



AGRICULTURAL KNOWLEDGE: LINKING FARMERS,
ADVISORS AND RESEARCHERS TO BOOST INNOVATION

AGRILINK'S MULTI-LEVEL CONCEPTUAL FRAMEWORK

THEORY PRIMER: 16) (THEORIES OF) KNOWLEDGE,
KNOWING AND LEARNING

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AgriLink

Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation.

AgriLink’s multi-level conceptual framework
 Theory primer: 16) (Theories of) Knowledge, knowing and learning

The elaboration of this Conceptual Framework has been coordinated by **The James Hutton Institute**, leader of AgriLink’s WP2.

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This document presents the multi-level conceptual framework of the research and innovation project AgriLink. It is a living document.

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Theory Primers

The purpose of the primers is to provide AgriLink consortium members with an introduction to each topic, which outlines the key points and identifies options for further reading. The primers have also served to demonstrate the wide range of expertise in the consortium, and to highlight the specific research interests of consortium members. Primers are intended to act as a **foundation for academic journal articles, and an early opportunity for collaboration between consortium members.**

16) (Theories of) Knowledge, knowing and learning

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1.0 General Overview of the Approach

1.1 Summary of the Approach

Theories of knowledge, knowing and learning offer and underpin many different approaches to research and other forms of practice. Several generations of these theories can be identified with different focuses and epistemological assumptions (i.e. about the nature of knowledge). Many have gradually been extended to include collective as well as individual learning. Distinctions of knowledge, knowing and learning are much contested so one person's 'learning approach' might not be the same as another's. A learning process approach in management and cybernetic traditions is in contrast with the more linear idea of applying 'blueprints' (Korten, 1980). A similar contrast is evident in approaches to knowledge, between those that take account of interaction such as knowledge exchange and co-creation or co-production of knowledge and the more linear idea of 'knowledge transfer'. Approaches to knowledge, knowing and learning draw on a range of different traditions and many different theories. All these approaches have important roles to play in the context of AgriLink but care is needed in drawing out their underpinning assumptions to recognise what to draw on when, including in design for learning.

1.2 Major authors and their disciplines

Ideas about knowledge and learning can be traced back to very early philosophers (e.g. Plato and Aristotle, along with psychologists (e.g. Pavlov, Piaget, Vigotsky, Bruner) and biologists (e.g. Darwin). Later disciplines of education (e.g. Freire, Buber, Knowles), neuroscience (e.g. Maturana) cybernetics (e.g. Bateson) computer and information science (e.g. Shannon and Weaver), sociology, political science, science and technology studies (e.g. Jasanoff), behavioural science, human geography, cultural anthropology, management science, genetics along with later philosophers e.g. Dewey, Ruskin, Schon, Polanyi) have all contributed and staked their claims to ideas about how we do or could know and learn.

Major authors of theories of knowing and learning have often drawn their insights from more than one discipline. (e.g. Lave and Wenger's work on Communities of Practice could be described as both a social theory of learning and a situated learning theory that has ethnographic, management science and sociological roots.) It can therefore make more sense to start with the theories and look at who has contributed rather than the authors (see Table 1 in section 2.2). Which contemporary authors would be identified as 'major' varies considerably with the researchers' perspectives and preferred theories.



1.3 Key references

There are many key references coming from different times and much wisdom to be found in returning to original sources of material. In later years many different syntheses of theories of knowledge and learning have been done. The following have been selected because together they cover a range of particular relevance to AgriLink. Each reference signifies a trajectory of contributions to theories and practices of knowledge, knowing and learning that can easily be traced back to its influences and forward to current times. There are many other possibilities.

