SELF-EFFICACY: A MEDIATING ROLE IN AGRICULTURAL STUDY

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ABSTRACT

Little research is available that describes how tertiary agricultural students cope with their first year university studies. This study attempted to fill this void by focusing on self-efficacy, persistence and satisfaction. Structural equation modelling, using AMOS, was employed to test the validity of a model drawing on first year tertiary agricultural students from a rural-based university and an urban-based university. The results of this work show constructs in the model, including self-efficacy, future orientation, and generic skills self-estimates, were key predictors of student persistence and satisfaction.

GENESIS OF THE RESEARCH

Following on from the 1991 McColl report on tertiary agricultural education, rural initiatives occurred from the Australian Association of Agricultural Deans (AAAD) annual meetings during the early 1990's, at which was noted the difficulty of attracting good students to agricultural courses. The New South Wales (NSW) body comprised representatives from Technical and Further Education (TAFE), NSW Agriculture and each of the universities teaching agriculture in NSW (viz., Charles Sturt University, Orange Agriculture College, University of New England, University of New South Wales, University of Sydney and the University of Western Sydney, Hawkesbury).

The professional body of agriculturalists, the Australian Institute of Agricultural Science and Technology (AIAST) held a conference on the issue of attracting the brightest stars (December 1995). From these initiatives there developed several projects. One of these, developed by Professor Ted Wolfe, Associate Professor Rod Francis, Dr Brian Hemmings, and Associate Professor Doug Hill and the Australian Institute of Agricultural Science through the then Executive Director Simon Field, achieved funding from the Rural Industries Research and Development Corporation (RIRDC).

One area identified for investigation was an evaluation of the performance and persistence at University of students who differ in maturity, educational background and qualifications, geographical background and agricultural experience.

THE AGRICULTURAL INDUSTRY CONTEXT

The contribution that the agricultural and related sector makes to Australia's gross domestic product is estimated to be 35 per cent and employs more than 20 per cent of the total work force (McColl, 1991). Australia's reliance on resource-based industries is unlikely to change in the foreseeable future. Instead, expansions in food and fibre production, and in processing and value-adding activities are expected, all of which will increase pressure on the environment. The education system aims to support the agricultural and related sector in sustainable development in the competitive international market place.

Agricultural professional bodies and agricultural tertiary educators are concerned with the low proportion of the agricultural work force which is tertiary qualified (Ferguson & Simpson, 1995)

and the declining number, and lower TER scores, of students entering tertiary agriculture courses who will eventually work in a variety of fields. In 1991 only 31% of those directly in farming and related occupations of forestry and fishing had any tertiary education qualifications, compared with 45% in the total Australian work force. ABARE data of farmers on broadacre and dairy farms show a more dismal picture with about 9% of men and 18% of women having tertiary qualifications (Gooday, 1995). For agriculture to remain as an important industry group in Australia, it must attract people who choose agriculture as a first career choice not a last career choice; and, in addition, see the need for professional development and further education.

UNIVERSITY AGRICULTURAL EDUCATION

Currently most universities select the majority of their students on the basis of an aggregate rank attained by students sitting for the Higher School Certificate or an equivalent award. Moreover, universities offer entry to students on the basis of mature age, industry involvement, and prior study. In tertiary agricultural education up to 30% of students have discontinued their agricultural course as early as the first semester of the first year of teaching (DEET, 1997). Comparing across several courses the dropout rate in agriculture is higher than most disciplines (DEET, 1997). Added to this, research into school students' attitudes to farmers and farming as a career (Francis, work in progress) reveals that the prevailing perception of agriculture is not a positive one. To improve this scenario careful research is needed to target and match potential university agricultural students to the needs of industry.

An examination of the curriculums offered by agricultural faculties indicates that universities have been oriented almost exclusively towards food production. While agricultural faculties have remained focused in their disciplines, it is apparent that most agricultural faculties have not, until recently, dealt with agricultural and rural problems in an holistic and integrated fashion. This is illustrated by Shute (1989, p.302):

> 'More and more, agricultural education and research depend on and relate to other disciplines and are paying more attention to nutrition and food quality, marketing and distribution, employment, extension and information systems, and environmental concerns'.

