Getting Started in Computer Science Education Research

Authors: Mike Joy, Shanghau Sun,
Jirarat Sitthiworachart,
Jane Sinclair and Javier López.

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Introduction

This booklet is aimed at academics whose background is principally in computing/IT at university level, and who are interested in developing their teaching activities with a view to research leading to publication.

This is *not* a definitive guide to research in Computer Science Education. Rather, it is intended to alert you to the issues involved in such research, and direct you to appropriate resources which you can use to explore those issues in greater depth.

Why Computer Science Education Research?

As academics, our time is split between teaching, research and administration. Our motivation may be focused on our technical interest in computing, yet teaching is a core activity which we would like to think we do well. Not only is good teaching a prerequisite for career progression, but it can also be tremendously satisfying and fulfilling, and something we can take pride in.

Education is changing, and is heavily influenced by new technologies which can be used to improve the effectiveness of our teaching and of our students' learning, and to make the experience more exciting and interesting. We have an opportunity to innovate, and to explore new methods and activities to support the teaching and learning process.

What are these innovations? Do they work (and why)? Answering these types of questions is what Computer Science Education research is all about.

If you've had an interesting educational experience, other computing educators are likely to be interested, and you may consider publication. This guide will give you the basic information you need to get started.

Education or Technology?

The title of this booklet is "Getting Started in Computer Science Education Research". This is to be interpreted in its broadest sense. An educator may argue "Computer Science Education" is necessarily a subset of "Education", and that the focus should not deviate from a grounding in Education theory. We take a broader view, and recognise that there are activities which we, as Computer Science educators, are involved in which are not primarily education-focused, but which are applied to the teaching and learning agenda. Perhaps we should use the phrase "Educational Technology" in the title, but this raises its own issues, since Educational Technology is a discipline in its own right.

The focus of this booklet is therefore any research which adds value to our understanding of the teaching and learning processes, or the technologies which support them, in Computer Science Education at university level. We focus on interdisciplinary work, but we also include research which may be essentially education, or pure computing, provided it relates to the teaching and learning agenda.

How to do Research is Computer Science Education

If, like us, you have a computing background, you will be familiar with techniques such as formal methods and the scientific method, and you will understand how to do research in your own particular field of study. Computer Science Education is necessarily interdisciplinary, and research in the area requires an understanding of how education research can be performed, in addition to any technical (computing) expertise you can apply.

The scientific method, however, is often implicit in our working methods, and we do not often question what those methods are or to what extent they are valid. We do need to be explicit, so that we can understand how the expertise we already have can be exploited within the domain of Computer Science Education, and how the research techniques we are familiar with compare with others, both technical and pedagogic.

The first part of this booklet considers research methodologies and techniques which might be applied to the domain of Computer Science Education, and include methods based in social science as well as scientific techniques. We outline briefly the characteristics of each, and suggest activities within the field of Computer Science Education for which each one may be an appropriate approach.

We do not attempt to provide a detailed guide to conducting research in Computer Science Education — there are many books which cover individual research techniques in depth, and we refer to suitable texts when appropriate. Our task is to suggest techniques which you may be able to use, their strengths and weaknesses, and to give examples of the type of research activity for which the technique may be suitable.

Your institution (or the Education Department / Faculty of Social Studies) will also be able to assist you, and may even deliver courses on social science research methods.

Where to Publish?

Few papers are either wholly technical or completely without any technical content. We use a model which assumes that most papers in Computer Science Education have both technical and educational content, and can be placed somewhere on the following (linear) scale.

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100% Computer Science <======================> 100% Education
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The second part of this booklet considers the conferences and journals which are appropriate for dissemination of Computer Science Education research. Using a refined version of the linear model, we have taken recent volumes / proceedings of the major journals and conferences which are relevant to Computer Science Education, and categorised the articles in each, in order to establish a “profile” for each.

Computer Science Research

In this section we review the principle methods used for Computer Science research, since where our research has a strong technical focus we need to be explicit about how we approach that activity.

Before embarking on a discussion of computer science research methods, it's probably worth asking the question: *What is Computer Science?*

Is it science? Or maybe technology or engineering? Or Mathematics?

The meanings of these four words are well-understood, and in a traditional setting there is seldom ambiguity. *Science* relates to the search for truth (knowledge, understanding), such as might be encountered in Physics. *Technology* refers to the skills, methods and tools needed for problem-solving, for example the application of metallurgy to the production of agricultural tools. *Engineering* is the design, construction and operation of useful artifacts, such as railways and bridges. *Mathematics* relates to abstraction and to logical reasoning.

