the exploration of such neuro-oriented activities is within the frame of the growing scope of cognitive engineering and neuroergonomics research which calls for the adoption of multiple views for a sufficient understanding of the students’ analyzed world, and exploitation of the dialectic process between understanding and prediction of the students’ cognitive expectation of their exam activity performance.

This study therefore sought to understand the cognitive dynamics of students’ preparation for exams-writing activity, especially the dichotomous influence of task complexity and difficulty on their goal-formation processes, as characterized by their goal-classification, and its influence on the systemic consideration of their activity-strategies and decision-outcomes. This is to address the gap relative to the realistic understanding of whether students’ characterization of goals relative to examination activity, is shaped by the historicity and complexity of the activity, and also whether these elements have realistic influence on students’ cognitive consideration of strategies and decision outcomes with its consequential effect on their cognitive expectation of the exam activity performance.

2. Literature review

Ergonomics is concerned with how humans interact with systems to perform tasks that achieve goals (Richardson and Ball 2009). This interaction requires thought processes that construct and manipulate mental representations of situations to enable the selection of task-oriented actions having predicted outcomes. Mental representations are, then, central to task performance and therefore ergonomics (Richardson and Ball 2009). Neuroergonomics, on the other hand focuses on investigations of the neural bases of mental functions and physical performance in relation to technology, work, leisure, transportation, health care and other settings in the real world (Parasuraman 2003). The two major goals of neuroergonomics, according to Parasuraman (2003) are to use knowledge of brain function and human performance to design technologies and work environments for safer and more efficient operation, and to advance understanding of brain function underlying real-world human performance (Parasuraman 2003).
2.1. Conceptualization of goals

Key variable in self-regulation is goal setting (Locke and Latham 2002). As the complexity of the task increases and higher-level skills and strategies have yet to become automatized, goal effects are dependent on the ability to discover appropriate task strategies (Locke and Latham 2002). Thus, in seeking to understand the dialectical complexities of an activity, there is the need to consider the existence of multiple goals (Sanda 2017). This is because, in most cases, an actor’s activity cannot be adequately interpreted upon the assumption that it is organized around a single, neatly identifiable goal (Sanda 2017). Instead, multiple goals, that are often in interaction and sometimes in conflict, are typically involved (Sanda 2017; Sanda et al. 2012).

A goal is characterized by Locke (1969) as what an individual tries to accomplish which is reflective of the object or aim of an action. The concept is similar in meaning to the concepts of purpose and intent (Locke 1969). Other frequently used concepts outlined by Locke et al. (1981) which have similar meanings to that of goal include the following; performance standard (a measuring rod for evaluating performance), quota (a minimum amount of work or production), work norm (a standard of acceptable behavior defined by a work group), task (a piece of work to be accomplished), objective (the ultimate aim of an action or series of actions), deadline (a time limit for completing a task), and budget (a spending goal or limit).

In the conduct of a systemic activity, Bedny, Karwowski and Bedny (2012) have outlined how an actor creates a goal, a subjective mental model of the activity, the type of exploratory actions and operations utilized, the possible types of mental models developed, and how preferable mental models are selected. According to Bedny et al. (2012), the outcome of an actor’s self-regulation activity is informed by the formation of the actor’s mental representation of the activity prior to its execution. This is because the cognitive processes which inform an actor’s mental representation of an activity are integrated (Bedny et al. 2012). This situation facilitates the formation of self-regulation mechanisms that are needed to achieve specific purpose of an organizational activity (Bedny et al. 2012). Thus, in identifying factors that influence practices evolving from actors’ activities in organizations, it is important to understand the practices that are entrenched in an actor’s conscious goal-directed processes that leads to the emergence of the actor’s thoughtfully mastered learning activity (Sanda 2017).

According to Sanda (2018), the conscious goal-directed processes of an actor are influenced by the history of the actor’s previous task engagements and his/her subjective perception of complexity in an impending task. Also, when the actor is preparing to engage in a pending organizational activity (writing examination in this study), different neuro-oriented activities occur in the transition of the individual’s conscious goal-directed processes to the emergence of thoughtfully mastered learning activity of the individual Sanda (2018). The transitional dynamics in such neuro-oriented activities is shaped by the psycho-characteristics of the activity goal formation, in terms of the individual “aiming for a best goal” or “setting the highest goal” (Sanda 2018).