Agricultural student profile

Entry to higher education has undergone substantial changes since the 1970s, and that has accelerated subsequent to the Dawkins' reforms. Access has now been made easier for mature-age and disadvantaged students (Dawkins, 1988). An indication of this is the shift in the age structure enrolled in universities. In 1992, 28% of students were 25 years of age and over with the main source of anticipated growth to be the 30-64 age group with a projected 23% growth to 2001. The rising demand from the 30-64 age group includes those new to higher education and those seeking to broaden their skills to re-qualify for occupational change (DEET, 1993). These general trends are also being reflected in the agricultural student profile.

Australia-wide data on commencing undergraduate enrolments by broad field of study for 1993 and 1994, i.e., DEET Data Element 311, (DEET, 1993), reveal a significant growth rate for Agriculture of +7.5%. The fastest growing field of study in Australia was Law while fields of study showing decrements are Education (-8.4%) and Health (-2.6%).

The participation of women in undergraduate agricultural and related education courses in 1990 was 35% of total enrolments (McColl,, 1991). The proportion of female enrolments in

agricultural and related education is lower than for all higher education, but the participation rate of women studying for agriculture and related education awards has been increasing steadily (McColl, 1991).

REVIEW OF STUDENT PERSISTENCE, SATISFACTION AND PERFORMANCE

Research in student persistence and attrition has largely been descriptive and does not explain the reasons why students withdraw from their studies. Frequently students who withdraw and graduates have been compared without any underpinning of theory to guide the research. Recent career development and attrition research of Hemmings and Hill (1995) has been grounded in a psycho-social theoretical base, providing insights into individual identity formation, adjustment to university lifestyle, and peer influences. But all too often however, isolated variables have been brought into connection with attrition which lead to results attributing the causes of attrition to certain demographic data, such as age, gender or occupation, or institutional variables (Peters, 1992).

This approach was rejected by Tinto (1975) who sought to explain the phenomenon as a complex process in which student variables interact with institutional variables. Tinto went further than mere description of this process with his concept schema and multivariate longitudinal testing and sought to explain the decision of a student to dropout. Tinto (1987) theorised that students enter tertiary education with varying patterns of personal, family, and academic characteristics and skills, including dispositions and intentions regarding persistence. These dispositions and intentions are continually modified and changed as a result of interactions with the structures and the members of the academic and social systems of that tertiary institution.

Many recent studies on tertiary education persistence and attrition include a measure of student intention (Hemmings, 1994), a feature which draws on the work of Bean (1980) who reasoned that a student's intentions are shaped by prior experiences and attitudes and lead directly to a behaviour such as study termination. A central feature of Bean's (1982, 1985) model of attrition is the causal link between and among attitude/experience, intention, and behaviour. He proposed four variable sets, namely, background variables, organisational variables, environmental variables, and attitudinal and outcome variables would affect, directly or indirectly, student intention to leave university.

Other general models on tertiary student change have also emphasised the importance of student's integration into the university community in predicting persistence (Astin, 1985; Pace, 1984; Theophilides, Terenzini, & Lorang, 1984). Pascarella (1985) proposes a model of tertiary student change that is applicable to multi-institutional studies because it considers institutional factors as well as factors by Tinto (1987). Pascarella's model, which has been supported in research (Pascarella, Smart, Ethington, & Nettles, 1987), describes student change as a function of five major sets of variables. These are:

1. student background and pre-university characteristics (e.g., demographics and aptitude);
2. structural and organisational characteristics of the institution (e.g., size and selectivity);
3. institutional environment;
4. interactions with socialising ;and,
5. quality of student effort.

A growing trend in higher education research is the emphasis on adult learning principles, processes, and teaching (Candy, Crebert, & O'Leary, 1994). This study would be inadequate if Tinto's model, was applied in this context without recognition to an increasing number of mature-

age students in agriculture and the recent and growing research in adult learning. Variables such as academic integration and social integration might not have the impact on withdrawal and persistence as believed, rather variables constructed in adult learning research might have a stronger influence or at least a complementary effect.

