

*Gowin's Knowledge Vee and the Integration of Philosophy and
Methodology: a Case Study.*

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ABSTRACT Universities with a strong research tradition commonly have courses or modules examining the tradition's philosophies and methodologies to prepare their students to undertake research programmes. Recently, however, authors have called for wider debate concerning how we teach these courses and this paper is intended, in part, to make a contribution to this debate. The Research Philosophy and Methodology module examined here makes an intriguing case study because of a number of distinctive characteristics. The teaching philosophy of the module is social constructivist and it uses Gowin's Knowledge Vee as its main heuristic device. This facilitates the construction of knowledge about philosophy and methodology in an integrated manner. The module has also been designed for both physical and human geography students at the introductory post-graduate level. There is, therefore, a second element of integration in the curriculum. Lastly, the module is predominantly web-based, being taken by distance students through the exchange agreement between Rhodes University, South Africa, and the University of Trollhättan-Uddevalla, Sweden. Evidence from reflective exercises shows that the learners' understanding of research and the research process has deepened considerably through using Gowin's Vee. Furthermore, using the Knowledge Vee in the web-based context has facilitated the integrative aspects of the module.

KEYWORDS Gowin's Vee, research philosophy and methodology, web-based learning, constructivism, curriculum development

Introduction

A group of scientists have been working with constructivist educational theory since the early 1980s (Gowin 1981; Novak and Gowin 1984; Novak 1984, 1998, 2002). Their work promotes deep learning (Biggs 1987, 1993; Ramsden 1992) in the sciences through using heuristic devices such as the Knowledge Vee and Concept Mapping. This research group has used, and developed, these heuristics to promote the construction of new knowledge and meanings by explicitly linking theoretical underpinnings to the natural or metaphysical world and reflecting on experience(s).

The Knowledge Vee has been used since 2003 as the structure which underpins the learning activities in my web-based Research Philosophy and Methodology (RPM) module described below. The RPM module is compulsory for all Geography Honours programmes at Rhodes University, South Africa and is also taken as the first module in a semester long collaboration 'International Research in Development Geography' with the University of Trollhättan-Uddevalla, Sweden (Fox and Assmo, 2004). Between 10 and 15 students have taken this module each year.

The following section of the paper introduce the uses of the Knowledge Vee in science education and relates this to the development of the RPM course's pedagogy. Following that is a discussion of the RPM course's pedagogy and its theoretical underpinnings intended as a contribution to the debate about how to teach research methodology in Geography curricula (Welch and Panelli 2003). Finally, detailed evidence from the

learners' work is examined to facilitate a critical examination of the impact of the Vee on their understanding. In this way I hope to introduce this constructivist device to a wider, geographical, audience and show that it can be used to integrate philosophical and methodological issues in one module.

The Knowledge Vee

The Vee diagram was originally designed by Cornell biology professor D.G. Gowin in the early 1980s. He was concerned that there was a gap between his students' ability to undertake laboratory experiments and their awareness of what they were doing in relation to the theoretical constructs they had been introduced to. Figure 1 is derived from his co-author's work (Novak 1998, 2002) and shows that two aspects of research are centrally placed. At the top of the diagram lies the focus question or questions and the bottom centre points to the investigation itself. To the left are the conceptual, theoretical issues which the researcher has to think through and to the right are the methodological operations the researcher undertakes to arrive at the knowledge and value claims concerning the worth of the research.

The interplay across the Vee from one-side to the other stresses the idea that the research process is interlinked and multi-faceted. The RPM course's learning activities, described later, have been sequenced to mirror this by moving the learners' attention across the Vee and back again each week as the course unfolds. One of the key advantages of using the heuristic is that it allows for the curriculum to integrate research methodology with

philosophy in one framework. Later I provide evidence from reflection that the learners' developed understanding of this balance and integration of components.

Following its original introduction Gowin's Vee has been used successfully in a number of disciplines and at a variety of educational levels but, as far as I am aware, not in a geographical context. Thiessen (1993) has used it within a mathematical problem-solving context in order to get secondary school students to be more reflective about their activities.