2.2. Goal-setting and characterization

According to Locke et al. (1981), in most goal-setting studies, the term goal refers to attaining a specific standard of proficiency on a task, usually within a specified time limit. Since
a goal is the object or aim of an action, it is possible for the completion of a task to be a goal (Locke et al. 1981). The basic assumption of goal-setting research, according to Locke et al. (1981), is that goals are immediate regulators of human action. However, no one-to-one correspondence between goals and action is assumed because people may make errors, lack the ability to attain their objectives (Locke 1968), or have subconscious conflicts or premises that subvert their conscious goals (Locke et al. 1981). Thus, given that goal setting works, it is relevant to ask how it affects task performance (Locke et al. 1981). Thus, goal setting could be viewed primarily, as a motivational mechanism, even though cognitive elements are necessarily involved (Locke et al. 1981). As such, goals tend to regulate performance most predictably when they are expressed in specific quantitative terms or as specific intentions to take certain actions rather than as vague intentions to “try hard” or as subjective estimates of task or goal difficulty (Locke et al. 1981).

Goals according to Locke and Latham (2002), affect performance through four mechanisms. Firstly, goals serve a directive function by directing attention and effort toward goal-relevant activities and away from goal-irrelevant activities Locke and Latham (2002). This effect, according to Locke and Latham (2002), occurs both cognitively and behaviorally. To exemplify this observation, Locke and Latham (2002) cited Rothkopf and Billington’s (1979) findings to the effect that students with specific learning goals paid attention to and learned goal-relevant prose passages better than goal-irrelevant passages. Secondly, goals have energizing functions, with high goals leading to greater effort than low goals Locke and Latham (2002). This, according to Locke and Latham (2002) has been shown with tasks that directly entail physical effort, such as the ergometer (Bandura and Cervone 1983); task entailing repeated performance of simple cognitive tasks, such as addition Locke and Latham (2002), task that include measurements of subjective effort (Bryan and Locke 1967a); and physiological indicators of effort (Sales 1970). Thirdly, goals affect persistence (Locke and Latham 2002), and when participants are allowed to control the time they spend on a task, hard goals prolong effort (LaPorte and Nath 1976). However, according to Locke and Latham (2002) there is often a trade-off in work between time and intensity of effort. Faced with a difficult goal, it is possible to work faster and more intensely for a short period or to work more slowly and less intensely for a long period Locke and Latham (2002). By implication, tight deadlines are seen to lead to a more rapid work pace than loose deadlines in the laboratory (Bryan and Locke 1967b) and in the field (Latham and Locke 1975). Fourthly, goals affect action indirectly by leading to the arousal, discovery, and/or use of task-relevant knowledge and strategies (Wood and Locke 1990). It is a virtual axiom that all action is the result of cognition and motivation, but these elements can interact in complex ways (Locke and Latham 2002). In this vein, meta cognitive factors are deemed to influence the efficacy of problem-solving capability in managing a micro-world control task (Elg 2005). In other words, a goal level or implicitly the control problem difficulty, interact with psychometric intelligence to determine control performance (Elg 2005).