1. Cerf, M., Gibbon, D., Hubert, B., Ison, R., Jiggins, J., Paine, M., Proost, J. & Röling, N. (eds.) (2000) *Cow up a Tree: Knowing and Learning for Change in Agriculture. Case Studies from Industrialised Countries*. Paris: INRA (Institut National de la Recherche Agronomique)
2. Illeris, K. (2002). *The Three Dimensions of Learning. Contemporary learning theory in the tension field between the cognitive, the emotional and the social*. Frederiksberg: Roskilde University Press.
3. Jasanoff, S. (ed) (2004) *States of knowledge, the co-production of science and social order*. London:Routledge.
4. Wals, A.E.J & Corcoran P.B (eds) (2012) *Learning for sustainability in times of accelerating change*. Wageningen, the Netherlands: Wageningen Academic Publishers:
5. Wenger, E. (1998) *Communities of Practice: Learning, Meaning and Identity*. Cambridge, UK: Cambridge University Press

1.4 Brief history of how the theory has developed and been applied

Many learning theories have evolved over time, often to become more socially than individually oriented. There has also been a lot of cross-fertilisation of ideas. Researchers have used one particular learning theory or the work of one theorist in their approach or they have drawn insights from several theories and develop their own synthesis of ideas. Theories of knowledge, knowing and learning have been applied in a range of different ways, often linked to making systemic changes. They enable distinctions and connections to be made that researchers have used to explore situations from perspectives of learning and knowing. Also in action research mode they have been used to help understand or facilitate learning, including how to provide the conditions where purposeful learning and knowing can emerge.

Contemporary examples of how learning theories have been applied of relevance to AgriLink:

1. **Learning in European agricultural and rural networks: building a systemic research agenda.** See Hubert B. et al (2012) who developed and tested a systemic approach to research practice through an EU-funded project.
2. **Extension systems and change facilitation for agricultural and rural development.** See Cristóvão, A., Koutsouris, A. and Kügler, M. (2012) who analysed agricultural extension systems and the changing roles of extension agents underlining the learning-innovation-change facilitators and knowledge brokers.
3. **Challenges to science and society in the sustainable management and use of water: investigating the role of social learning.** See Ison, R. Röling, N and Watson, D. (2007) who, following a major three year EU-funded project, make the case for researching social learning in contexts such as water catchments.
4. **Learning as Issue Framing in Agricultural Innovation Networks.** See Tisenkopfs, T., Kunda, I. and Šūmane, S. (2014) who combine frame analysis and social learning theories in the context of two agricultural innovation networks in Latvia to consider how to improve practical collaborative outcomes in networks.



5. **Networked learning for agricultural extension.** See Kelly N. et al. (2017) who explored motivations for adopting information and communications technology (ICT)-mediated learning networks in agricultural education and extension and propose a framework. They provide examples from India and Australia.
6. **Rethinking Communication in Innovation Processes: Creating Space for Change in Complex Systems.** See Leeuwis C. and Aarts, N. (2011) who draw on literature about learning and knowledge in arguing that three (simultaneous) processes of network building, supporting social learning and dealing with dynamics of power and conflict deserve particular attention and support by communication professionals. This is an example of how theories of knowledge, knowing and learning are often used alongside other theories.

1.5 Basic concepts

Learning: meanings range from the processes whereby individuals or groups acquire and/or construct knowledge and understanding through study or experience, to different kinds of change in individuals, relationships and in situations e.g. in states of knowing, behaviour and in processes of participation. As Bateson (1972, p. 283) said ‘The word “learning” undoubtedly denotes change of some kind. To say what kind of change is a delicate matter.’

Knowing: can mean being aware and being able to distinguish, recognise or perceive. Knowing is dynamic and relational. Cook and Brown (1999) draw on American Pragmatist philosophers to distinguish between what is possessed and used in action as knowledge and what is part of action as knowing.

Knowledge: can be quite a static concept where knowledge is seen as ‘facts’ or seen as a dynamic concept where production and co-production of knowledge is seen as a continuous process and/or where knowledge is seen as part of a continuum (as in data, information, knowledge, wisdom) . Different forms of knowledge are widely recognised e.g explicit knowledge is treated as though it can be formalized and tacit knowledge as that associated with skills or ‘know-how’. Knowledge associated with individuals is often distinguished from that of groups (Cook and Brown, 1999).

De Laats and Simons also distinguish individual and group learning mapping learning processes against outcomes. These distinctions can be extended to knowledge and knowing (Fig 1).

