

From boring bug lectures to interactive invertebrate learning – Using audience participation software to ‘actively’ transform grains industry training

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Abstract. Insect identification workshops undertaken by the extension team under the Grains Research and Development Corporation's National Invertebrate Pest Initiative aim to raise the awareness, profile and importance of correct invertebrate identification in order to up-skill grains industry personnel to adopt more sustainable pest-management practices. To promote greater audience interaction and encourage active learning, we adopted and applied the interactive TurningPoint® software technology in our workshops. Benefits included: instant assessment for participants enabling targeted learning; immediate determination of participants' prior knowledge and experience for trainers; and standardised evaluation processes for quality assessment, delivery and participants' learning experience. Over 1,000 participants have attended these workshops across Australia and other industry-related extension projects (e.g. biosecurity) have aligned with these activities. Three key lessons from the reported work are: (1) TurningPoint® adoption leads to highly interactive workshops; (2) TurningPoint® enhances participants' learning experience; and (3) TurningPoint® provides dynamic avenues for participant input and evaluation.

The Challenge

For many years, invertebrates (insects and allied forms such as mites and slugs) have been a low priority for southern Australia broadacre grains industry personnel. This is largely due to the availability of effective broad spectrum insecticides that have progressively become cheaper in the past 20 years. An objective of the National Invertebrate Pest Initiative (NIPI) adoption team has been to raise the awareness, profile and importance of invertebrates (pest and natural enemies), and their correct identification, to industry personnel. This up-skilling is critical to develop and adopt sustainable pest management practices in grain crops and reduce the current over-reliance on inexpensive broad-spectrum insecticides and the attitude of ‘when in doubt, knock them out’.

It was understood by the NIPI adoption team (the authors) that a workshop/course would be the avenue to up-skill personnel and the delivery would have to include different techniques, including both theoretical and practical components, to accommodate all learning styles. The practical components of workshops, either in the field or ‘hands-on’ using a microscope, are examples of active engagement. This approach is critical in any teaching endeavour to promote understanding and knowledge retention. It is required to achieve some of the learning objectives and bring the subject matter presented in the theory component to life. Active engagement also encourages autonomous learning where participants can focus on their areas of interest.

Our main challenge was to make the theory component of the workshop - essentially ‘boring bug lectures’ on identification - into an interactive and exciting information session. Insect identification material is technically challenging and like many disciplines comes with its own jargon and technical terms. While PowerPoint lectures are an appropriate presentation style for certain topics (such as technical information with a systematic approach and direct instructions), they often lead to a passive learning environment. Our aim was to create interest and encourage participants to build confidence in invertebrate pest identification; appreciate the role of beneficial invertebrates; be aware of the implication of the indiscriminate use of broad-spectrum pesticides in increasing invertebrate resistance and other environmental implications and use the resources of identification booklets “ute guides” and PestFacts/PestFax services.

The three grains regions of southern, western and northern Australia all had different starting points for this challenge, depending on pre-existing material and activities available for the

grains industry. These starting points for the development of current workshops/courses are briefly described below.

Southern Perspective

In the southern region the lack of 'in field' entomological support over the years was clearly evident as there was no knowledge platform upon which to build workshops. The initial workshop was generated as a 'basic' refresher course, covering topics determined to be of the most significant interest. This content was negotiated with a prominent independent consultant group which was used as a 'model' group to represent industry. In addition, we used the types of specimens coming through the diagnostics service offered to industry as part of the PestFacts/PestFax extension services (Mangano et al. 2009), to decide workshop insect identification content. The workshops cover key broad-acre invertebrates, including pests and natural predators, emphasising diagnostic characters used for correct identification. Theory components include mite, aphid, larval forms and beneficial insect identification. It also covers basic principles of pest management, damage, sampling techniques and resistance issues.

Southern workshops are designed to run for one day and are specifically designed for adult learner groups (e.g. consultants/agronomists or farmer groups). Depending on the target audience and time permitted, workshop components can include oral presentations, a practical, an open forum discussion and a farm walk. Group size was capped at 25 participants due to limited resources and to enable sufficient one-on-one contact for participants with facilitators (ideally four).