As reported in the extant literature, research conducted more than five decades ago found that specific challenging (difficult) goals led to higher output than vague goals such as actors being asked to do their best (Locke 1968). Locke et al. (1981) reported no differences in the results obtained by studies on tasks whose actors have no-goals, and that in which actors are explicitly told to do their best. According to Locke et al. (1981), it appears that actors with no-goal, typically try to do as well as they can on their assigned task. According to Locke et al. (1981), the terms “task difficulty” and “goal difficulty” are often used
interchangeably, but a distinction between them can be made. While a task can be viewed as a piece of work to be accomplished, a difficult task is one that is deemed as hard to perform and requires a high level of skill and knowledge (Locke et al. 1981). In this respect, actors automatically use the knowledge and skills they have already acquired that are relevant to goal attainment, when confronted with task goals (Locke and Latham 2002). If the path to the goal is not a matter of using automatized skills, actors will draw from their previously used repertoire of skills in related contexts, and which are applicable in a prevailing situation (Locke and Latham 2002). Similarly, if the task for which a goal is assigned is new to actors, they will engage in deliberate planning to develop strategies that will enable them to attain their goals (Smith, Locke and Barry 1990). In this regard, actors with high self-efficacy are more likely than those with low self-efficacy to develop effective task strategies (Latham, Winters and Locke 1994; Wood and Bandura 1989). As such, a time lag will evolve between assignment of a goal and the effects of the goal on performance, as actors search for appropriate strategies (Smith et al. 1990). When actors are confronted with a task that is complex for them, urging them to do their best sometimes leads to better strategies (Earley, Connolly and Ekegren 1989) than setting a specific difficult performance goal (Locke and Latham, 2002). This, according to Locke and Latham (2002), is because a performance goal can make actors become so anxious to succeed and as such will scramble to discover strategies in an unsystematic way and thus fail to learn what is effective, a situation than can create evaluative pressure and performance anxiety (Locke and Latham 2002). The antidote to this is to set specific challenging learning goals, such as to discover a certain number of different strategies to master the task (Seijts and Latham 2001; Winters and Latham 1996). When actors are trained in the proper strategies, those given specific high-performance goals are more likely to use those strategies and hence improve their performances, than actors given other types of goals (Earley and Perry 1987, Locke and Latham 2002). In this wise, if the strategy used by an actor is inappropriate, then a difficult performance-outcome goal will lead to a worse performance than a goal oriented as “easy” (Audia, Locke and Smith 2000; Earley and Perry 1987; Locke 2000; Locke and Latham 2002).

Therefore, based on the reviewed literature, the model shown in Figure 1 below is proposed to outline the dynamics students’ goal formulation, as shaped by their goal-characterization (either as best or highest), in their systemic consideration of activity-strategies and decision-outcomes when preparing for examination activity.

3. Method and material

The cognitive work analysis framework continues to attract increasing attention from the human factors and ergonomics community (Salmon, Jenkins, Stanton and Walker 2010). Conversely, hierarchical task analysis has been, and remains, the most popular of all human factors and ergonomics methods (Salmon et al. 2010). Despite the very different theoretical and methodological nature of the two approaches, and also the entirely different analyses derived, Salmon et al. (2010) argued that the two methods provide highly complementary outputs, and that there is benefit in applying both approaches to inform the design and/or evaluation of the same product or system. In this vein, the quantitative method of task complexity evaluation suggests a requirement for measurement procedures and units of measurement that enables different elements of activity to be compared (Bedny and
Thus, aside the use of experimental and theoretical approaches in evaluating task complexity (Bedny and Karwowski 2007), expert judgments, such as the use of a five-point scale can be used for the subjective evaluation of the task's complexity, historicity, goal formulation, strategy formulation and outcome decision-making (Sanda 2017). Thus, arguing from the perspectives of Bedny and Karwowski (2006, 2007) and Sanda et al. (2014), the fundamental notions of task historicity, complexity, goal formation, strategy formulation and outcome decision-making are significant in an examination writing activity. As such, modeling of the activity will permit teachers to take into consideration, not only the cognitive and behavioral aspects of the activity, but also its motivational aspects. In this regard, the subjective opinions of the students preparing for the examination (task performers) were taken into consideration.

Arguing from the perspective of Engeström (1987) and Sanda (2006), the conscious goal-directed processes of an actor preparing for an organizational activity, which is situated in the actor's actions (a manifestation of his/her thinking), is influenced by the history of the actor's previous task engagement and his/her subjective perception of new task (Bedny and Karwowski 2007; Sanda 2017). This is based on the premise that the goals, being discrete elements of activities, can be transformed into contradictions, which may demand creative solutions, as well as expanded and generalized into a qualitatively new activity structure within societal productive practice (Engeström 1987). Using the systemic analytical approach (Bedny and Karwowski 2006, 2007; Sanda 2016), the influence of historicity on the cognitive aspect of complexity that informs the specificity of goal formation in examination writing activity, and those emotional-motivational consequences of the historicity and complexity

Figure 1. Conceptualized model of students' systemic exam-writing preparation activity.
dichotomy on goal formation and its subsequent impact on actors’ strategy formation and outcome decisions formulations in the examination writing activity were evaluated.