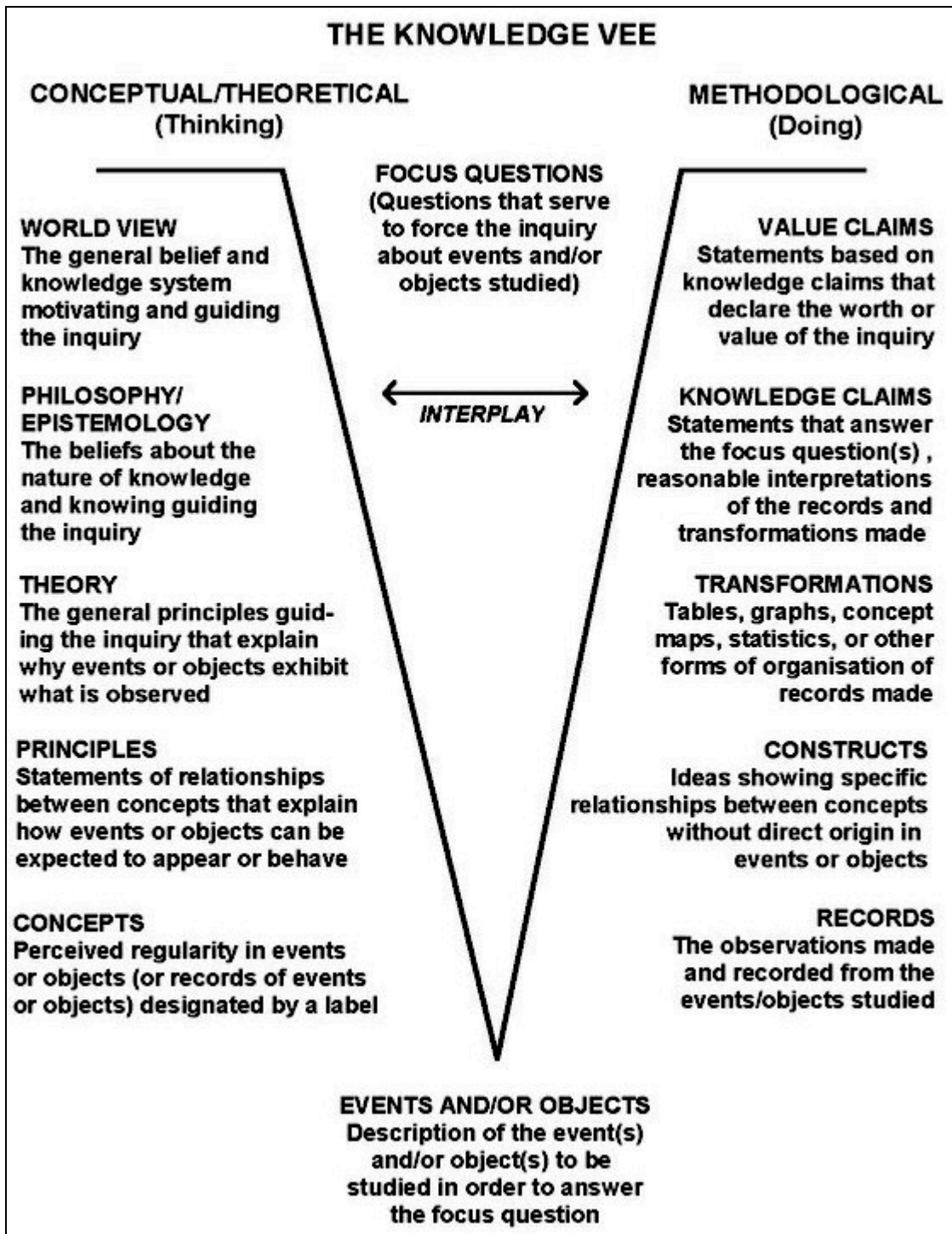


FIGURE 1: Gowin's Knowledge Vee.

Roth and Bowen (1993) have also used it as 'a map' for learning and additionally as an assessment tool for science students in secondary schools. Each component of the Vee

being awarded marks if it was successfully addressed. They also developed a checklist of six questions to guide their learners through the research process:

1. What do I want to find out about?
2. What do I know about the topic?
3. How do I go about finding the answer to my question?
4. What did I observe and measure?
5. What can I make of my findings?
6. How do the concepts and events interrelate?

I have used and modified these same questions myself in relation to groups of complementary learning activities in the RPM course. McGoey (1997) provides another example of an educational researcher who has used the Vee as an explanatory device in his research into learning problems of Chemistry secondary school students.

Within the higher education context Stewart (1997) has used the Vee in helping post-graduate information-technology students to develop their critical appraisal of research papers. Higgins (1991) has used it as a structural device to describe the various components of his PhD research into computer mediated learning with nursing students. Passmore (1998) used Vee diagrams to encourage meaningful learning in a nuclear medicine technology curriculum whilst Nataraj and McManis (2001) have described how it has helped their Engineering curriculum.

The Vee does not appear to have been used in post-graduate geographical curricula concerning research philosophy and methodology. Indeed, there is a dearth of debate

concerning how to adequately teach research methodology let alone how to integrate philosophy with methodology (Welch and Panelli 2003). There are examples of representations of the research process in a number of geographical texts. Diagrams showing the upward or downward directions of inductive and deductive research have been popular since they appeared in David Harvey's *Explanation in Geography* (Harvey, 1969). Some authors have gone further, for example, Kitchin and Tate (2000) represented research as a circular process which is split up into many distinct phases. Welch and Panelli (2003) point out, however, that most geography student texts which support research methods courses typically only have one chapter concerning philosophical and epistemological issues and up to 15 other chapters tackling specific groups of techniques and analytical methods.