The considerable research concerned with the transition from school to university and work (Cornell, Cornell, Dickie, Elizov, Farrell, Kubanek, Montpetit, & Waller, 1990; Hemmings & Hill, 1995) and on factors which influence success at university (Holdaway & Kelloway, 1987; Tinto, 1988) cannot be ignored in this study of student persistence. For example, Hemmings, Boylan, Hill, and Kay (1995) identified four key factors. These are:

- changes in expectations in study requirements;
- adjustment to university lifestyle;
- personal changes in daily living patterns; and,
- individual identity formation.

In relation to university transitions, McInnis, James, and McNaught (1995) found that study habits, social interactions, and co-operative learning were important determinants of success and adjustment at first year university.

An increasing body of research is pointing to the contribution of the theoretically based construct self-efficacy in explaining academic achievement, persistence and career-relevant behaviour (Bandura, 1997; Lent, Brown & Larkin, 1987; Pajares, 1996; Schunk & Zimmerman, 1994; Zimmerman & Schunk, 1989). Research using college students has supported the hypothesis that efficacy expectations are predictive of success and persistence in pursuing educational and career goals. Given the emphasis on self-efficacy in this research, a further explaining of the theoretical construct is warranted. This paper suggests that self-efficacy beliefs serve as an important cognitive influence, helping to determine persistence in, and satisfaction with, their chosen studies.

Perceived self-efficacy refers to beliefs concerning one's capabilities to attain designated levels of performance (Bandura, 1986). Self-efficacy is hypothesised to influence choice of activities, effort expended, and persistence (Bandura, 1986). Students who hold low self-efficacy for learning may avoid tasks; those who judge themselves efficacious are more likely to participate. When facing difficulties, self-efficacious learners expended greater effort and persisted longer than students who doubt their capabilities (Schunk, 1990). Students acquire information about their self-efficacy in a given domain from their performances, observations of other's experiences, and forms of social persuasion. Furthermore Schunk (1990) also claims that students acquire self-efficacy information from physiological indexes such as heart rate and sweating. However the information acquired does not automatically influence efficacy, but is cognitively appraised. In forming an appraisal students take into account factors such as perceived ability, expended effort, task difficulty, teacher assistance, other situational factors, and patterns of successes and failures.

Self-efficacy can be distinguished from other similar constructs such as self-concept and self-esteem. While these latter constructs are hypothesised to affect diverse areas of human functioning, self-efficacy in this study is viewed as offering prediction of behaviour within the specific domain of tertiary agricultural study. Another important distinction is necessary, that between capabilities and outcomes. Self-efficacy refers to perceived capabilities. People differ as to whether they believe that outcomes occur independently of how they behave or that outcomes are contingent on their behaviours. For example students who believe the teacher will praise them

for scoring high on a test (an expectation of a positive outcome) may not study hard if they doubt their capabilities for performing well (low self-efficacy).

Another important component in self-efficacy concerns the interplay between beliefs about outcomes of actions and how much those outcomes are valued (Atkinson, 1964). People are likely to act when they believe an action will produce positive outcomes, and when they value those outcomes. While value is an important aspect, it is not enough; students who value high grades and believe that studying hard will produce them, may not be motivated to study if they doubt their capabilities to study effectively. Schunk (1990, p.72) summarises the difference between self-efficacy and other views stating "...*it's the emphasis on students' beliefs concerning their capabilities to employ effectively the skills and knowledge necessary to attain outcomes*".

As Bandura (1993) summarises, the impact of most environmental influences on human motivation, affect, and action is heavily mediated through self- processes. These processes give meaning and valence to external events. Self influences therefore operate as important proximal or immediate determinants at the core of causal processes. Efficacy beliefs influence how people feel, think, motivate themselves, and behave. This paper explores the influence of self-efficacy on students' satisfaction and persistence. This influence is considered by testing a model of persistence for first year tertiary agricultural students from rural and urban universities. The model suggests self-estimates of a student's skills and future orientation, influence self-efficacy, which in turn positively affects satisfaction and persistence.