3.1. Data collection procedure

Based on the well-established knowledge that activities of individuals are realized by goal-directed actions, informed either by mental or motor conscious processes, as objects of the cognitive psychology of skills and performances, an experimentation on individual differences of maximization in examination activity goal formation and decision outcomes was performed. Using the maximization measurement scale (Dalal, Diab, Zhu and Hwang 2015), a self-administering questionnaire (see Appendix 1, Supplementary material) was developed and used as the data collection tool. The questionnaire included a synopsis that explained the research purpose and objectives. It also included an ethical section informed by University of Ghana’s research ethics that addressed the issue of respondents’ consent and rights to participate in the research. Data were collected from 338 Graduate Students, all of whom were pursuing the Master of Business Administration (MBA) degree programme at the University of Ghana Business School, in Accra, Ghana. Being Graduate students, all the respondents hold a first university degree, and as such, were highly educated and have written examinations so many times for so many years as they progress on the education ladder. As part of the participants’ self-administering process of the questionnaires, each participant was given a copy of the questionnaire with a return-envelope by the researcher. The researcher asked each participant to firstly read the ‘research synopsis’ as well as the ‘consent and rights of participants’ provided in the questionnaire. All the participants were asked by the researcher to return their questionnaires, whether completed or not, in the envelope provided, well-sealed. At the time of data collection, the respondents were preparing to write their end of second semester examinations.

3.2. Data analysis procedure

Using the systemic analytical approach (Bedny and Karwowski 2007; Sanda et al. 2014), the influence of an individual’s goal formation characteristics (i.e. either best goal or highest goal) on the transition of his/her consideration of activity strategy and outcome decisions in examination writing activity was analyzed. The collated data were analyzed stepwise, firstly descriptively, and secondly inferentially using the structural equation modelling (SEM) approach with the analysis of moment structures (AMOS) as analytical technique (Sanda and Kuada 2016). This procedure has the advantage of maximizing the validity of the estimates (Di Stefano, Zhu and Mindrilă 2009). The AMOS graphics enables the conduct of analyses for multiple levels of variables using a range of in-built statistical techniques (Sanda and Kuada 2016). In the first step, path analysis was carried out to test the predictability of measured individual factors that constitute the various components of the conceptualized model shown in Figure 1. In this analysis, the path coefficients (i.e. model fit estimates) for both the observed variables (i.e. perceived task difficulty, perceived task experience, goal characterization, decision outcome expectation, and consideration of activity strategy) and unobserved variables (i.e. cognitive formulation of best goal, cognitive consideration of activity strategy, cognitive effect of best goal on
strategy-outcome transition, cognitive consideration of outcome decision, and cognitive expectation of best goal activity performance) were appraised and the model-fit of their relationships tested. The AMOS graphics statistical software is used as the analytical tool. At the start of the analysis, each of the latent variables in the proposed (see Figure 1) was loaded in the AMOS software to assess the model-fit of their respective measurable indicators (factors). The model fit is interpreted from the perspective of Schumacker and Lomax (2004) that the value of a path coefficient must be 0.7 or higher. The criteria used to establish model acceptance and fit are the Chi Square (CMIN) and the Comparative Fit Index (CFI). For the CMIN, a probability value below 0.05 implies model acceptance. CFI values close to 1.0 also indicates a very good model fit.

4. Results and discussion

Gender analysis showed that, out of the total 338 questionnaires retrieved, 296 respondents indicated their gender while 42 did not. Out of the 296 who indicated their gender, 180 (60.8%) were females and 116 (39.2%) were males.

4.1. Structural analysis of conceptualized model

In this analysis, the predictive factors (observed endogenous variables), included a student’s Perception of Task Difficulty (PTC), Perception of Task Experience (RSTO), Best goal (BG), Highest goal (HG), Consideration of Activity Strategy (PATP), Decision Outcome Expectation (PSTO), Strategic Decision of “What-To-Do” Starting Only When Best-Goal is Formed (SDBG) and Strategic Decision of “What-To-Do” Starting Only When Highest-Goal is Formed (SDHG). Similarly, the latent (unobserved) variables included a student’s Expected Performance, Outcome Decision, Cognitive Strategy, Goal Formulation, Best Goal Strategy and Highest Goal, all referred to as unobserved endogenous variables, as well as Task Difficulty and Task Experience, also referred to as unobserved exogenous variables.

The AMOS-generated standardized path diagram showing the standardized path coefficients in the structural models for best-goal and highest-goal settings are shown below in Figure 2 and Figure 3 respectively.