In some sense, computer science captures aspects of all four, and there is a trend for "computing" to be divided into defined sub-disciplines of which "computer science" is but one. It is interesting to note that the ACM in its current *curricula recommendations* (www.acm.org/education/curricula.html) identifies five sub-disciplines:

- Computer Engineering,
- Computer Science,
- Information Systems,
- Information Technology, and
- Software Engineering.

The purpose of this section is not to teach how to do Computer Science research — you already know how to do that in your own field. Rather, we seek to encourage you to think about the methods you are using. We do not attempt to give a comprehensive list of such methods, for which you are referred to the articles below. We do, however, invite you to consider two of the main approaches — theoretical and empirical.

Further reading

Dodig-Crnkovic (2002) presents a lucid discussion of the various methods in Computer Science, and Colburn (1999) and Floridi (2004) provide useful background material which help to explain what distinguishes our subject from other scientific and engineering disciplines.

Glass *et al.* (2004) undertook a study in which they analysed 628 papers from top Computer Science (CS) journals, 369 from Software Engineering (SE) journals and 488 from Information Systems (IS) journals. These were then categorised according to the topic, the research approach taken (evaluative, descriptive or formative), the research method used, the level of analysis, and the reference discipline (if appropriate).

Shaw (2003) analysed one major Software Engineering conference, and identified both the types of research, and the factors which influenced the acceptance (or otherwise) of papers submitted. This paper answers the question "What kinds of results do Software Engineering researchers produce?"

Information Systems is identified by the ACM as a Computing discipline, and although we do not focus on it here, we direct the reader to a couple of resources which will present an IS-specific view of the

research process. Roger Clarke (www.anu.edu.au/people/Roger.Clarke/) provides a large website with resources relevant to Information Systems, including research methods appropriate to that discipline, and Myers' website on Qualitative Research in Information Systems (www.qual.auckland.ac.nz) is comprehensive in its scope.

Theoretical Methods

Computer Science is partially grounded in mathematics, and formal reasoning about computational electronic devices is a principal foundational activity. Mathematical techniques, such as semantic modelling and algorithm design and analysis, are often used to reason about computational systems, and standard mathematical methods, including recursion and induction, are employed. Indeed, some aspects of computing *are* mathematics — computation, for example, is as valid a domain of mathematical discourse as algebra or logic.

Glass *et al.*, in a survey of Computing journal and conference articles (2004), report that over 73% of *Computer Science* papers surveyed could be described as "mathematical", whereas for *Information Systems* this falls to approximately 12%, and for *Software Engineering* to below 11%

What this means in practice is that whenever a system can be described, or modelled, by an abstract structure, that structure is then available to be analysed as an entity in its own right, and the results of that formal mathematical analysis enhances our understanding of the system that it represents. Specific instances might include the following:

- semantics, as a description of a programming language minus its syntactic "sugar";
- complexity theory, as a means of analysing the performance of a program; and
- graph theory, as a model of computer networks.

Pros

- "Hard" results may be obtained which are repeatable and verifiable.

Cons

- The topic under investigation must allow a mathematical model.
- The researcher must be competent with the appropriate branch of mathematics!

Examples

A novel but computation-intensive technique for checking similarity of source code files is used for plagiarism detection. Can it be implemented so that it runs with an acceptable speed?

A distance learning tool is developed for use in environments with limited network bandwidth. What media types can it handle (in principle) with acceptable response times?

Further reading

Dodig-Crnkovic (2002) provides a clear overview of the theoretical approach. Milner's (1993) paper — although rather technical — is a quality example of how a theoretical approach might be employed to explore a specific topic which is fundamental to computer science.