Western Perspective

Field entomological support in Western Australia prior to the interactive invertebrate workshops was mainly in the form of researchers presenting their trial results via a number of avenues including oral presentations (e.g. field days, farmer meetings and agribusiness conferences); written communication (e.g. farm notes, district newsletters and conference proceedings) and the interactive weekly PestFax newsletter service.

Researchers focused their extension on specific research projects they were involved with (e.g. aphid thresholds on canola). Very few comprehensive invertebrate pest training courses were conducted apart from a two day intensive "accredited" training course in 2004 and 2005 at Curtin University, Muresk campus. The content material for current workshops is based on the accredited course and modified to suit the target audience as per the southern perspective.

Northern Perspective

Unlike the southern region, the northern region has enjoyed considerable entomological support in related industries. This has been driven by cotton bollworm pesticide resistance, the arrival in 1994 of silver leaf whitefly, the expansion of grain/pulse crops into new production areas and industry demand for improved pest management. This has led to integrated pest management (IPM) courses being developed either as stand alone courses (e.g. for soybeans) or as modules within broader Accredited/Certified Pulse Agronomist courses. These courses have been delivered on an as-needs basis. The standard IPM course consists of a 6 hour theory component followed by 2 hours in the field. Theory components include an outline of IPM, insect biology, ecology and identification; key pest and beneficial insects and insect sampling techniques. Economic thresholds, crop stages at greatest risk, insecticide groups and registrations, and how to make pest management decisions, also form vital components of the IPM course. Critical to IPM extension in the north is detailed research that underpins the IPM guidelines for pests in northern grain crops.

The 'key' transformative ingredient

To promote greater audience interaction, engagement and to encourage active learning in the theory components of the workshops/courses, we adopted and applied the interactive TurningPoint® software technology on a national level. This software is compatible with PowerPoint and allows trainers to ask questions of the audience electronically. The audience responds by nominating their answers on specific keypads.

TurningPoint® was used in workshops/courses for the following:

- Warm up and ice breaker questions to get participants familiar with the technology (e.g. gender, favourite past time, local general knowledge, jokes).
- To profile participants' background and demographics (e.g. occupation; confidence levels in identifying pest and beneficial insects; experience in the industry and growing specific crops).

- Evaluate knowledge and experience (e.g. identification of key pests; rating pest problems in their crops; ability to make correct pest management decisions as per IPM guidelines).
- Document pest activity and management practices in their regions (e.g. most common pest pressure in region, what is their standard management practice for cereals at emergence such as seed dressing and pre-emergence spray).
- Evaluation of workshop/course (e.g. course interest, relevance, improvement in knowledge and confidence levels, relevance to farming practices, future assistance needs).

