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ABSTRACT

Drawing on data collected from students attending Australian rural- and urban-based universities, structural modeling was used to test the validity of a model of student persistence and satisfaction in agricultural courses. The model placed personal and environmental factors as predictors of student persistence and satisfaction and was comprised of seven constructs. The two entry constructs (data collected at the beginning of the first year) were knowledge of agriculture and future orientation (goals and career); the three intervening constructs were fit with the course, fit with the ideology (values and beliefs), and self-efficacy; and two dependent constructs (data collected towards the end of the first year) were level of student satisfaction and student intention to persist with agricultural study. Results indicated that constructs in the model, including self-efficacy, knowledge of agriculture, future orientation, fit with the ideology, and fit with the course were predictors of student persistence and satisfaction. Some implications for current educational practice, industry, and professional engagement in tertiary education were suggested. (Contains 53 references, 3 figures, and 2 tables.) (YLB)

Developing a model to explain student persistence in tertiary agricultural study

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ABSTRACT

This paper suggests a model that places personal and environmental factors as predictors of student persistence and satisfaction. Drawing on data collected from students attending Australian rural-based and urban-based universities, structural equation modelling was employed to test the validity of a model of student persistence and satisfaction. The results of this work show constructs in the model, including 'self-efficacy', 'knowledge of agriculture', 'future orientation', 'fit with the ideology' and 'fit with the course' were predictors of student persistence and satisfaction. Some implications for current educational practice, industry and professional engagement in tertiary education are suggested by the authors.

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Introduction

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. Universities also offer entry to students on the basis of mature age, industry involvement, and prior study. In tertiary agricultural education up to 30 per cent of those students given placements have discontinued their agricultural course as early as the first semester of the first year of teaching (DEET, 1993). Moreover, according to DEET(1993), the dropout rate in agriculture is higher than most disciplines.

This paper focuses on some of the factors which might explain and predict agricultural student persistence and satisfaction. Specific factors considered include prior knowledge of agriculture and related industries, the 'future orientation' of the student, the 'ideology' underpinning the faculties and schools of agriculture both in rural and urban areas, and the academic and non-academic 'fit' of the student with the course.

The agricultural industry context

Agricultural and related education in this paper encompasses education in agricultural production, processing and marketing, and in soil, water, and forest conservation and management in Australian higher education institutions. The agricultural and related sector encompasses the production system, the supply of inputs to the production system, and activities associated with the processing and marketing of the outputs. The sector also includes research and development, extension, regulation, and education and training.

The contribution that this 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 per cent of those directly in farming and related occupations of forestry and fishing had any tertiary education qualifications, compared with 45 per cent in the total Australian work force. ABARE data of farmers on broadacre and dairy farms show a more dismal picture

with about 9 per cent of men and 18 per cent of women having tertiary qualifications (Gooday, 1995).

While the reasons for this situation are complex, Johnson, Bone, and Knight (1996) believe that the literature indicates that the educational culture for many farmers appears to be one where formal tertiary education is not highly valued (Bell & Pandey, 1987; Clarke, 1987). 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.

Agricultural courses

Agricultural courses vary in length, discipline bases and specific objectives (Lindsay, 1990). The four-year degree, with the possible award of honours, has been the foundation of the older universities. These courses have a first-year in the basic sciences which may include economics. They cover the disciplines of soils, plants, animals and farm management with choices for specialisation. As well, these courses often have a research project in the final year which aims to give students experience in the definition and investigation of a problem and subsequent reportage of that problem.

On the other hand, amalgamated universities typically have a shorter degree course, without the basic sciences, and offer vocational diplomas. Both the older and amalgamated universities usually offer courses in resource management as a specialisation from the base of the agricultural degrees. This is in response to the demand to manage resources on a sustainable basis, productively and economically (Blacklow, 1991).

Student persistence and satisfaction

Tinto (1975) sought to explain the dropout 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.

More recent studies on tertiary education persistence and attrition include a measure of student intention (Hemmings, Jin & Low, 1996), 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.

The Bean and Tinto models are underpinned by a person-environment interaction theory (Hemmings, 1994). The theoretical model of persistence and attrition proposed by Neuman and Finaly-Neuman (1989) has the emphasis on the outcomes of person-environment interactions expressed in the form of students' perceptions of needs rather than the interactions *per se*. They contend that though students may have faced and already overcome social and academic integration difficulties, they still confront the problem of whether or not their personal needs will be met if they continue to use the resources and facilities of the institution. Neuman and Finally-Newman (1989) argue that if students did not view the learning experience to be worthwhile, and that further involvement in university activities did not fulfil personal needs, these students would elect to withdraw

from study.