The goodness of fit statistics of the best-goal model (Figure 2 above) and highest-goal (Figure 3 above) model showed that overall, minimum was achieved for the respective models. The goodness of fit statistics for Figure 2 showed that the overall model fit for best-goal appears quite good. This is because the estimated $\chi^2$ of 166.95 (df = 10) has probability level of 0.00 which is smaller than the 0.05 used by convention. Thus, the null hypothesis that the model fits the data is accepted. Also, the estimate for the Comparative Fit Index (CFI) of 1.00 indicates an acceptance of the null hypothesis of a good fit for the tested model. Similarly, the goodness of fit statistics for Figure 3 showed that the overall model fit for highest-goal appears quite good. This is because the estimated $\chi^2$ of 190.36 (df = 10) has probability level of 0.00 which is smaller than the 0.05 used by convention. Thus, the null hypothesis that the model fits the data is accepted. Also, the estimate for the Comparative Fit Index (CFI) of 1.00 indicates an acceptance of the null hypothesis of a good fit for the tested model.
4.2. Interactive effects of latent variables’ in best goal structural model

In this analysis, the interactive direct and indirect effects of the unobserved endogenous and exogenous variables (i.e. latent variables) in the best-goal structural model, as highlighted in Figure 2 above, are determined. The standardized regression estimates for the latent variables’ interactive effects in the model are shown in Table 1.
Using Schumacker and Lomax’s (2004) threshold value of 0.7 or higher for significant variable effect on another, it is firstly inferred from Table 1 above that students’ Task Experiences have very significant direct effect on their Goal Formulation when they characterize their goals as best ($r = 1.95$). On the contrary, such Task Experiences have very significant indirect effects on their Goal Strategy ($r = 1.03$), Cognitive Strategy ($r = 1.03$), and Expected Performance ($r = 1.12$).

Figure 3. AMOS graphics generated path diagram showing standardized path coefficients in the structural model for students formulating highest goals.
Table 1. Standardized regression estimates for latent variables’ direct and indirect interactive effects for best goals structural model.

<table>
<thead>
<tr>
<th>Interactive latent variables</th>
<th>Task experience</th>
<th>Task difficulty</th>
<th>Goal formulation</th>
<th>Cognitive strategy</th>
<th>Goal strategy</th>
<th>Outcome decision</th>
<th>Expected performance</th>
<th>Regression values (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal formulation</td>
<td>-1.95</td>
<td>0.00</td>
<td>2.08</td>
<td>0.53</td>
<td>0.86</td>
<td>0.40</td>
<td>0.35</td>
<td>1.00</td>
</tr>
<tr>
<td>Cognitive strategy</td>
<td>0.00</td>
<td>0.00</td>
<td>1.09</td>
<td>1.09</td>
<td>1.00</td>
<td>0.86</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Goal strategy</td>
<td>0.00</td>
<td>0.00</td>
<td>1.03</td>
<td>0.86</td>
<td>0.35</td>
<td>0.00</td>
<td>0.31</td>
<td>0.00</td>
</tr>
<tr>
<td>Outcome decision</td>
<td>0.00</td>
<td>0.00</td>
<td>0.89</td>
<td>0.31</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

and Outcome Decision (r = 0.89) when they characterize their goals as best. Yet, the students’ Task Experiences have no significant direct (r = 0.00) or indirect (r = 0.31) effect on their Expected Performances when they characterize their goals as best.

Secondly, students’ perception of Task Difficulty has very significant direct effect on their Goal Formulation when they characterize their goals as best (r = 2.08). Additionally, such Task Difficulty has very significant indirect effects on their Goal Strategy (R = 1.09), Cognitive Strategy (r = 1.09) and Outcome Decision (r = 0.89) when they characterize their goals as best. Yet, the students’ Task Experiences have no significant direct (r = 0.00) or indirect (r = 0.31) effect on their Expected Performances when they characterize their goals as best. On the contrary, the students’ perception of Task Difficulty has no significant direct (r = 0.00) or indirect (r = 0.31) effect on their Expected Performances when they characterize their goals as best.

Thirdly, students’ Cognitive Strategy for the task has significant direct effect on their Goal Strategy when they characterize their goals as best (r = 1.00). Additionally, such Cognitive Strategy has significant indirect effects on their Outcome Decision (r = 0.86) when they characterize their goals as best. On the contrary, the students’ Cognitive Strategy have no significant direct (r = 0.00) or indirect (r = 0.31) effect on their Expected Performances when they characterize their goals as best.