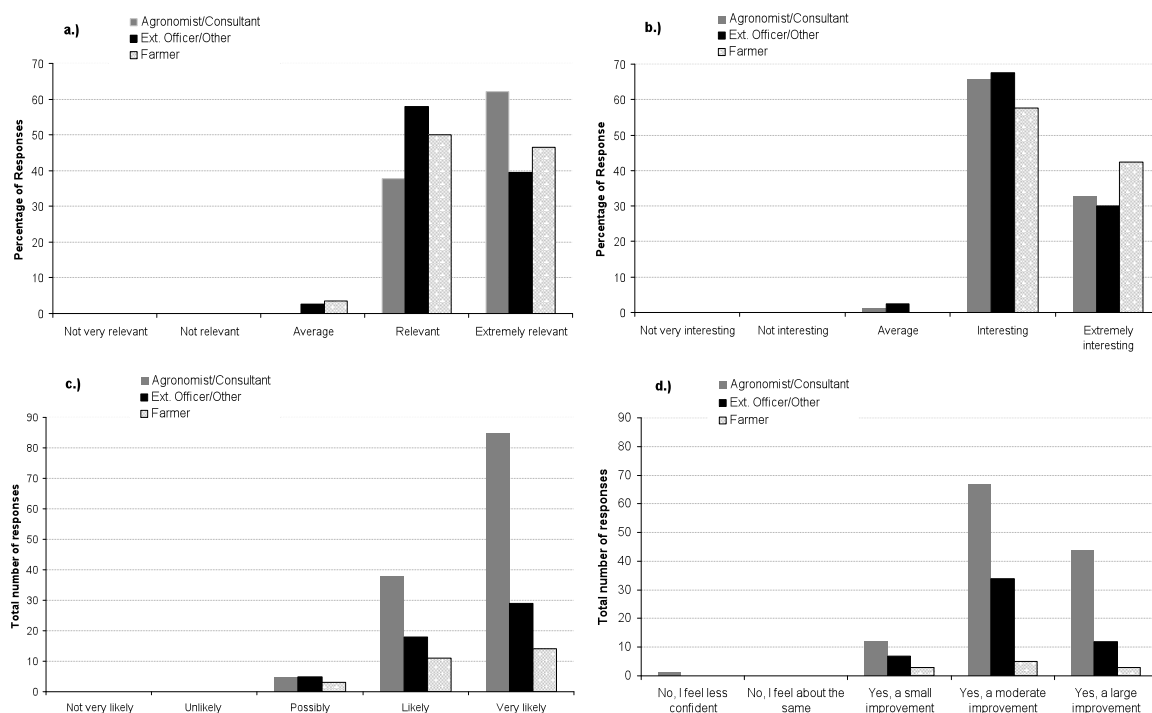
The ‘interactive’ evolution

To date, more than 1000 participants (agronomists, growers and other industry providers) have attended these workshops across the nation in areas where TurningPoint® has been extensively used as a tool to engage participants and evaluate their responses. TurningPoint® allows for a large number of interactions with the audience in a very short period of time. These responses can form an accurate picture of the participants’ requirements. It also allows us to explore people’s perceptions and opinions as well as their specific knowledge level. This provides feedback to presenters and assists them to deliver targeted and relevant information to the audience.

Informal feedback is usually provided and most participants are forthcoming with additional information, particularly during the practical ‘hands-on’ components of the workshops/courses and in subsequent correspondence via email or phone discussions. Feedback and evaluation – crucial components of workshops for quality assessment of standards, delivery and participants’ learning experience - can be easily and instantaneously obtained with TurningPoint® through the use of electronic questioning. Evaluation can include ranked questioning on workshop interest, relevance and difficulty, improvements in confidence levels and knowledge, delivery methods, attitudes and much more.

In terms of evaluation, the workshops/course rated very well over all states. This is evident from a subset of workshop participants in the southern grain region where the workshops have been very successful for advisors, growers and other industry service providers in terms of relevance (Figure 1a), interest (Figure 1b), improvement in confidence level of insect and mite identification in broad acre (Figure 1c) and the likelihood that 3 pieces of information from the workshops will be used (Figure 1d).

Figure 1. Overall workshop ratings from a subset of workshop participants in southern grains region (2008) for a). Relevance, n=140; b). Interest, n=140; c). Improvement in confidence level in ability to identify insects and mites in broad acre, n=189; and d). Probability of using 3 pieces of information from the workshop, n= 207.



Benefits to the trainer

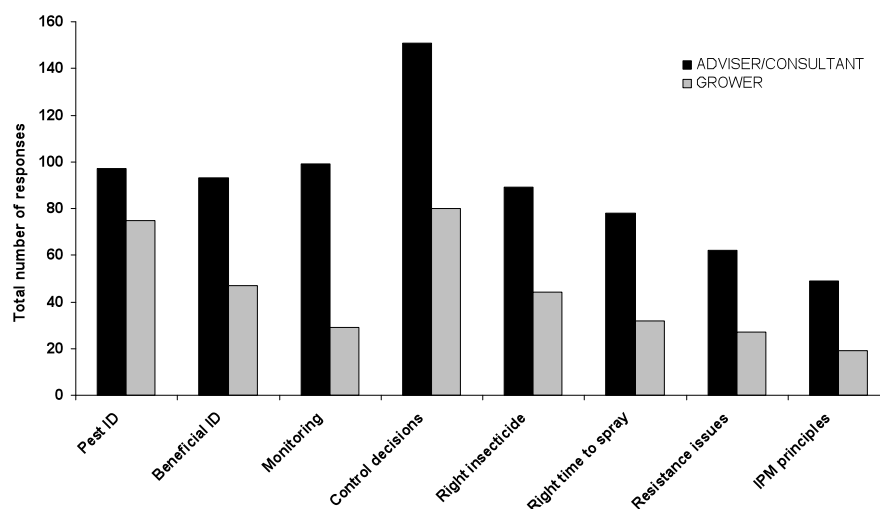
Participants encompass a wide range of knowledge, experience, age, occupation and learning abilities. Profiling the participants through TurningPoint® demographics questioning (e.g. occupation, experience etc.) immediately provides the trainer with more information about the group and can provide an insight into their knowledge base.