Other general models on tertiary student change have also emphasised the importance of a 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 some of those factors highlighted by Tinto (1987). Pascarella's model, which has been supported in follow-up research (Pascarella, Smart, Ethington, & Nettles, 1987), describes student change as a function of five major sets of variables. These are student background and pre-university characteristics, structural and organisational characteristics of the institution, the institutional environment, interactions with socialising agents, and the quality of student effort.

General models of tertiary student change have yet to be applied to understanding agricultural persistence. However, in the somewhat related field of engineering, studies show that two factors have received attention, viz., student background characteristics and quality of effort at university (Pascarella & Terenzini, 1991). Early research suggested personality characteristics such as emotional rigidity and maturity might be important in engineering persistence (Beall & Bordin, 1964; Elton & Rose, 1967). More recent engineering-based research, using a large sample, found freshman grade point average, the Scholastic Aptitude Test scores and self-perceptions of maths and science abilities predicted persistence for both males and females (Linden, Jagacinski, LeBold, & Shell, 1985).

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 a study of student persistence. For example, Hemmings, Boylan, Hill, and Kay (1995) identified four key factors: 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 the first year at university. However, there have been no major Australian studies relating specifically to the transition from high school into agricultural courses.

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. Our paper suggests that self-efficacy beliefs serve as an important cognitive influence, helping to determine persistence in, and satisfaction with, agricultural study.

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; conversely, those who judge themselves as efficacious are more likely to participate. When facing difficulties, self-efficacious learners expend greater effort and persist 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 others' 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".

There has been a resurgence of interest in self-efficacy, and related concepts of the self, and the associated processes by which human agency is exercised especially in different areas of psychology. This is not surprising given that self influences affect the selection and construction of environments. In other words, 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.

In this paper we are particularly interested in the influences of self-efficacy, fit with the ideology of the discipline, fit with the course and future orientations on students' satisfaction and persistence. These influences are considered by testing a model of persistence for first year tertiary agricultural students from rural and urban universities. The model suggests a student's *'fit with the ideology of the discipline'*, *'future orientations'*, and *'knowledge of agriculture'*, will influence *'fit with the course'*, which in turn influences *'self-efficacy'*. *'Self-efficacy'* directly and indirectly influences a student's *'persistence'* and *'satisfaction'*.

The model of student persistence and satisfaction in agricultural courses

The model comprises seven constructs of which two are entry constructs (data collected at the beginning of first year), three are intervening constructs and two are dependent constructs (data collected towards the end of first year).

The two 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; and
- Future orientation (goals and career).

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 three constructs which can be deemed **'intervening factors'**, influencing the person's attitude during the first year of study. These are:

- Fit with the course;
- Fit with the ideology (values and beliefs); 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 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
- student intention to persist with agricultural study.

Operationalising the independent constructs

Future Orientation: Goal Commitment /Career Commitment

The construct Future orientation comprises two sub-scales (viz., goal commitment and career commitment). 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 combined scale is the sum of each of the sub-scales.

Knowledge of Agriculture

Knowledge of agriculture 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 scale comprises seven items drawn from Holland's (1985) occupational scales and includes statements regarding awareness of, 'The kinds of work done by people in agriculture' and 'The places where persons in these jobs work'.

Fit with the Ideology

This construct is the extent of compatibility the student has with the values and beliefs generally deemed to be associated with persons either who aspire to or are currently in agriculture and related industries. The eight item scale is drawn from Holland (1985) and includes statements such as 'I am comfortable with the culture associated with agriculture and related industries' and 'I generally agree with values held by most people who work in agriculture and related industries'.

Fit with the Course Content

This construct seeks to describe the level of compatibility the student has with the content of the course. The construct canvasses practical and theoretical aspects of the course, including curricular and course coherence (McInnis et al., 1995). Some examples of the eleven statements are 'I really enjoy the theoretical content of my subjects' and 'The staff made it clear from the start what they expected from students'.

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 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. Items in the eleven item scale include 'I have confidence in my ability to do agricultural study' and 'With respect to my study, I am satisfied with my skills and abilities' (Glaser, 1984).

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

- 'I will complete this course'.

Previous studies have indicated that all constructs have adequate psychometric properties with the exception of the construct developed for this study, 'Knowledge of Agriculture'. The latter construct along with the other constructs all had acceptable scale reliability coefficients using the Holmes-Smith and Rowe (1994) method to measure internal consistency (see Table 1).