THE MODEL OF STUDENT PERSISTENCE AND SATISFACTION

The model posited draws on a number of theoretical aspects including persistence and attrition theory, career and the psycho-social development frameworks, learning theory and motivation theory. The model considers academic and non-academic factors impacting on the individual, present and future that might influence persistence in, success and satisfaction with, agricultural study. Much of the prior research on persistence has focused on academic factors in the individual's past (e.g., high school grade point average) that influence the choice of a particular course leading to a career (Jackson, Gardner, & Sullivan, 1993). The model comprises twelve constructs of which four are entry constructs, six are intervening constructs and two are dependent constructs.
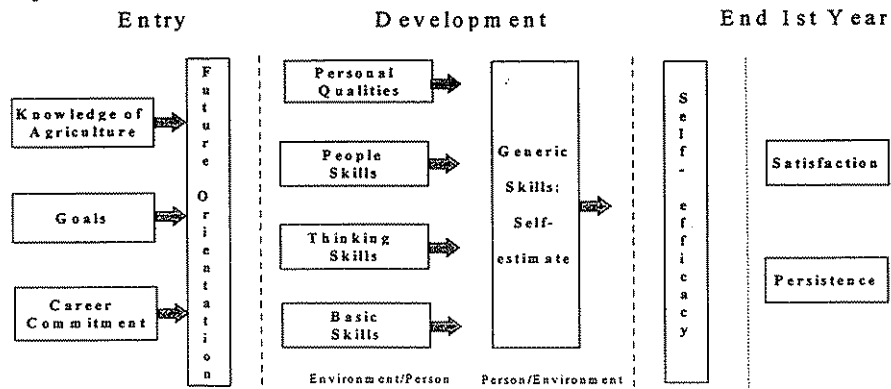

Figure 1: A model of persistence and satisfaction in agricultural study

The four constructs which can be deemed 'entry' constructs describe the person on entry to agricultural study and exist prior to any influences from the institution or the course. These are:

- Knowledge of Agriculture;
- Goals;
- Career Commitment; and
- Future Orientation.

This model seeks to explain the phenomenon as a process in which student variables interact with institutional variables. Students enter tertiary education with varying dispositions and intentions regarding persistence. Students also enter tertiary education with a purpose; students have a goal or goals in mind and have a stronger tendency to look towards the future rather than the past.

During the first year of the course there are six constructs which can be deemed 'intervening factors', influencing the person's attitude during the first year of study. These are:

- Personal Qualities,
- People Skills,
- Thinking Skills,
- Basic Skills,
- Generic Skills: Self-estimate, and
- Self-efficacy.

Student dispositions and intentions will be continually modified and changed as a result of interactions with the structures and the members of the academic and social systems of the particular tertiary institution. During the agricultural course students will be influenced and therefore change and develop as a result of interactions with the institution, other students, and the course itself. During this time students will develop their range of generic skills and qualities including personal qualities, people skills, thinking skills and basic skills.

After nearly one year of agricultural study students will have also undergone changes and will have made a re-assessment or re-commitment in relation to goals and career commitments and a re-assessment of their generic skills. Students will also form a judgement of their ability to complete tasks in the agricultural discipline. This judgement is measured in the 'Self-efficacy' construct. This construct directly influences the dependent constructs satisfaction and persistence.

Drawing on a person-environment interaction theory, the theoretical model has the emphasis on the outcomes of person-environment interactions expressed in the form of students' efficacy of competence rather than the interactions *per se*. Although students may have faced and already overcome social and academic integration difficulties, they still confront the problem of whether or not they have the ability in the particular domain of agriculture to carve a niche in the future. These judgements will be made continually, but there may be some point in time when the judgement carries more 'weight'. Neuman and Finally-Newman (1989) argue along a similar line but emphasise the students' perceptions of needs rather than self-judgements of ability in a particular domain.

In an educational context, self-efficacy refers to students' expectations about their ability to complete specific academic tasks successfully or achieve specific goals (Schunk, 1985). The students' self-efficacy is hypothesised to affect individuals' activity choices, effort, and

persistence. Learners who are unsure of their ability to complete a task will often avoid it or give up more easily when they encounter difficulties. An initial sense of self-efficacy varies as a function of prior experience and perceived ability in particular tasks. It is refined through success and failure on similar tasks, observations of others, and social influence from others (Bandura, 1986). There is evidence that self-efficacy predicts a broad range of outcomes, including academic achievements and career choices (Bandura, 1997). Efficacy beliefs are future-oriented and are therefore depicted as an intervening construct prior to the dependent constructs of **'Persistence** and **'Satisfaction'.**

Thus, at the end of the first year, the student outcomes can be described by two different constructs, namely:

- the level of student 'satisfaction', and
- their intentions to persist with agricultural study.