This technology allows us to find out what people know, what they think they know and what they really know. Attitudes, perceptions and expectations can also be determined.

A standardised evaluation process enables demographic analysis across agro-ecological regions and professions (e.g. grower versus agricultural consultant). For example, Figure 2 indicates that both farmers and agronomist are most concerned with control decisions from a subset of participants from southern region workshops in 2007 and 2008. Demographic data can also be linked with technical questions and then compared by demographic groups. This allows us to determine the needs of various groups over time.

TurningPoint® technology is cost effective and efficient in collecting data from a large number of responses in a format that is easy to retrieve and use. We no longer deal with piles of evaluation forms that need to be collated and analysed. TurningPoint® allows us to react to information during the course and also evaluate outcomes and effectiveness at a later date.

Figure 2. Total number of responses (n = 1071) from a subset of people who attended workshops/field days in the southern region in 2007/08^{*}



^{*}Participants were asked to identify areas where they needed more assistance including: pest identification, beneficial identification, monitoring techniques, making control decisions (e.g. knowing when and how to intervene), selecting the right insecticide, knowing when to spray, resistance issues and IPM principles.

Benefits to the participant

The interactive program is popular and entertaining for our participants. It keeps them interested and alert and also aids the learning process through active engagement and input as well as instant self assessment. For example, although the interactive program is anonymous (we choose to keep it that way), each individual can self-assess their performance against the correct answers provided and group average responses. Audience anonymity also reduces the skewing of results by peer pressure.

Participants are also asked at the start of the workshop/course how confident they felt about identifying insects and mites in broad-acre (in southern and western regions) and how they felt about pest management (northern region). Pre and post responses and ratings continuously show an improvement in confidence levels. In Queensland, testing participants' knowledge base is done via TurningPoint® prior to the course as well as after the course is delivered (see Fig. 2). This allows trainers to see whether participants have improved their knowledge during the course.

In the southern region, an assessment is conducted for evaluating some of the main learning objectives of the workshop. A test using unlabeled live or preserved specimens is used during the practical exercise to evaluate competencies attained by the participants. This type of assessment is applied due to the impracticalities of setting up TurningPoint® and the participants appreciate the informality.

Limitations

TurningPoint® questions are designed as closed questions, i.e. answers are provided and participants choose one or more responses. This means that we cannot gain additional information from a given question. Formulating questions so as to obtain the desired information is a challenge.

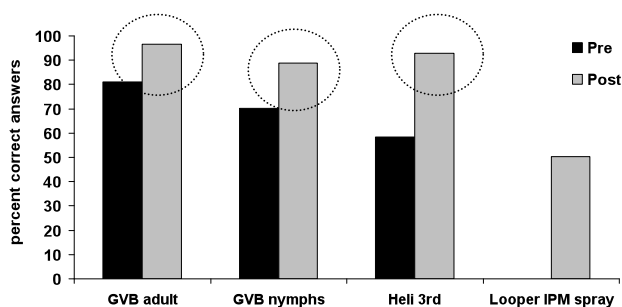
Truthful answering by participants is assumed but there is room for guessing. It is therefore important to provide a 'don't know' option, encourage participants to use this option and also to put a maximum number of answer options (more than questions in a series) to minimise accidental guessing.

The more we use TurningPoint®, the more we realise the value of asking more questions to address gaps in information and assess participants' awareness and responses to pest management principles. Some gaps recently identified in the Queensland course include the growth stage of insects sprayed; what they sprayed for; how did they make the decision; spray options and the pesticides used at different crop stages.

Improvements to future workshops/courses

Feedback has indicated areas that need most attention are those concerned with decision making and insect identification (see Figures 3 and 4). In addition, feedback from Queensland courses has highlighted the need to conduct these courses on an annual basis to reinforce knowledge and remind participants of the need for IPM. In the southern region we have seen numerous people attending workshops more than once for their continued learning.