Method

Instrumentation

The study titled '*The first year of agricultural study* ' used two survey 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 1998. 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) had 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, input from selected Australian researchers in higher education, information from industry reports and stakeholders, 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 five hundred students attending nine university campuses. These were the University of Sydney, Sydney and Orange campuses, Charles Sturt University, Wagga Wagga campus, University of Queensland, St Lucia and Gatton campuses, University of Melbourne, Parkville and Dookie campuses, University of Western Sydney, Hawksbury campus, and Curtin University of Technology, Muresk campus.

Structural equation modelling

The multivariate analytical technique, structural equation modelling (Schumacker & Lomax, 1996), was used to examine the relationships among and between factors and constructs described by a prediction model and to test and validate the model. The participants were aware that participation was voluntary and consent forms were signed by each student with full contact details made available. The instrument took an average of twenty minutes to complete. All ethical requirements specified by the Charles Sturt Ethics Committee were met.

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 thirty variables of which eight were observed endogenous variables, (goal1c, job1c, knowc, persist, coursec, efficacy, ideology, satc), and the remaining twenty-two variables were unobserved variables. The unobserved variables comprised seven endogenous variables (Future orientation, Knowledge of agriculture, Persistence, Fit with course, Self-efficacy, Fit with ideology, and Satisfaction), and fifteen exogenous variables (e1, e2, e3, e4, e5, e6, e7, e8, e9, e10, e11, e12, e13, e14, e15). The model included 19 free parameters to be estimated.

The goal1c 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 job1c, knowc, ideology, self-efficacy, fit with course, persistence, and satisfaction. The latent variable, future orientation, was measured by two composite variables, goal1c and job1c each of which was derived by using the factor scores (regression method) to weight the individual measures. This strategy was used because of the limited number of participants available to perform a full latent-variable model.

Bentler (1993) suggested that the ratio of sample size to numbers of free parameters to be estimated may be as low as 5:1, whereas a ratio of at least 10:1 may be more appropriate for arbitrary distributions. In this study the measurement strategy used offered a ratio of 7:1. Consequently, we were confident of yielding a correct model evaluation on the basis of chi-square (χ^2) probabilities. The parameters that were fixed were those measured by one factor congeneric models (Holmes-Smith & Rowe, 1994) where the reliability of the composite was derived by the formula:

$$r_c = \frac{\varpi\left(\hat{\Sigma} - \hat{\Theta}_\delta\right)\varpi'}{\varpi\hat{\Sigma}\varpi'}$$

where ϖ is a row vector of factor score regression coefficients,

ϖ' is the symmetric matrix of measurement error variances and covariances

Θ_δ is the matrix of variances and covariances (θ_{11}, θ_{12}, θ_{13}, etc.) amongst the measurement error terms δ_1, δ_2, etc.,

$\hat{\Sigma}$ is the fitted covariance matrix (implied moments in the AMOS programme) amongst the observed indicator variables.

These parameters were goal1c, job1c, knowc, ideology, fit with course, self-efficacy, satisfaction and persistence. The error variances of these eight variables were fixed at 1 minus the square of each of the corresponding lambda loadings (Loehlin, 1992). Error paths were all fixed at unity. See Table 1 below.

Table 1: Reliabilities, lambdas and error variances for observed composite variables.

Composite variables	reliability coefficient (r)	Lambda ($\lambda = \sqrt{r}$)	error variance (θ = 1-r)
job1c	0.801	0.894	0.199
goal1c	0.720	0.848	0.280
knowc	0.812	0.901	0.188
efficacy	0.789	0.888	0.211
coursec	0.812	0.901	0.188
persist	0.922	0.960	0.078
ideology	0.895	0.946	0.105
satc	0.890	0.943	0.110

The paths between Future orientation and Self-efficacy, Self-efficacy and Persistence, Self-efficacy and Fit with course, Self-efficacy and Satisfaction, Fit with course and Satisfaction, Fit with ideology and Fit with course, Knowledge of agriculture and Future orientation, and Knowledge of agriculture and Fit with ideology were free and to be estimated. The specified model was tested with standardised coefficients obtained from the maximum likelihood (ML) method of estimation.