OPERATIONALISING THE INDEPENDENT CONSTRUCTS

Future Orientation : Goal Commitment /Career Commitment / Knowledge

The construct Future Orientation comprises three sub-scales. Goal Commitment refers to the student's commitment to graduating from university with a degree. Career Commitment refers to the student's commitment to a career specifically in agriculture. The sub-scale Knowledge refers to the extent the student has searched and found information about agriculture and related industries combined with the student's exposure to agriculture and related industries prior to attending university. The combined scale is the sum of each of the sub-scales. (Note: Tinto conceived Goal Commitment as the sum of two items, 1. highest expected academic degree (bachelors to doctorate) and 2. the importance of graduating from college (1 = not important to 4 = extremely important).

Generic Skills: Self-estimate

The scale Self-estimate comprises the level of foundation skills which the student has self assessed him or herself to have. These include the four sub-scales of personal quality skills, people skills, thinking skills, and basic skills.

Self-efficacy (for the Agriculture Course)

The construct Self-efficacy for the agriculture course comprises twenty-seven items. Self-efficacy refers to students' expectations about their ability to complete specific academic tasks successfully. Self-efficacy is not to be confused with self-esteem. Self-efficacy is a judgement of one's ability to perform a task within a specific domain. An initial sense of self-efficacy varies as a function of prior experience and perceived ability in certain tasks. Efficacy beliefs are future-oriented.

OPERATIONALISING THE DEPENDENT CONSTRUCTS

Satisfaction

A three item scale requiring answers to the following questions:

1. Overall, I am really enjoying my course;
2. I am finding my course intellectually stimulating; and
3. Overall, I am very satisfied with my university experience so far.

Persistence

A three item scale requiring answers to the following questions:

1. I will probably leave this course before completion;
2. I might leave this course before completion; and
3. I will complete this course.

Previous studies have indicated that all constructs have adequate psychometric properties with the exception of the newly conceived construct, Knowledge of agriculture as a career.

METHOD

Instrumentation

The study used two questionnaire instruments. The first questionnaire identified the student's knowledge of agriculture as a career, goals and career commitment and was administered to first year agricultural students at the beginning of 1997. The second questionnaire was administered to the same agricultural students but towards the end of their first year of study, with the purpose of exposing which of the proposed constructs (in the model above) have an effect on the satisfaction and persistence of agricultural students in their first year at university.

The research method recognised the multivariate nature of the decision by students to persist with their studies and that this phenomenon can be viewed as a process of interactions between the person and the environment, taking into account present and future interactions. The questions have been drawn from research in the fields of tertiary education, persistence and attrition, a literature review on persistence and attrition, input from selected Australian researchers in higher education, information from industry, and input from a reference advisory group.

The questionnaires have been reviewed by a range of experts including the reference group members, and have been further refined through a pre-pilot study conducted early in 1997. The instruments were administered to one hundred and fifty-five students attending the University of Sydney, representing an older university with a science-based first year, and two rural-based campuses which have a more agriculture-focused first year, these being Charles Sturt University (Riverina campus), and the Orange campus of the University of Sydney.

Structural Equation Modelling: The statistical model to be estimated

The adequacy of the model was assessed by structural equation modelling with the AMOS program (version 3.6; Arbuckle, 1997). As can be seen in Figure 2, the proposed model contained a total of twenty-two variables of which seven were observed endogenous variables, (skill1rc, knowc, career1c, satisfc, selfac, goal1c, ficompl), and the remaining fifteen variables were unobserved variables. The unobserved variables comprised three endogenous variables (satisfaction, self-efficacy, persistence), and twelve exogenous variables (skills1, future1, e1, e2, e3, e4, e11, e10, e5, e6, e12, e9).