On the other hand there are excellent texts such as Holt-Jensen's (1999) *Geography, History and Concepts* which dissects geographical traditions, paradigms, epistemologies and ontological concerns. He presents diagrams, such as the epistemological funnel, to assist our understanding of complex intellectual issues and he also critiques the inductive: deductive binary and introduces an alternative, called abduction which he maintains is a more realistic delimitation of the research process. Abduction describes research as moving from empirical patterns to tentative theories and then further on to critical testing which may or may not establish corroboration of the theory.

One of the main challenges for the RPM curriculum was how to develop a pedagogy which bridged the artificial divide between methodology and philosophy. In 2002 I was

researching how to change the module's pedagogy from face-to-face delivery to web-based learning. There were a number of reasons for changing the pedagogy. Firstly, the face-to-face curriculum was focussed largely on the philosophical and epistemological concerns, using Holt-Jensen (1999) as the main text, and did not develop applied research skills. Comments from the Department's external examiners had made me consider how to incorporate methods and techniques. Secondly, there was the need to see whether it would be possible to incorporate Swedish students, as distance learners, through our recently signed exchange programme. Thirdly, I was researching curriculum changes as part of the Postgraduate Diploma in Higher Education course which I was taking in 2002. I was very excited, therefore, when I chanced across a discussion of the Vee diagram whilst researching social constructivism. I could see immediately that it would be the ideal structure for the new curriculum I was designing and that I should look for and develop active learning techniques appropriate for each of the Vee's components. These are described in the next section. If the learning activities could be presented through a web-based learning platform then I would also be able to accommodate distance learners. This is also introduced below.

Course pedagogy

The RPM curriculum was developed so that it was aligned to Rhodes University's whole degree outcomes which are, in turn, in line with the new statutory South African educational framework, the National Qualifications Framework (NQF). The NQF is

behaviourally based and stresses assessment of discernible outcomes in student performance (Lockett, 2001). It is broadly comparable to the National Qualifications Framework developed for England, Wales and Northern Ireland. Achievement descriptors for South Africa's NQF were originally developed through the South African Qualifications Authority (2000) and Council on Higher Education (2001). They have changed little to date and are described below in Table 1 using the latest draft of the Higher Education Qualifications Framework by the Ministry of Education (2004).

The RPM course lies at NQF level 8, the first year of postgraduate study broadly comparable to the final year of a four year Scottish Honours degree or first year of a taught Masters programme in England and Wales. The Swedish students taking the course are in their final (sixth) semester of a three year undergraduate Bachelors programme and this, in conjunction with the lower emphasis on research training in their undergraduate courses, explains some of the difficulties they experience with the RPM course (Fox and Assmo 2004).

TABLE I: Competencies to be Demonstrated by Learners Studying at South African National Qualifications Framework Level 8.

Applied Competencies	Autonomy of Learning
1. A comprehensive and systematic knowledge base in a discipline/field and a depth of knowledge in some areas of specialization. 2. A coherent and critical understanding of the	7. A capacity to operate effectively in complex, ill-defined contexts. 8. A capacity to self-

<p>principles and theories of a discipline/field; an ability to critique current research and advanced scholarship in an area of specialization; an ability to think epistemologically.</p> <p>3. An understanding of a range of research methods, techniques and technologies and an ability to select these appropriately for a particular research problem in an area of specialization.</p> <p>4. An ability to identify, analyse and deal with complex and/or real world problems and issues using evidence-based solutions and theory-driven arguments.</p> <p>5. Efficient and effective information retrieval and processing skills; the identification, critical analysis, synthesis and independent evaluation of quantitative and/or qualitative data; an ability to engage with current research and scholarly or professional literature in a discipline/field.</p> <p>6. An ability to present and communicate academic professional work effectively, catering for a range of audiences by using a range of different genres appropriate to the context.</p>	<p>evaluate exercising personal responsibility and initiative.</p> <p>9. A capacity to manage learning tasks autonomously, professionally and ethically.</p> <p>10. A capacity to continue to learn independently for continuing academic/professional development.</p>
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The RPM course's outcomes relate to both the applied competencies and autonomy of learning categories shown in Table I. Six specific outcomes were developed for the RPM course so that students will:

1. Be able to identify and critically read research literature from the different paradigms which characterise the discipline.
2. Be able to demonstrate that they can interpret their own, and other researchers' work, by making appropriate knowledge and value claims.
3. Be able to demonstrate an ability to design a methodology and/or methodologies through which information can be collected accurately and consistently.
4. Be able to make an appropriate selection from a range of techniques through which information can be analysed and transformed.
5. Be able to explain the relationships between the ideology, epistemology, ontology and methodology of selected research work.
6. Be able to produce a written research proposal which contains consistent and appropriate concepts, theories and methods and which is presented in a scientifically acceptable form.