Fourthly, students’ Goal Strategy for the task has significant direct effect on their Outcome Decision when they characterize their goals as best (r = 0.86), but has no significant direct (r = 0.00) or indirect (r = 0.31) effect on their Expected Performances.

Lastly, it is obvious from Table 1 that the students’ Goal Formulation has no significant direct or indirect effects on their Cognitive Strategy, Goal Strategy, Outcome Decision, Expected Performances when they characterize their goals as best.

Based on the findings above, the model of students’ psycho-systemic process of best-goal formulation to performance expectation in exam-writing activity is presented in Figure 4.
It is inferred from Figure 4 above that, the notion that “in the emergence of an individual’s thoughtfully mastered learning when readying for a best-goal-oriented task, his/her characterization of the goal as “best” in his/her activity goal formulation mediates the influences that the individual’s consideration of activity strategies has on his/her considerations of decision outcomes does not hold. By implication, the characterization of the goal as “best” has no effect on the influence that his/her cognitive processes in the goal formulation has on the transition of his/her Cognitive consideration of the activity strategy and the Cognitive consideration of decisions for the activity outcome. Rather, the best goal characterization appears to have significant positive influence on the individual’s Cognitive consideration of activity strategy. The sense in this finding is underscored by Earley, Connolly and Ekegren’s (1989) argument, corroborated by Locke and Latham (2002) that when actors are confronted with a task that is complex for them, urging them to do their best sometimes leads to better strategies than setting a specific difficult performance goal. Locke et al. (1981) reported no differences in the results obtained by studies on tasks whose actors have no-goals, and that in which actors are explicitly told to do their best. According to Locke et al. (1981), it appears that actors with no-goal, typically try to do as well as they can on their assigned task. Arguing from the perspective of Locke and Latham (2002), the findings show that when an actor is confronted with task goals, the actor automatically use the knowledge and skills he/she has already acquired and which he/she perceive as relevant to goal attainment (Locke and Latham, 2002). In this regard, as observed by Locke and Latham (2002), an actor will draw from a repertoire of skills that he/she has used previously in

Figure 4. Derived model of students’ psycho-systemic process of best-goal formulation to performance expectation in exam-writing activity.
related contexts, and which he/she will tend to apply in his/her prevailing situation. If the path to the goal is not a matter of using automatized skills (Locke and Latham 2002).

### 4.3. Interactive effects of latent variables’ in highest goal structural model

In this analysis, the interactive direct and indirect effects of the unobserved endogenous and exogenous variables (i.e. latent variables) in the highest-goal structural model, as highlighted in Figure 3, are determined. The standardized regression estimates for the latent variables’ interactive effects in the model are shown in Table 2.

Using Schumacker and Lomax’s (2004) threshold value of 0.7 or higher for significant variable effect on another, it is firstly inferred from Table 1 above that students’ Task Experiences have very significant direct effect on their Goal Formulation when they characterize their set goals as highest (r = 1.45). On the contrary, such Task Experiences have very significant indirect effects on their Goal Strategy (r = 1.25), Cognitive Strategy (r = 1.25) and Outcome Decision (r = 0.89) when they characterize their goals as highest. Yet, the students’ Task Experiences have no significant direct (r = 0.00) or indirect (r = 0.31) effect on their Expected Performances when they characterize their goals as highest.

Secondly, students’ perception of Task Difficulty has significant direct effect on their Goal Formulation when they characterize their goals as highest (r = 1.52). Additionally, such Task Difficulty has very significant indirect effects on their Goal Strategy (R = 1.31), Cognitive Strategy (r = 1.31) and Outcome Decision (r = 0.93) when they characterize their goals as highest. Yet, the students’ Task Experiences have no significant direct (r = 0.00) or indirect (r = 0.31) effect on their Expected Performances when they characterize their goals as highest. On the contrary, the students’ perception of Task Difficulty has no significant

---

**Table 2.** Standardized regression estimates for latent variables’ direct and indirect interactive effects for highest-goals structural model.