The skills1c variable was a composite variable measured by using the factor scores (regression method) to weight each contributing variable to the composite set. This approach was also adopted for the observed composite variables selfac, satisfc and ficompl. The latent variable, future1 was measured by three composite variables, knowc, goal1c and career1c each of which was derived by using the factor scores (regression method) to weight the individual measures.

The parameters that were fixed were those measured by one factor congeneric models (Holmes-Smith & Rowe, 1994). These were skills1, self-efficacy, satisfaction and persistence. The error variances of these four latents were fixed at 1 minus the square of each of the corresponding lambda loadings (Loehlin, 1992). The latent variable, future1, measured by the three composite variables of knowc, goal1c and career1c had the parameter future1 regressed on goal1c set to 1 since this composite had the highest reliability alpha. The other two parameters were free and to be estimated. Error paths were all fixed at unity. The covariance between skills1 and future1 was free as were the paths, skills1 to self-efficacy, skills1 to satisfaction, self-efficacy to satisfaction, self-efficacy to persistence, and satisfaction to persistence. The specified model was tested with standardised coefficients obtained from the maximum likelihood (ML) method of estimation.

Figure 2: Hypothesized and statistical model to be estimated.
Persistence and satisfaction in agricultural study
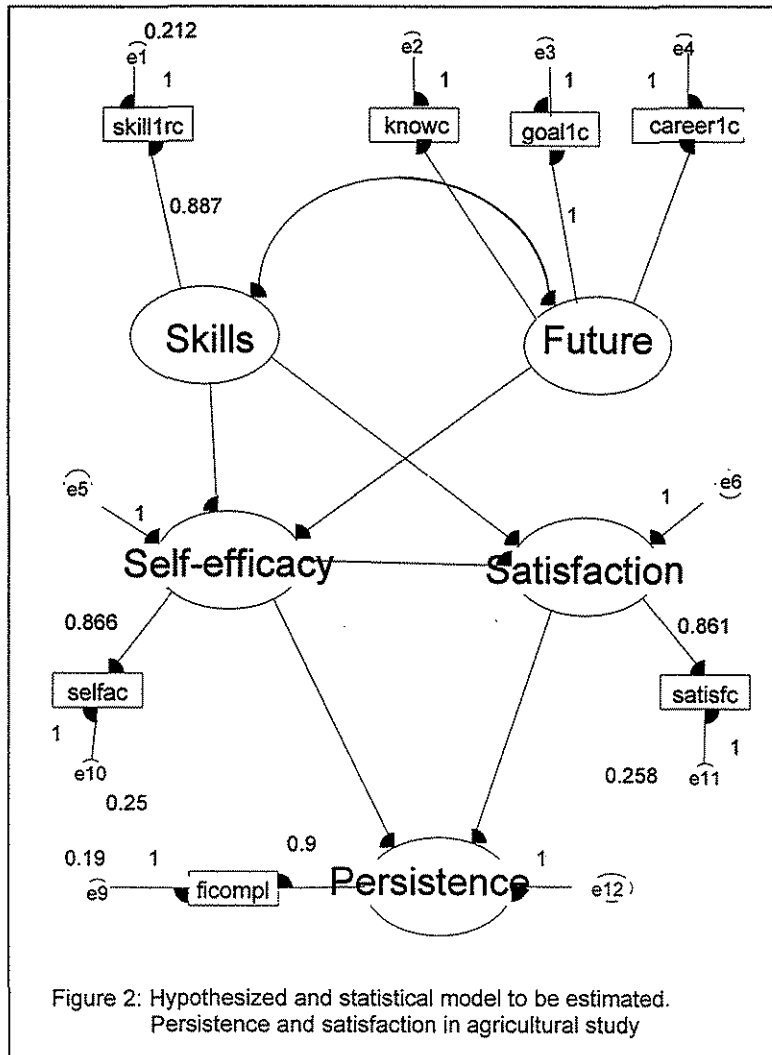
RESULTS

Fit indexes

The AMOS program provides different indexes to ascertain the model fit. The chi-square (χ^2), indicates the lack of fit resulting from over-identifying restrictions placed on the model (Bollen, 1989). A non-significant χ^2 indicates that the model is an adequate representation of the sample data. However, it should be noted that the χ^2 varies as a function of sample size (Marsh, Balla, & McDonald, 1988). With a large sample size, the χ^2 is usually significant, even though the model offers a good fit to the data. The conservative and stringent cut off value for the χ^2 statistic of $p<.05$ was chosen.