These six outcomes, and associated learning pedagogy, ensure that most of the 10 NQF competencies are being addressed in the module: especially applied competencies 2-6 and autonomy of learning criteria 7-9. The remaining competencies, such as the first applied competence, are developed elsewhere in the Honours programme.

The module has 16 learning activities, accessed through a web-based learning platform,

spread over a five week period. The activities are grouped into five, weekly, sections and positioned with reference to the relevant part of the Knowledge Vee (Figure 1). Three pieces of summative assessment are related to the outcomes described above and they comprise half of the marks for the course. The learners write a draft literature review, complete a provisional methodology matrix, prepare (and defend) their research proposal in the week immediately following the end of the module. They also peer review each others' literature reviews and methodology matrices. The remaining half of the marks for the module are provided from their end-of-year examination. This is a two hour, two question paper where they write reflective answers. This has proved to be a very good time to get them to reflect on their learning since they have finished their research projects and received feedback associated with the marking process.

The RPM module starts with activities introducing its learning philosophy through examining the value of the Knowledge Vee in various disciplines. The learners are then prompted for their focus question(s): they are asked, therefore, *what do I want to find out about?* Throughout the following week they undertake activities which ensure they think critically about knowledge and value claims (on the right hand-side of the Vee) and prepare a literature review which is peer reviewed by two of their colleagues and assessed by myself. This portion of the course directs them to a second question: *what do we already know about the research topic?* The third week of the course switches attention across the Knowledge Vee to their world views and philosophical/epistemological considerations. The learners are required to reflect on their own philosophies and epistemologies, the philosophies of the courses they have taken and the relationship

between techniques, methods, methodology, epistemology and ontology (Holt-Jensen 1999). A third question is now being addressed: *how do we know what is known?* The fourth week of the course moves back again across the Vee to the transformations, constructs, records, events or objects categories. The examination of diverse methods and analytical practices is intended to enable them to answer the following question: *how do I go about finding the answer to my focus question(s), what techniques are available?* At this point they peer review the second piece of summative assessment: the methodology matrix. This matrix requires them to relate techniques to their research's objectives within the context of an appropriately selected methodology.

In the fifth week of the course each learner works with their personal supervisor who, as disciplinary specialist, advises them about specific theories, principles and concepts (the remaining parts of the left hand side of the Vee) relevant to the focus question(s). Here the fifth question is: *what theory informs my research question?* These components of the Vee are dealt with by the student's personal supervisor since specific theories, principles and concepts relating to the focus question are content-specific and specialised. The methods of selection and collection of events and objects are also developed in consultation with the supervisor for the same reason.

The research proposal is drawn up immediately after the course's fifth week through consultation with the individual's supervisor and with reference to the assessment criteria and following examination of past examples. The proposals are evaluated by myself before they make their verbal defense.

The development of the research proposal is, therefore, the end result of a guided process that takes the learner through consideration of the 12 components shown in Figure 1. The learner moves through the cycle identified by Kolb (1984) and applied in a geographical setting by Healey & Jenkins (2000). The sequence of learning activities (Kolb's concrete experience) leads to observing what has happened (reflective observation), to thinking about how this impacts on their own (and their peers) research ideas and other components of the Vee (abstract conceptualisation), and finally planning how to proceed with their research programme (active experimentation). Later sections will use quotations from learners' work to show how they have, indeed, followed this cyclical process. Figure 2 expresses this cycle within the context of the functions provided by the module's web-based learning platform, DisCo (Distance Courses).