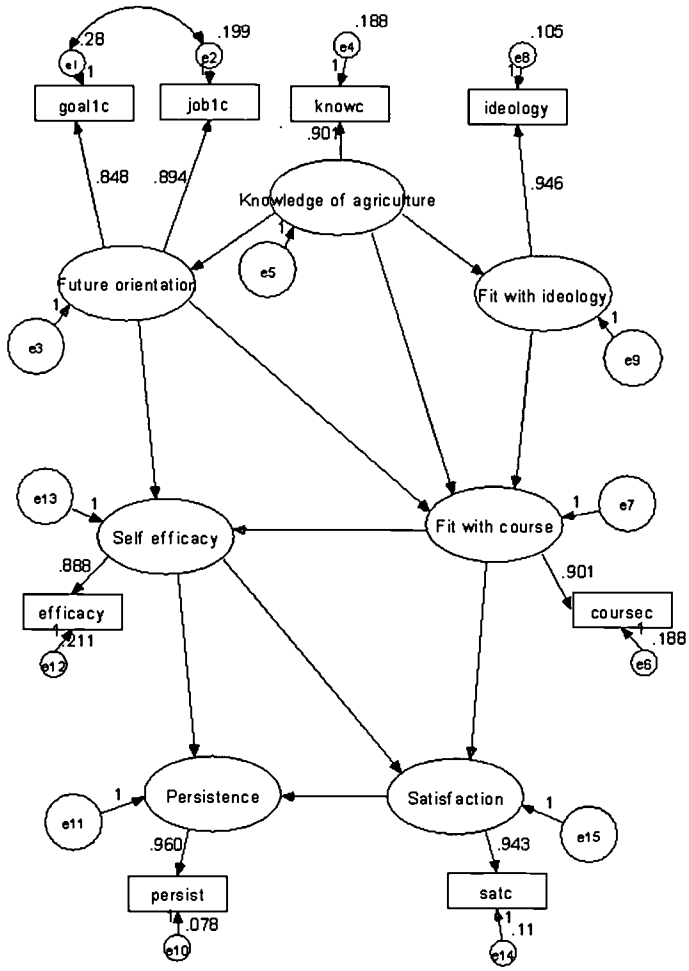


Figure 1: Hypothesised and statistical model to be estimated.

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. Thus, models with a significant χ^2 statistic ($p < .05$) were not considered acceptable in the present study.

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 0.85 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.

A value of less than 0.05 is considered to indicate an acceptable fit of the model (Bentler & Bonett, 1980). 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.

Results

Distribution and matrix to be analysed

A correlation matrix based on the eight observed variables was used to estimate the measurement and structural models. Given that covariances are not as informative as correlations for communicating the bivariate relations among measured variables, Table 2 presents a correlation matrix with standard deviations, and means for each variable.

Table 2: Correlation matrix, standard deviations and means for the model variables

Variable 1 2 3 4 5 6 7 8

1. satc 1.000

2. ideology .275 1.000

3. efficacy .341** .105 1.000

4. coursec .423** .388** .266 1.000

5. persist .423** .132 .439** .254 1.000

6. knowc -.054 .304* .127 .053 .167 1.000

7. job1c .208 .166 .186 .270 .224 .424** 1.000

8. goal1c .404 ** .016 .439** .242 .509** .203 .512** 1.000

Mean 4.89 5.62 6.61 5.11 4.93 5.13 5.49 6.96

SD .716 .839 .772 .766 .845 .898 .843 .776

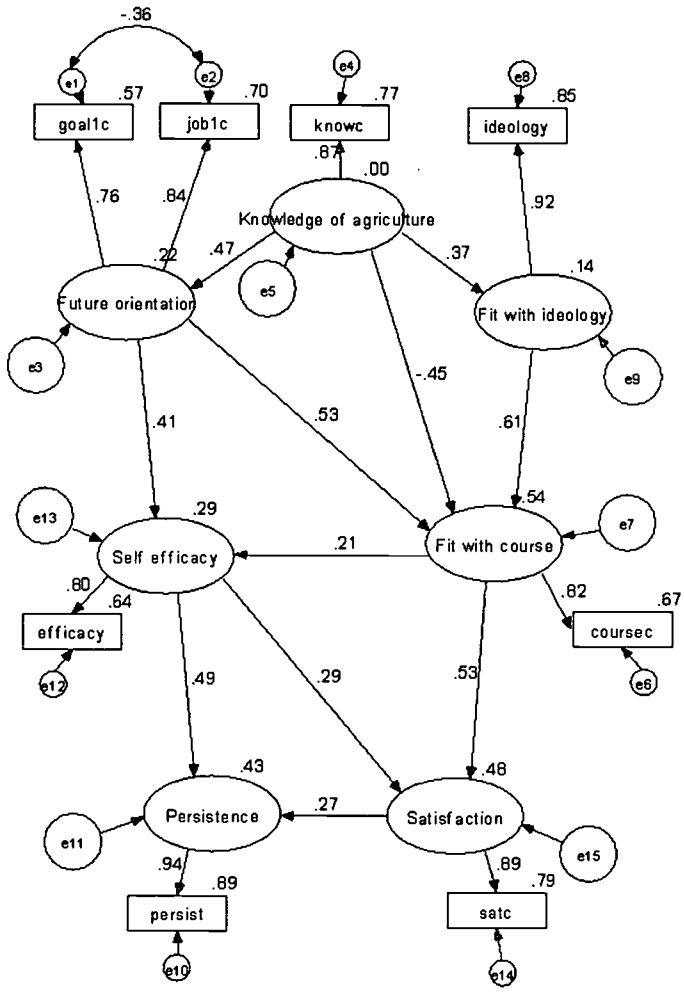
Note: N=127. Correlations significant at *$p < .05$ **$p < .01$ (Guilford & Fruchter, 1978).