In addition, other fit statistics for the model were examined, viz., the comparative fit index (CFI), goodness-of-fit index (GFI), and the adjusted goodness-of-fit index (AGFI). The CFI assesses the relative reduction in lack of fit as estimated by the χ^2 of a target model versus a baseline model in which all the observed variables are uncorrelated (Bentler, 1990). The CFI can vary between 0 and 1. Models with a CFI below the 0.90 cut off value are considered unacceptable (see Bentler & Bonett, 1980). The remaining indices of fit can also take on values from 0 to 1; the closer the value is to 1, the better the fit of the model. Another fit index is also suggested; the standardized root mean square residual (RMR) which represents the average deviation of the prediction from the actual correlation matrix. Taken together, these fit indices indicate whether a model is a good fit and suggest that a model is providing a reasonable explanation of the data.

The proposed model

Initial analyses revealed some problems in the hypothesised model. Indeed, although the CFI of 0.937 and GFI of 0.956, and the RMR of 0.045 were satisfactory, χ^2 was significant, χ^2 (13, N=155) = 25.1, (p=.236), In addition, the paths between self-efficacy and persistence, and skills1 and satisfaction were not significant. Consequently a second model was tested in which two parameters were freed simultaneously; future1 regressed on knowc and future 1 regressed on career1c. Results for this second model indicated an improvement in the model fit. The overall χ^2 (11, N=155) = 19.44, and was nonsignificant (p= .054). Moreover, CFI of 0.956, GFI of 0.966, AGFI of 0.914 and RMR of 0.036 reflect a better fit of the model to the sample data.
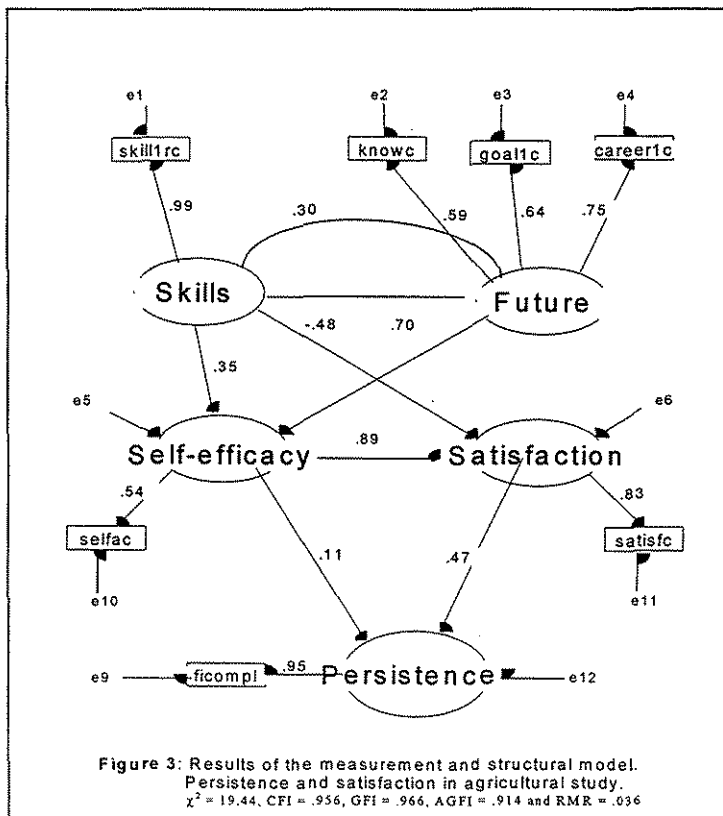
Figure 3 presents the standardised solutions for the full structural and measurement model. Standardised path coefficients revealed that a student's future orientation had a strong positive influence on a student's self-efficacy (β= .70) . Skills1 had a moderate positive influence on self-efficacy. However, skills1 had a strong negative direct influence on satisfaction. Self-efficacy, however, had a very strong influence on satisfaction (β = .89). The direct influence of satisfaction on persistence was .47, while the direct influence of self-efficacy on persistence was a weak .11. Explained variances (R^2) for self-efficacy, satisfaction and persistence were .76, .54, and .29 respectively. The R^2 values suggest that the model explains substantial variance in self-efficacy and satisfaction and acceptable variance in persistence.