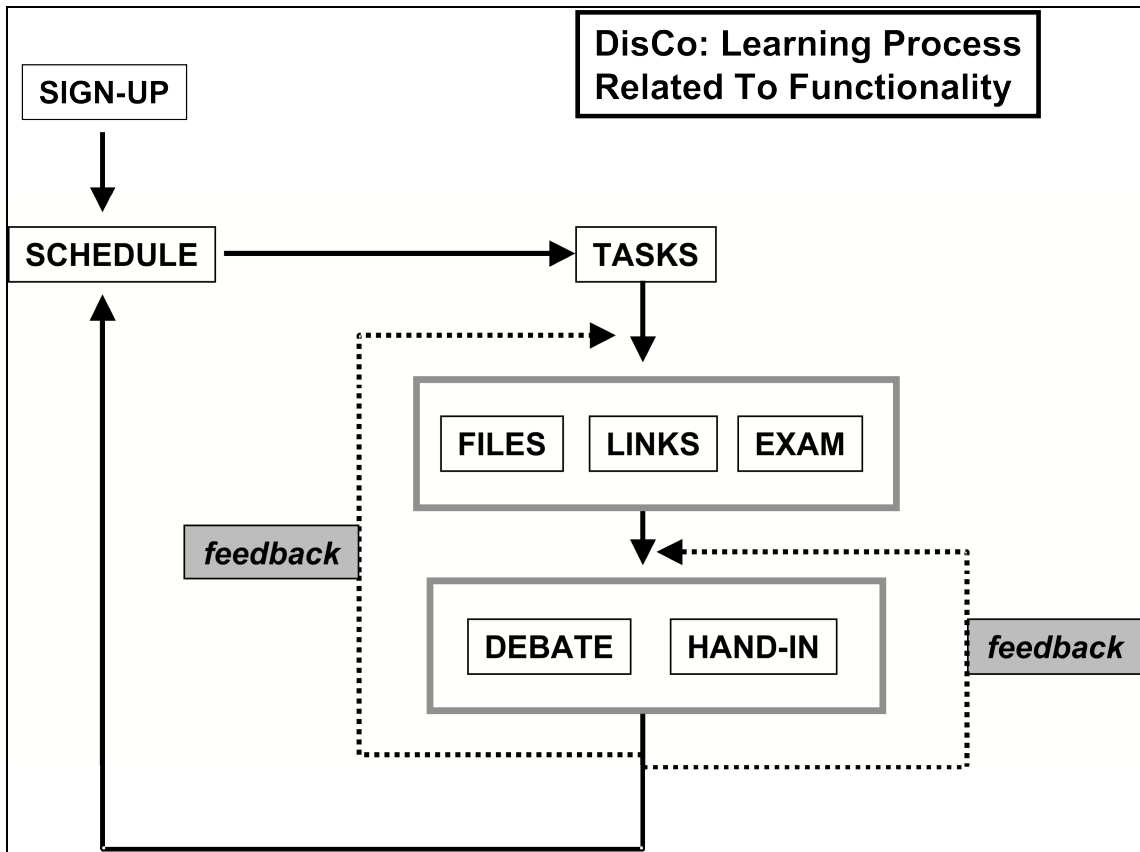
The RPM module uses web-based learning as its primary method in engaging learners with a variety of activities. The focus is upon the learner who, directed by the activities and assessments, develops new meaning. There are typically three to four learning activities each week and these are supplemented by a face-to-face discussion. The Swedish learners have a weekly video conference in place of the face-to-face session. Virtual learning is the basis of this, and approximately half of our other, Honours level courses. Our Swedish collaborators provided DisCo, a simple web-based learning platform (Svensson 2003), and the RPM's pedagogy could be called sophisticated in its use of virtual learning environment functions (Clarke, 2004) since it is based on the following:

- Learning materials, assessment criteria etc., uploaded as files.
- Learning materials located as web links.
- Course outcomes, purpose and schedule described.
- Learners use the hand-in facility for their completed assignments,
- Learners and instructors use the bulletin board and e-mail facility.
- Synchronous collaboration tools, such as video conferencing, facilitate discussion.

The assessment methods developed for the module are similar to what Clarke (2004, 72) has described as typically ‘complex, learner centred, subjective and objective, exploiting high-quality graphics.’ For example, the assessment criteria are specified in advance and made available in DisCo. Web links and uploaded files contain theoretical and contextual readings. Files and Power Point presentations are handed-in. Discussion can take place using the bulletin board and video conferencing facility.

Figure 2 expresses the multiple feedback possibilities that the module uses as a flow chart, the labels in the diagram all refer to the different first and second level functions found in the web platform (Svensson 2003). The learners proceed through the module by engaging in Learning Activities (Tasks) that use Files, Links and Exam materials. Formative feedback and summative assessment comes via discussion in the Bulletin (Debate) Board and work submitted (Hand-in). The literature reviews and methodology matrices are recycled back for peers to review and then handed in for a second time. Once an activity has been completed then learners loop back through the schedule to the next task. There is a weekly face-to-face (or video conference) session with no fixed agenda to handle questions and issues arising from the module.

FIGURE 2: DisCo's Functionality and the Sequence of Learning Activities.



All of the summative evaluation uses criterion-based schedules which are shown to the class before they undertake each learning activity. Typically the schedule has several rows of criteria and the evaluator (either myself or their peers) ranks competence within each row. Fox and Rowntree (2004) give a worked example of these assessment instruments. Verbal descriptors for the very good and very poor categories show the learners what is expected: these two categories bracket the good, competent and poor options. The learners are also given a variety of examples from previous years where the work itself is commented on by myself using Word's comment facility, and the completed assessment schedule is attached. The module could readily be categorised as

providing a high degree of support and evidence from the learners shows that it has proved to be highly challenging. In the group work context this has been shown to encourage questioning through engagement with the tasks concerned (Robson 1994). The evidence in the following section shows that this is also the case with the RPM course.

Impact of the Knowledge Vee

The 2003 end-of-year examination provided an opportunity for reflective evaluation of Gowin's Vee. This was after the class had finished their research projects which the RPM course was preparing them to do. Their examination consisted of answering two, one hour questions from a selection of four. In 2003 one of the questions was:

Write an essay reflecting on what you have learned about the 12 components of Gowin's Knowledge Vee (Gowin, 1984) through undertaking your research project.

Two of the three who answered this question gave remarks that showed they definitely valued the Vee as a heuristic device.