Satc= satisfcation with course, ideology=values and beliefs, efficacy=judgements of ability to achieve in agricultural study, coursec=fit with the course, persist=persistence, knowc=knowledge of agriculture, job1c=career commitment, goal1c=gaol commitment.

Initial analyses revealed some problems in the hypothesised model. Indeed, although the CFI of 0.809 and GFI of 0.906, AGFI of 0.822, and the RMR of 0.057 were satisfactory, and all the paths were significant, the χ^2 of 33.45 (df =19) was significant (p=.023). Consequently, a second model was tested in which paths were inserted from Knowledge of agriculture to Fit with course, and from Future orientation to Fit with course. Results for this second model indicated an improvement in the model fit. The overall χ^2 (df=17) of 27.24 was nonsignificant (p= .065). Moreover, a CFI of 0.863, GFI of 0.924, AGFI of 0.840 and RMR of 0.049 reflect a better fit of the model to the sample data.

Figure 2 presents the standardised solutions for the full structural and measurement model.

Standardised path coefficients revealed that a student's Knowledge of agriculture influenced both the Fit with ideology and Future orientation (β = .37 and .47 respectively). Knowledge of agriculture had a strong negative influence on Fit with course (β = -.45). Fit with ideology proved to have the most powerful influence on the model with the direct influence of Fit with ideology on Fit with course being .61. Fit with course had a very strong direct influence on Satisfaction (β = .53) and a moderate influence on Self-efficacy of .21. Self-efficacy had a strong influence on Persistence (β = .49) and a less powerful influence on Satisfaction (β = .29). Satisfaction had a moderate influence on Persistence (β = .27).



[χ^2=27.24, p=.065, CFI= 0.863, GFI=0.924, AGFI=0.840,and RMR =0.049]

Figure 3: The measurement and structural model of persistence and satisfaction in agricultural study.

Examination of the total effect of Self-efficacy on the dependent variable, persistence, shows that a one standard deviation in Self-efficacy resulted in a 0.679 increase in Persistence and had the strongest positive influence on Persistence than any variable in the model. A one standard deviation increase in Satisfaction resulted in a lower yet still strong positive influence on Persistence of 0.327. A one standard deviation increase in

Self-efficacy resulted in a lower but still moderate positive total effect of a 0.285 increase in Satisfaction.

The total effect of Fit with course was stronger on the Satisfaction variable (0.571) than on the Persistence variable (0.318). The total effect of Knowledge of agriculture on Satisfaction was inconsequential at 0.056 and inconsequential on Persistence at 0.111. The total effect of Fit with ideology was more important for both the Satisfaction and Persistence variables at 0.295 and 0.160 respectively. The total effect of Future orientation had stronger influences on Self-efficacy than on Satisfaction and Persistence. The 'explained variances' (R^2) for Self-efficacy, Satisfaction and Persistence were .29, .48, and .43 respectively. These R^2 values suggest that the model explains substantial variance in persistence and satisfaction and acceptable variance in self-efficacy.

Discussion

A testing of the model posited has shown that self-efficacy is a reasonable 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 and Fit with the course, are mediated through it. A model run without these variables being mediated through Self-efficacy, proved to be a poor fit with the data. This mediational role is consistent with the extant literature. Self-efficacy also had the strongest total effect on persistence than any variable in the model. The model showed that efforts to improve a person's Self-efficacy by one standard deviation would result in a 0.591 increase in Persistence. 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.

Student persistence appears to be affected by 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 seem to strengthen their resolve to continue. A good level of perceived knowledge of agriculture does not result in a good level of Fit with the course, but it does influence a high level of ideological values and beliefs which subsequently has a positive influence on Fit with the course.

This finding has implications for not only educational processes during the course, but also the marketing of agricultural courses, and the targeting of that marketing effort. 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 43% 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 other tertiary settings and possibly other sectors.

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