Main effects

The main purpose in the study was to assess the effects of a student's self-estimate of his or her skills, future orientation, perceived self-efficacy and satisfaction with agricultural study, on his or her intention to persist with study. Satisfaction exerted the largest direct effect on persistence (β = .47), whereas self-efficacy exerted a smaller direct effect (β = .11). This means that students

are likely to persist with their studies when they are more satisfied. We would expect a standard deviation increase in satisfaction to be associated with approximately half a standard deviation increase in persistence on the part of students. However even though the direct effect of self-efficacy on persistence is much less, self-efficacy exerted the largest direct effect on satisfaction (β = .89) than any variable in the model. Increased satisfaction is strongly affected by a student's increased self-efficacy.

A student's estimate of his or her skills had a strong but negative effect on the level of satisfaction (β = -.48). In this study, students with higher skills were those who were less satisfied with their agricultural study. However skills had a positive effect on self-efficacy (β = .35). This result indicates that a student who perceived he or she has high levels of skills, will also have high self-efficacy. The result suggests the variable self-efficacy interacts with other variables in complex ways. Future orientation had a strong effect on self-efficacy (β = .70), indicating that a student with strong goal commitments, career commitments and knowledge of agriculture as a career, also had a stronger self-efficacy. While the effect of future orientation on self-efficacy is more than twice that of skills on self-efficacy, both these predictor variables share a covariance of 30%. That is about 30% of the variance in skills and future orientation is shared. While no cause effect is established, there is a relationship in that as one construct varies, so too does the other by a specified amount.

Figure 3: Results of the measurement and structural model.
Persistence and satisfaction in agricultural study.
χ^2 = 19.44, CFI = .956, GFI = .966, AGFI = .914 and RMR = .036

DISCUSSION

A testing of the model posited has shown that self-efficacy is an important predictor of a student's persistence with agricultural study. Self-efficacy appears to play a mediating role in that stronger effects result when variables, in particular future orientation, are mediated through it. This is inconsistent with the extant literature (Bandura, 1997). The interdependence among factors suggests that efforts to achieve satisfaction with, and persistence at, agricultural study may have a reasonable chance of success if attention is given to a student's self-efficacy, because changing one factor simultaneously affects other factors.

A predictor of a student's persistence appears to be the level of commitment to goals in general, a commitment to agriculture as a career and knowledge of agriculture as a career. Students who have already made career decisions on entry to agriculture appear to strengthen their resolve to continue. The level of perceived skills is not the important criterion, but the resolve to pursue a career in agriculture. This has implications for not only educational processes during the course, but also the marketing of agricultural courses, and the targeting of that marketing effort. Schunk (1991) suggests that as skills develop, higher self-efficacy may not always lead to greater persistence. Self-efficacy might relate negatively, rather than positively, to persistence, because higher skills should mean that students do not have to persist as long to answer questions or solve problems. Schunk and the authors of this paper believe that additional research on the relation between efficacy and persistence in academic settings is needed.

Previous studies (e.g., Ethington, 1991) estimating models in the area of academic persistence have typically explained from 29% to 69% of the variance of the dependent variable. This model which included the mediational variable self-efficacy, accounted for 29% of the variance of persistence, and is therefore comparable to other models. Given the importance of a student's self-efficacy on satisfaction and persistence, the design and implementation of programmes that encourage students to expect more from themselves may prove to be highly beneficial. In an environment that cultivates high, but not unrealistic, expectations, a student's talent and proficiency are likely to be optimised.

The present study is a step toward the exploration of factors that influence the academic persistence of tertiary agricultural students, and the understanding of the mechanism through which university influences, and influences involving the self, affect the progress of students. Future research should continue to investigate the mechanisms that affect academic persistence of tertiary students, and should also continue to examine the applicability of this model to students in tertiary and possibly other sectors.

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