The 12 components of the Vee Diagram have taught me that it is extremely unwise to undertake a research project without first laying the foundation of philosophy, theory and knowing your world view. Not only does philosophy make your findings more professional as a geographer, they are more easily understood when the reader understands your ontology and epistemology. In conclusion, the Vee Diagram deserves its place as the Philosophy and Methodology Course's main

learning device. The process of undertaking research project can be clearly mapped and analysed on the Vee, making it clearer for me to understand my direction.

The second quotation, below, indicates that reflection about the Vee's utility is most meaningful when the learner has finished his or her project and so can connect concrete experience (their project) to abstract conceptualisation.

By following the guidelines of the Vee, the final conclusion of the research should make logical sense and flow naturally out of what has gone before. Without following this process though, there is a every chance that the various parts of the research will end up being unrelated or insufficiently linked to produce a meaningful and defensible conclusion ... The Vee may be useful in providing focus for the project however its full appreciation I believe can only be concluded with the conclusion of the project.

In 2004 the class was set a slightly different question that required them to look at the uses of the Vee in other disciplines as well as in their own research.

Figure 1 shows Gowin's Knowledge Vee (Gowin, 1984) the Philosophy and Methods course's main learning device. Write an essay which discusses how the device has been used in other disciplines and contexts and reflect on whether it has helped you to understand the research process.

They produced some very perceptive answers that showed they had reflected deeply during and after the course. Six of the nine learners answered this question. The first

quote below is typical of the level of discussion. Significantly, the learner discusses how she arrived at a second research topic having rejected her first focus question as theoretical constructs were lacking.

The use of the “Vee” is invaluable as it diagrammatically represents the importance of matching/linking theoretical and the methodological components in order to produce a well-constructed piece of research ... The personal research process needed to commence with an initial interest in a topic that could develop into a focus question. However, if one refers to the Knowledge Vee one can see there needs to be a conceptual/theoretical framework as well as a methodology to satisfy such a focus question. If these elements of research are not considered in the context for which they were created then the research process will fail ... For example in my research I came up with an initial idea to study a particular aspect of economic geography and location of business. The focus question was formulated as well as the methodology, the theoretical component of the research, however, was lacking even in the initial stages of research investigation. This led to a new topic being created and implemented.

The following quotations are given in some length since they show clearly that the learner has undergone a deep learning experience which the Vee has assisted with. The first quote shows that she has assimilated what the Vee can do through reflective observation to the extent that she used it to advise a more senior student.

The reason why he [Gowin] designed the Vee is because very often, people who are unfamiliar with research, and the creation of new knowledge do not grasp that concepts and methods are fundamentally interlinked, and have to play off each other to create knowledge that has worth and a certain level of integrity I used Gowin's Vee to design my research project that was an in-depth look at the reasons behind the drop in the Swedish national fertility rate. I also used it to analyze and critically review other research papers and literature for my projects and I used it as a tool to teach myself how philosophy is directly linked to methodologies as well as explaining to a friend of mine doing his masters degree how to better link the conceptual and theoretical side of his research when writing up his discussion. On this subjective level alone, the Vee has helped me to understand the research process in a far more clear fashion than when I started this course.

She goes on to describe one of those insightful, emancipatory, moments when she began to construct a new level of understanding. The quotation shows that she moves from reflective observation about her world view through abstract conceptualization of how she connects with certain schools of thought to active experimentation with a particular type of focus question.

In the beginning of the course I was the typical student, looking for a way to get step by step through the Vee, which is the most important lesson one has to learn. But the moment when one links philosophy and epistemology to methodology is a great one, because suddenly the diagram becomes more sensible. One considers

world views (I had to struggle to pull out my subjective world view to concentrate on the actual world view) and considers one's own ideas about knowledge. Which takes time and much reading but essentially, I decided that I believed there is an objective, real world that is made up of everything, but me. However, through my eyes, I have a particular subjective view which involves all my feelings, experiences, and emotions. Thus my research and methodology has to be based on these ideas, to provide for some link between how people interact with the world that exists independently of them. Which in essence drew me to the humanist school and similar philosophies which draws a line as to what research techniques to use, which influenced my focus questions.

Having discussed how her focus question came to be grounded philosophically she goes on to show that she clearly links knowledge claims to the philosophy of the researcher.

In fact the idea of the knowledge claim is something that appeals to me greatly, and if anything it is the most important thing the Vee taught me. There is no absolute truth (as the post-modernists tell us) and in this it is important to understand that research does not offer us new "truths" about the world, it offers a claim about knowledge to help explain a certain element in the world which people will either accept or reject depending on their world view. The Vee helps to explain the research and knowledge is founded very deeply within a philosophy, ontology and epistemology and ignoring this is simply ignoring the fact that had the research

project been designed through a different philosophy the results would be different – knowledge is ultimately a subjective thing.