	Outcomes	Individual	Collective
Processes			
Individual		Individual learning and or knowing	Individual learning and knowing processes with collective outcomes
Collective		Learning and knowing in social interaction and development of knowledge	Collective learning and knowing and co-production of knowledge

Fig. 1 Individual and collective learning and processes and outcomes. Source: Adapted from De Laats and Simons (2002).

Note that the term ‘social learning’ can apply to all three of the shaded boxes.

Further concepts are included in Table 1 in Section 2.2.

2.0 Application to the analysing the role of farm advisory services in innovation

2.1 Relevance to AgriLink Objectives

[tick relevant]	AgriLink Objectives
✓	Develop a theoretical framework utilising a multi-level perspective to integrate sociological and economic theories with inputs from psychology and learning studies; and assess the functions played by advisory organisations in innovation dynamics at multiple levels (micro-, meso-, macro-levels) [WP1];
✓	Assess the diversity of farmers' use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms [WP2];
✓	Develop and utilise cutting edge research methods to assess new advisory service models and their innovation potential [WP2];
✓	Identify thoroughly the roles of the R-FAS (regional FAS) in innovation development, evaluation, adoption and dissemination in various EU rural and agricultural contexts [WP2];
✓	Test how various forms of (national and regional) governance and funding schemes of farm advice i) support (or not) farmers' micro-AKIS, ii) sustain the relation between research, advice, farmers and facilitate knowledge assemblage iii) enable evaluation of the (positive and negative) effects of innovation for sustainable development of agriculture [WP4];
✓	Assess the effectiveness of formal support to agricultural advisory organisations forming the R-FAS by combining quantitative and qualitative methods, with a focus on the EU-FAS policy instrument (the first and second version of the regulation) and by relating them to other findings of AgriLink. [WP4].
	At the applied level, the objectives of AgriLink are to:
✓	Develop recommendations to enhance farm advisory systems from a multi-level perspective, from the viewpoint of farmers' access to knowledge and services (micro-AKIS) up to the question of governance, also recommending supports to encourage advisors to utilise specific tools, methods to better link science and practice, encourage life-long learning and interactivity between advisors [WP5];
✓	Build socio-technical transition scenarios for improving the performance of advisory systems and achieving more sustainable systems - through interactive sessions with policy makers and advisory organisations; explore the practical relevance of AgriLink's recommendations in this process [WP5];
✓	Test and validate innovative advisory tools and services to better connect research and practice [WP3];
✓	Develop new learning and interaction methods for fruitful exchanges between farmers, researchers and advisors, with a focus on advisors' needs for new skills and new roles [WP3];
✓	Guarantee the quality of practitioners' involvement throughout the project to support the identification of best fit practices for various types of farm



	advisory services (use of new technologies, methods, tools) in different European contexts, and for the governance of their public supports [WP6].
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2.2 How this can be applied/developed in AgriLink

Table 1 Theories, theorists and their potential relevance to AgriLink

Theories or models of learning	Main idea concerning learning	Examples of associated theorists ¹	Questions this theory might raise in an AgriLink context
Activity theory	<p>Cultural–historical theory that explains how people learn to perform activities.</p> <p>Three generations of this theory can be identified. Started with a focus on artefact-mediated and object-oriented action, moved on to explain collective human activity systems and then interacting human activity systems</p>	<p>Vygotsky (1934,1978), Leont'ev (1981), Engestrom (1999)</p>	<p>How might we learn to modify our activities (e.g. transport, food production) to reduce adverse effects on our environments and each other? How might we learn to innovate in relation to agriculture?</p>
Actor network theory	<p>Attempts to explain both social and technological evolution partly by providing a conceptual framework to integrate human and non-human factors in social processes suggesting both have agency. One of several traditions that has led to a focus on the role of objects in learning</p>	<p>Latour (1987, 2005), Callon (1986), Law (1986,1999)</p>	<p>Which mediating objects might enable us to interact to develop innovative approaches?</p>
Adaptive management and complex adaptive systems	<p>Focuses on learning how to effectively influence the resilience, adaptability and transformability of social–ecological systems through understanding the dynamics involved. Informed by cybernetics</p>	<p>Holling (1978) , Gunderson et al (1995) Folke et al (2002)</p>	<p>How might we influence the process of transformation of our European agricultural systems of interest?</p>