<table>
<thead>
<tr>
<th>Interactive latent variables</th>
<th>Regression values (R)</th>
<th>Direct effect</th>
<th>Indirect effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal formulation</td>
<td>Task experience</td>
<td>1.45</td>
<td>0.00</td>
</tr>
<tr>
<td>Cognitive strategy</td>
<td>Task experience</td>
<td>0.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Goal strategy</td>
<td>Task experience</td>
<td>0.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Outcome decision</td>
<td>Task experience</td>
<td>0.00</td>
<td>0.89</td>
</tr>
<tr>
<td>Expected performance</td>
<td>Task experience</td>
<td>0.00</td>
<td>0.31</td>
</tr>
<tr>
<td>Goal formulation</td>
<td>Task difficulty</td>
<td>1.52</td>
<td>0.00</td>
</tr>
<tr>
<td>Cognitive strategy</td>
<td>Task difficulty</td>
<td>0.00</td>
<td>1.31</td>
</tr>
<tr>
<td>Goal strategy</td>
<td>Task difficulty</td>
<td>0.00</td>
<td>1.31</td>
</tr>
<tr>
<td>Outcome decision</td>
<td>Task difficulty</td>
<td>0.00</td>
<td>0.93</td>
</tr>
<tr>
<td>Outcome decision</td>
<td>Cognitive strategy</td>
<td>0.00</td>
<td>0.71</td>
</tr>
<tr>
<td>Expected performance</td>
<td>Task difficulty</td>
<td>0.00</td>
<td>0.32</td>
</tr>
<tr>
<td>Cognitive strategy</td>
<td>Goal formulation</td>
<td>0.86</td>
<td>0.00</td>
</tr>
<tr>
<td>Goal strategy</td>
<td>Goal formulation</td>
<td>0.00</td>
<td>0.86</td>
</tr>
<tr>
<td>Outcome decision</td>
<td>Goal formulation</td>
<td>0.00</td>
<td>0.61</td>
</tr>
<tr>
<td>Expected performance</td>
<td>Goal formulation</td>
<td>0.00</td>
<td>0.21</td>
</tr>
<tr>
<td>Goal strategy</td>
<td>Cognitive strategy</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Expected performance</td>
<td>Cognitive strategy</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Outcome decision</td>
<td>Goal strategy</td>
<td>0.71</td>
<td>0.00</td>
</tr>
<tr>
<td>Expected performance</td>
<td>Goal strategy</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Cognitive strategy</td>
<td>Outcome decision</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Expected performance</td>
<td>Outcome decision</td>
<td>0.35</td>
<td>0.00</td>
</tr>
</tbody>
</table>
direct \( r = 0.00 \) or indirect \( r = 0.32 \) effect on their Expected Performances when they characterize their goals as highest.

Thirdly, students’ Cognitive Strategy for the task has significant direct effect on their Goal Strategy when they characterize their goals as best \( r = 1.00 \). Additionally, such Cognitive Strategy has significant indirect effects on their Outcome Decision \( r = 0.71 \) when they characterize their goals as best. On the contrary, the students’ Cognitive Strategy has no significant direct \( r = 0.00 \) or indirect \( r = 0.25 \) effect on their Expected Performances when they characterize their goals as highest.

Fourthly, students’ Goal Strategy for the task has significant direct effect on their Outcome Decision when they characterize their goals as highest \( r = 0.71 \), but have no significant direct \( r = 0.00 \) or indirect \( r = 0.25 \) effect on their Expected Performances. Similarly, the students’ Outcome Decision has no significant direct or indirect effect on their Cognitive Strategy and Expected Performances.

Lastly, it is obvious from Table 1 that the students’ Goal Formulation has a significant direct effect on their Cognitive Strategy \( r = 0.86 \), as well as a significant and appreciable indirect effect on their Goal Strategy \( r = 0.86 \), and Outcome Decision \( r = 0.61 \), respectively. The Goal Formulation has neither direct nor indirect effect on the students Expected Performances when they characterize their goals as highest.