Another learner also gives a very personal account of how the course's approach and using the Vee had helped his development. The quote below reveals many of the characteristics of the deep learner: he relates previous knowledge to new knowledge; he organizes and structures his world view into a coherent whole; his emphasis is on his own 'internal' voyage of discovery (Ramsden 1992).

Research in many ways is about self discovery in other words learning by doing in order to prove or disprove a particular concept. Constructivists promote self reflection and a more in-depth look at our individual world view. Gowin's Vee is well suited to this journey of self discovery as it encourages and guides a researcher into the various component parts of research. In many ways I had no idea research would be broken down into so many different categories or building blocks. In a sense the Vee provides an awareness of the possibilities available to a researcher and an explanation of the methods (i.e interplay) available.

Without using the Vee I would not have discovered my philosophies i.e. the box of thoughts, processes and methodologies that would best allow me to answer my research question. Hence in a theoretical context it helped me identify and deconstruct, or critically assess, the readings I was exposing myself to. Therefore I could identify what readings were appropriate and which were not by recognising

the presence or absence of various knowledge and value claims. Once the theoretical component of my research was of sound value I could then abstract methodologies that suited both the theory and my research question. I did find however that as I selected various methodologies, based on what was available, achievable and practical I had to reword the theory and refine my research question ... Through combining the methods and collection of observations from the events into a concept map or mind map I was able to identify the type of transformations that would suit the focus question.

This learner goes on to show that he could then relate his development outside the course environment to the RPM course's intentions. The relating of theory to everyday experience is also typical of deep learning.

The fieldwork experience was vital to the growth of my knowledge and value claims which is not included in Gowin's Vee diagram. I found the more I interacted with my research environment the more I developed an understanding of interplay between environmental variables. Hence experience was essential to developing knowledge and value claims. This experience would not have been as beneficial had it not been for a thorough review of relevant literature. Theory allowed me to identify and make connections between environmental variables e.g. spatial location of alien species and the influence of water, geology, aspect etc. In a sense the Vee promotes a more holistic approach to research which allows for the development of more defensible and applicable knowledge and value claims.

Lastly, his conclusion draws together some of the main points which his answer has discussed.

Gowin's Vee is therefore a very good way for students to prepare for research as it reduces the need for trial and error, puts your own research with the context of science and, or society ... and therefore allow for a more holistic, more defensible, complete and applicable research project. It produces verifiable knowledge and value claims within the context of an individual's philosophy.

Conclusion

Welch and Panelli (2003) have argued persuasively for the teaching of research methodology, rather than just techniques, and presented evidence from their undergraduate programme at Otago showing how they have negotiated a successful curriculum. The RPM module discussed above, however, takes this process somewhat further in that it was designed to integrate philosophy with methodology for both human geography and physical geography students. The quotations from human and physical geographers in the previous section illustrate this clearly. All Rhodes University Geography students, whether from the humanities or science degree programmes, take the course at Honours level. For example, the class will include students studying spatial development, water resource management or landscape process and management. The Swedish students, however, would all be human geographers as physical geography is not

offered as a discipline at HTU. Nowhere have the students commented that the module was unsuitable for them as human/physical geographers.

The quotations in the previous section were selected to show the potential of using the Knowledge Vee and they have been interpreted through using concepts such as deep learning (Ramsden 1992) and the four elements of Kolb's experiential learning cycle: concrete experience, reflective observation, abstract conceptualization and active experimentation. They clearly indicate that high levels of understanding have resulted from using this teaching pedagogy and these findings provide interesting examples of the utility of Gowin's Knowledge Vee within the geographical context. Hopefully, they will also encourage other geographers to use this device since it appears to integrate both methodological and philosophical concerns in one cohesive structure and it can readily be translated into a web-based format.

References

- BIGGS, J. (1987) *Student Approaches to Learning and Studying*, (Hawthorn, Victoria, Australian Council for Educational Research).
- BIGGS, J. (1993) What do inventories of students' learning process really measure? A theoretical review and clarification, *British Journal of Educational Psychology* 83, pp 3-19.
- COUNCIL ON HIGHER EDUCATION (2001) A New Academic Policy for Programmes and Qualifications in Higher Education. Discussion Document, (Council on Higher Education, Pretoria).