¹ The specific references are only indicative of these theorists' work. Their contributions have spanned many years and publications.



appreciative systems	Focuses on the learning process of appreciation as distinct from action and on developing individual or collective 'appreciative settings' i.e. readinesses to see and value, in order to make reality and value judgments. The appreciative system was described as 'in endless development...in far from consistent...physical, social and personal worlds.' (Vickers, 1987 pp.92-3)	Vickers (1965, 1970, 1987)	How might we appreciate the dynamics of learning and innovation in the context of European agricultures? How might researchers, advisors and farmers develop appreciative settings appropriate for making transitions towards sustainable agriculture?
constructivist	Individuals construct their own knowledge and understanding of the surrounding world through learning.	Bruner (1966, 1973); Papert and Harel (1991); Piaget (1926); Vygotsky (1978)	What processes are needed to enable people to construct relevant knowledge and understanding?
cybernetic	Focuses on systems, communication, control and regulatory feedback. First-order cybernetics assumes an observer of a system can stand outside a system of interest, the position also adopted in traditional behaviourist theories of learning. Second-order cybernetics includes an observer in a system-of-interest and assumes that individuals are structurally coupled with their environments. Examples of learning theories developed from second-order cybernetics include conversation theory in which 'teachback' forms an important part of learning.	Bateson (1972); Churchman (1971); von Foerster (1981); Maturana and Varela (1987); Pask (1976); Wiener (1948).	How can we communicate about our different worlds? What kinds of intervention might be needed where we have positive feedback effects (e.g. in relation to farmer decision making and climate change)?



experiential learning	Knowledge is produced through transformation of experience. Kolb and Fry (after Lewin) represented this kind of learning in a cycle around (i) concrete experience, (ii) observation and reflection, (iii) formation of abstract concepts and (iv) testing in new situations. Schön's distinction between 'reflection on action' and 'reflection in action' presents an alternative way of thinking about reflection as part of experiential learning. Mezirow emphasised critical reflection in transformative learning leading to changing meaning structures and perspectives.	Dewey (1933); Freire (1970); Kolb and Fry (1975); Kolb (1984); Lewin (1946); Mezirow (1990); Schön (1983).	Can we learn our way to purposeful action through transformation of our experiences and perspectives? If so, how? What is the role of reflexive monitoring and critical reflection?
instructivist	Learning takes place as a result of teacher-led instruction. Opposite of constructivism	Skinner (1974), Carroll (1985), Bloom (1956),	How can we recognise both strengths and limitations of instruction in agricultural extension situations?
knowledge management	Range of theories with different epistemological assumptions and focuses. Linked to organisational learning. Three generations of knowledge management theories and practice are identified by Snowden. First generation focused on knowledge sharing and knowledge transfer, second generation focused on knowledge creation, tacit and explicit knowledge, third generation informed by social constructionism and complex adaptive systems.	Brown and Duguid (1991, 2001); Nonaka, and Takeuchi (1995); Polanyi (1974); Snowden (2002); Stacey (2001).	How can we develop knowing and knowledge that will support purposeful action? How do we create a context in which this kind of knowing and knowledge might be developed or emerge?
learning and epistemological development	Learners progress through developmental stages in how they view knowledge from dualism to relativism. Learners need to 'bridge' the epistemologies of knowing and knowledge which have different roles in action.	Baxter Magdola (1992); Perry (1968); Piaget (1926); Salner (1986). Schon (1995). Cook and Brown (1999).	Does a theory of epistemological development help us to understand how we think, act and interact in relation to our actions relating to AgriLink? If so, how?