Figure 3. Soybean IPM course (data average from 5 courses) conducted in coastal Qld in 2009 showing insect identification skills pre-course and post-course completion



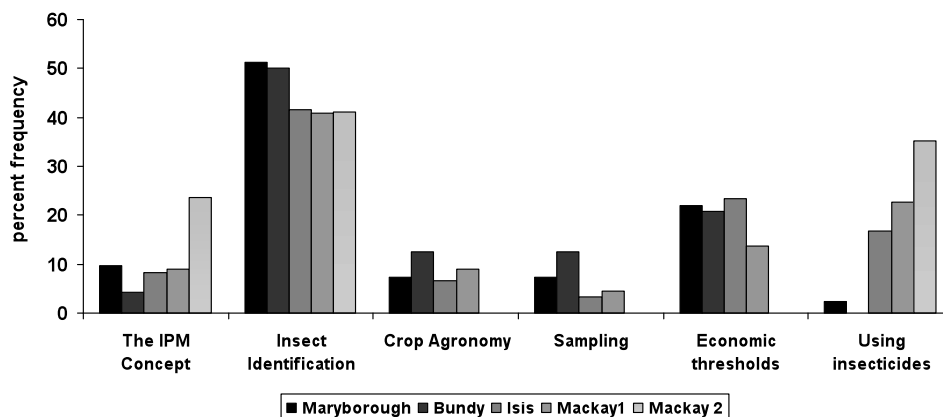
GVB = green vegetable bug; GVB nymphs = GVB juveniles; Heli 3rd = 3rd instar *Helicoverpa* larva and; dotted rings indicate the differences between pre and post percentages.

TurningPoint® has a number of features – many of which we do not use often – which can provide more in-depth information. These include ranked answers and preferences. For example, questions with multiple answers or questions that are ranked in order of preference give trainers an insight into the most important issues. Such questions also provide more options for participants who often see a number of areas they would like to answer.

As a trainer, it is important to facilitate learning through empowering participants with choice, options and by increasing interest. TurningPoint® has allowed trainers to get an indication of regional issues and differences, such as pest pressures between regions. These differences are important and need be incorporated into training programs. It is equally important to get an idea about the perceptions of pest management and common practices in different regions to gather baseline data. This is particularly the case with some groups where crop protection is heavily reliant on chemical applications and more emphasis may need to be given to alternative integrated control. Whilst we endeavour to cover key issues relating to these regional differences through initial consultation prior to a workshop/course, our continued data collection through TurningPoint® will inevitably refine differences for delivery purposes as well as allow us to track changes over time.

Another request from participants in the southern region was for more comprehensive notes for use after the course. As these interactive workshops have been well received and successful, industry is funding a training manual to complement workshop activities for the southern and western regions.

Figure 4. IPM course relevance showing areas rated most highly by participants of five soybean IPM courses conducted in new soybean growing areas in coastal Queensland in 2009



Note how highly insect identification is rated, and the differences between locations.

Concluding remarks

Whilst the adoption of TurningPoint® has led to highly interactive workshops, providing a dynamic avenue for participant input and enhancement of learning experience, it does not give a direct measure of adoption and application of knowledge at a broader scale. The ultimate question: “are participants applying their learning in the field?” still remains unanswered and is the next step and future challenge in our NIPI program.

Anecdotally we know that insect awareness has now increased in the field to some degree, through participants’ testimonials and the continued requests for these workshops, which are well regarded in the industry. Other industry-related extension projects (e.g. On-farm grains biosecurity program, GRDC Updates) are also requesting to align some of their objectives with our training activities.

At the national level through NIPI, the exchange of information and the merging of the lessons learnt has been invaluable in the growth of delivery mechanisms across the nation. Thanks to such a dedicated team and the interactive software TurningPoint®, invertebrate awareness has been ‘activated’ in the minds of many participants to build a life long interest, greater appreciation and fascination with insects.

TurningPoint® will continue to provide us with useful feedback on our workshops/courses. We will, in turn, continue to learn to use TurningPoint® to its full capacity to get the most out of this technology and obtain information we seek. We continue to strive towards ‘actively transforming’ grains education and up-skilling personnel to improve usage of IPM and reduce reliance on pesticides in the broadacre grains industry. This is a gradual process that our workshops seek to foster. Who knows, invertebrates may become a trendy issue to know about, especially since their dynamics lend themselves well to movie themes and innovative technologies in other industries.

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