- FOX, R.C. & ASSMO, P.A. (2004) The Development of a Research Philosophy and Methodology course using Web-Based Learning: an International Collaboration, 30th Congress of the International Geographical Union, Commission on Geographical Education Symposium Proceedings, *Expanding Horizons in a Shrinking World*. IGU Commission on Geographical Education, University of Strathclyde, Glasgow, Scotland, pp. 140-145.
- FOX, R.C. & ROWNTREE, K.M. (2004) Linking the doing to the thinking: using criterion-based assessment in role-playing simulations, *Planet* 13, pp12-15.
- GOWIN, D.B. (1981) *Educating*, (Ithaca, New York, Cornell University Press)
- HARVEY, D. (1969) *Explanation in Geography*, (London, Edward Arnold).
- HEALEY, M. & JENKINS, A. (2000) Kolb's experiential learning theory and its application in Geography in Higher Education, *Journal of Geography* 99, pp.185-195.
- HIGGINS, R. (1991) Computer-Mediated Cooperative Learning: Synchronous and Asynchronous Communication Between Students Learning Nursing Diagnosis, [Online] <http://www.cybercorp.net/rhiggins/thesis/higlita1.html> [2 December 2003].
- HOLT-JENSEN, A. (1999) *Geography, History and Concepts, A Student's Guide*. 3rd Edn (London, Sage).
- KITCHIN, R. & TATE, N.J. (2000) *Conducting Research into Human Geography: Theory, Methodology and Practice*, (Harlow, Prentice Hall).

- KOLB, D. (1984) *Experiential Learning: Experience as the Source of Learning and Development* (Englewood Cliffs, New Jersey, Sage Publications).
- LUCKETT, K. (2001) A proposal for an epistemically diverse curriculum for South African higher education in the 21st century, *South African Journal of Higher Education* 15(2), pp.49-61.
- MCGOEY, J. (1997) Pairing And Compiling Discrepant Events To Help Generate Understanding of Kinetic Molecular Theory, [Online] Proceedings, 4th International Misconceptions Seminar,
<http://www2.ucsc.edu/mlrg/proc4abstracts.html> [15 March 2005].
- MINISTRY OF EDUCATION (2004) The Higher Education Qualifications Framework. Policy Issued Under the Higher Education Act No. 101 of 1997. Draft for Discussion, [Online] ,
<http://education.pwv.gov.za/content/documents/486.pdf> [8 April 2005]
- NATARAJ, M., AND McMANIS, K. (2001) Application of Educational and Engineering Research to Classroom Teaching. Proceedings, 7th Annual International Conference on Engineering Educations, ICEE 2001, Oslo, Norway.
- NOVAK, J.D. (1984) Applications of advances in learning theory and philosophy of science to the improvement of chemistry teaching, *Journal of Chemical Education* 6, pp. 607-612.
- NOVAK, J.D. (1998) Metacognitive strategies to help students learning how to learn, [Online] *Research Matters - to the Science Teacher* No. 9802,

<http://www.educ.sfu.ca/narstsite/research/metacogn.html> [11 October 2002].

NOVAK, J.D. (2002) Meaningful Learning: the Essential Factor for Conceptual Change in Limited or Inappropriate Propositional Hierarchies Leading to Empowerment of Learners. *Science Education* 86(4), pages 548-571.

NOVAK, J.D & GOWIN, D.B. (1984) *Learning How to Learn* (Cambridge, Cambridge University Press)

PASSMORE, G.G. (1998) Using Vee Diagrams to Facilitate Meaningful Learning and Misconception Remediation in Radiologic Technologies Laboratory Education, [Online] *Radiologic Science & Education* 4(1), pp. 11-28
<http://www.aers.org/V4N1PASSMORE.HTML> [2 December 2003]

RAMSDEN, P. (1992) *Learning to Teach in Higher Education*, (London, Routledge).

ROBSON, M. (1994) Working with groups on sensitive issues, in: H.C. FOOTE, C.J. HOWE, A. ANDERSON, A.K. TOLMIE & D.A. WARDEN (Eds) *Group and Interactive Learning*, pp. 183-186. (Southampton. Computational Mechanics Publications).

ROTH, W.-M & BOWEN, M. (1993) The Unfolding Vee, [Online] *Science Scope* 16(5) pp. 28-32
<http://www.educ.uvic.ca/faculty/mroth/teaching/445/MiddleVee.htm> [2 December 2003]

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (2000) *The National Qualifications Framework and Curriculum Development*, (Pretoria, South

African Qualifications Authority).

STEWART, G. (1997) The use of Gowin's Vee to improve post-graduate critical analysis of research papers, [Online]

<http://hsb.baylor.edu/ramsower/ais.ac.97/papers/stewart2.htm> [2

December 2003].

STITT-GOHDES, W.L., LAMBRECHT, J.J., & REDMANN, D.H. (2000) The critical-incident technique in job behavior research, *Journal of Vocational Education Research* 25(1), pp. 63-89

SVENSSON, L. (2003) Less is more in distance education. The contradictory relationship between rapid adoption and radical innovation, [Online] *Educational Technology & Society*. 6(1)

http://ifets.ieee.org/periodical/vol_1_2003/svensson.html [27 November 2003].

THIESSEN, R. (1993) The Vee Diagram: a guide for problem solving [Online] *AIMS Newsletter May/June 1993*

<http://www.aimsedu.org/puzzle/arrrec/vee.pdf> [20 January 2003]

WELCH, R.V. & PANELLI, R. (2003) Teaching research methodology to geography undergraduates: rationale and practice in a human geography programme, *Journal of Geography in Higher Education*, 27 (3), 255-277.