learning systems	Considers learning as systems made up of interconnected elements and processes different system levels and structurally coupled with learning environments. Draws on cybernetics. Learning in different systems at different levels leads to ideas of public learning, learning society, institutional learning.	Bawden (1994, 1995, 2000, 2007); Checkland and Casar (1986); Ison et al (2007), Maturana and Varela (1987); Schön (1973); Vickers (1970, 1987); Wenger (2000).	What elements and processes comprise our learning systems? What and whose purposes do and could these systems of interest serve? How can we affect the contexts of our learning systems in order to improve effectiveness, efficiency and ethicality of our actions relating to AgriLink?
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levels and orders of learning	Level I - first order learning - routine learning and knowing that takes context as given. Level II - second order learning - not confined, learning about the context of level I learning and knowing about learning and knowing. Level III learning takes another step back to learn about the contexts of level II. Kitchener suggests level III is about epistemic cognition and deals with <i>knowing about the nature of knowledge</i>	Bateson (1972); Kitchener (1983); Maturana and Varela (1987).	How can we bring about second order change? How can we learn and know how to support knowing and learning better?
loops of learning	Single loop learning involves superficial change that allows 'more of the same' to continue without challenging underlying norms, policies and objectives remain unchanged. Double loop learning challenges norms, policies and objectives and underlying values may change. Triple loop learning is concerned with the context for double loop learning.	Argyris and Schön (1978).	How can we go forward differently and/or do 'more of the same' better?
situated learning	Knowing and learning are located in processes of co-participation, i.e. in a situation rather than in heads of individuals.	Brown, Collins and Duigud (1989); Lave and Wenger (1991); Rogoff and Lave (1984); Wenger (1999)	What practices are we involved in with others and how can we improve them?



social learning	Range of ideas from those that explain what and how social interactions contribute to individual learning to those that focus on collective learning to those that include both.	Bandura (1977); Daniels and Walker (1996); De Laat, (2006). Finger and Verlaan (1995); Illeris (2002); Røling (2002); SLIM, (2004c); Wenger 1999); Wildemeersch (1999).	How can we support individual and collective action that will improve our situations?
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Source: Adapted from Blackmore (2009). It is adapted from an extract of part of an Appendix in Blackmore (2007), which was developed and adapted from Wenger (1999), Ison et al. (2000), Brockbank and McGill (1998), Illeris (2002) and Blackmore (2005).

2.3 Research questions relevant to AgriLink

See questions in Table 1 in Section 2.2

2.4 Methodological implications

Largely used in qualitative research and in blending methodological traditions. Researchers using these theories will often find that they need to make apparent their own epistemological, ontological and axiological assumptions which some do not find easy. Sampling and data collection in which the researcher's perspective is hidden (e.g. in surveys) is usually inappropriate for researching and supporting learning and knowing.

Can be used as part of systemic inquiry with iteration and reflexive monitoring (e.g. in WP3).

Multiple inquiries can use different theories of knowledge, knowing and learning.

2.5 Strengths and weaknesses

The diverse nature, scope and range of the approaches in which researchers and practitioners use these theories is both a strength and a weakness. Most learning theories include potentially useful concepts and distinctions, particularly in relation to change which is generally a strength.

As we all learn, many assume that they understand what is involved in learning without explicitly drawing on theories. This can lead to limitations and misunderstandings e.g. when assumptions are made that learning always requires teaching or knowledge transfer rather than facilitation and co-production of knowledge.

2.6 Potential operational problems

There are significant differences between first and second order learning and what is involved in each. Both are important but if wanting to innovate second order learning is required and this distinction needs to be made explicit, not assumed. Both learning and learning to learn requires skills and understanding (e.g. in facilitation and evaluation).

In many of our processes we need critical reflection-in-action, not just reflection on action. How we 'design for learning' and provide space for this as a project can draw on these theories.



There is a huge range of tools and techniques associated with learning theory and practice, ranging from conceptual frameworks to techniques such as diagramming and methodologies that explicitly deal with learning and change. It is important to recognise that there are many ways in which these tools and techniques can be used and that there is skill involved in knowing what to use when and in which situations.

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