Based on these findings, the model of students’ psycho-systemic process of highest-goal formulation to performance expectation in exam-writing activity is presented in Figure 5.
Thus, it could be inferred from Figure 5 that; the notion that “in the emergence of an individual’s thoughtfully mastered learning when readying for a highest-goal-oriented task, his/her characterization of the goal as “highest” in his/her activity goal formulation moderates the influences that the individual's consideration of activity strategies has on his/her considerations of decision outcomes does not hold. By implication, the characterization of the goal as “highest” has no effect on the influence that his/her cognitive processes in the goal formulation has on the transition of his/her Cognitive consideration of the activity strategy and the Cognitive consideration of decisions for the activity outcome. The sense in this finding is underscored by Earley and Perry (1987) and Locke and Latham’s (2002) arguments that when actors are trained in proper strategies, those given specific high-performance goals are more likely to use those strategies than actors given other types of goals. This finding implies that in preparing for complex tasks, actors must choose appropriate strategies (Sanda 2018), and must have the ability to attain or at least approach their goals (Locke et al. 1981). The findings thus relate to the observation by Locke et al. (1981) to the effect that strategy development is motivated by goals, with the mechanism itself being cognitive in essence, and involving either skill development or creative problem-solving. Thus, considering the notion that goal-setting works, it is relevant to ask how it affects task performance, as underlined by Locke et al. (1981), since goal setting is primarily a motivational mechanism, even though cognitive elements are necessarily involved Locke et al. (1981).

5. Conclusion

The findings from this study has shown that the complexity of an actor’s activity is a manifestation of the number of rules inherent in the cognitive and motivational-emotional attribution of the activity (Kieras and Polson 1985; Sanda et al. 2014). Therefore, the specificity of an actor’s cognitive formulation of goals, consideration of both activity strategy and decision outcome must be viewed as important source of activity complexity that must be understood in the formulation process of an organizational activity prior to its performance. In this wise, the mediating constraints in the self-regulation system of an actor, in terms of continual reconsideration of his/her cognitive consideration of activity strategies, must be understood, since it can sometimes result in changes in the methods of achieving the goal, as well as a change in the goal itself (Sanda 2017). This is because, self-regulation is an intrinsic self-organizing tendency of organizational activity whose underlying goal and evaluation criteria may change during an individual self-regulation process (Bedny and Karwowski (2007).

Based on the premise that an actor’s self-regulation system takes shape and gets transformed over lengthy periods of time, with its problems and potentials being understood only against its own history, this study has provided understanding on the dynamics of actors’ Cognitive Formulation of Goals and its influence on the mutual effect an actor’s Cognitive Consideration of Activity Strategies and Activity Outcome Decision. Arguing from the perspective that an actor’s subjective perception of task complexity does not influence his/her activity goal formation, as well as his/her consideration of activity strategies, the findings show that cognitively characterizing the goal of a pending activity as either “highest” or “best” has no significant effect on the influence that an actor's goal formulation cognitive processes has on his/her cognitive considerations of the activity strategy, and his/her Cognitive consideration of decisions for the activity outcome. In this
regard, it is firstly concluded that the cognitive processes of goal formulation must be viewed as the aim of the activity, and as such, the activity can be formulated without characterizing the goal. It is also concluded that the cognitive characterization of task-goal in terms of “best” or “high” as indicative of the cognitive measures of an actor’s Goal Formation for an Activity has no significant influence on the dichotomous interrelationship that exists between the historicity (experience) of the individual’s self-regulation activity and the individual’s subjective perception of task complexity (difficulty), both of which are engraved in the conscious goal-directed processes of the individual actor. The actor’s cognitive processes of activity goal formation tend to have enormous influence on the actor’s cognitive considerations of activity strategies when compared to the actor’s cognitive considerations of decision outcomes. The practical learning from this finding is that it provides educational instructors a better pedagogical understanding of how their students formulate their goals before examination, and why such instructors should understand the rationale behind most of such students becoming apprehensive when writing examination real-time.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The author acknowledges the support of the University of Ghana Business School (UGBS), University of Ghana, Legon Accra, Ghana.

Notes on contributor

Mohammed-Aminu Sanda is Adjunct Professor of Human Work Science at the Department of Business Administration, Technology, and Social Science at Lulea University of Technology in Sweden. He is also a faculty of the Department of Organization and Human Resource Management at University of Ghana Business School in Accra Ghana. He received his doctoral degree in Human Work Science in 2006 from Lulea University where he also did a 2 years postdoctoral fellowship from January 2010 to December 2011. His ongoing research is on using the Macroergonomics and the Systemic Structural Activity Theory in creating knowledge and in the development of efficient and good work environment through the integration of organizational and human systems. He is a member of the International Society for Cultural and Activity Research (ISCAR) and served on the ISCAR Executive Committee, representing the African Region, and also as the Editor of ISCAR Newsletter from 2011 to 2017.

References