Empirical Methods

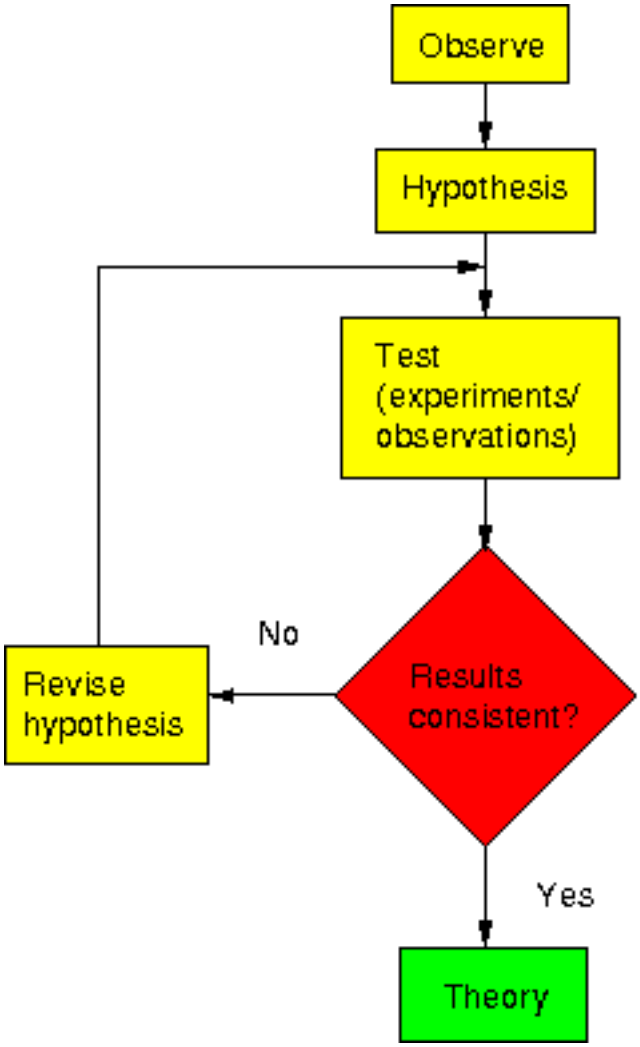
In contrast to the theoretical view of Computer Science, the approach which relies on “concrete” evidence is referred to as *empirical*.

Empirical evidence is observable by the senses, and empirical research draws conclusions from direct or indirect observations of the subject of study. Empirical methods are characterised by an experimental approach, in which hypotheses should be testable and refutable by experimental observation.

Two empirical approaches are common within the Computing disciplines — the Scientific Method, also used in the physical sciences, and Simulation, used extensively for research into (for example) networks and large software systems.

The Scientific Method

The Scientific Method is an iterative process whereby the investigator formulates an hypothesis based on observed information, performs tests and/or experiments to validate the hypothesis, and if those tests are *consistently* passed, the hypothesis is supported. The following flowchart illustrates the process:



A necessary condition for a method to be described as “scientific”, is that it must allow for a theory validated by that method to be *falsified*. That is, it must be possible for new evidence or data to overturn results which are currently accepted as valid or proven.

The scientific method is characterised by a positivist approach where objective, value-free facts can be observed and used to test hypotheses. Universal causal laws are developed, and events are explained by relating them to general laws.

Domains such as the physical sciences are appropriate for application of the Scientific Method. In Computer Science, its application is less obvious, but may be suitable for topics which do not lend themselves to formal (mathematical) analysis.

Many areas in which strict application of the scientific method is not possible can still benefit from an approach which stresses the importance of rigour, falsification and validadtion, yet allows a broader view of the experiments that are carried out and the facts that are established. This is particularly useful when dealing with human behaviour.

A good example of an area of interest within Computer Science for which a scientific approach is clearly appropriate is HCI, a subject which is itself interdisciplinary, and draws as much on Psychology (cognitive, perceptual and social) as on Computer Science. The types of activity that HCI research might cover include interface design (including menus and devices), visualisation, usability, and aspects of AI and autonomous agents, and the types of research may involve techniques specific to HCI, such as task analysis and cognitive walkthroughs. Observation of users may be required, and may involve user participation, users “thinking aloud”, or recording of a user’ interactions and subsequent analytical analysis.

Pros

- There is a much literature on the Method, which is well understood.
- The Method has been adapted for use in many scientific disciplines.
- Useful for topics which overlap other scientific disciplines.

Cons

- Limited applicability in the Computing disciplines.
- Possible learning curve where other dicsiplines, such as Psychology or Physics, are involved.
- Is seen by some as being reductionist in the way it reduces ideas to quantifiable, testable units.

Examples

A networked educational tool is deployed, and has users located in multiple locations globally. It is discovered that some of the learning materials are inaccessible to some users, in particular those residing in a particular country, and it is presumed that data is filtered by the authorities in that country. Hypotheses relating to the algorithm used to filter the data can be formulated, and tested by constructing appropriate data and observing if the affected users can access those test data.

A new tool for students learning computer programming aims to speed up the process by optimising the movements a student makes (keystrokes, etc.) when entering code. Its effectiveness, or otherwise, is an HCI research problem.

Further Reading

There is much literature devoted to discussion and debate concerning the Scientific Method, with Popper (1959) and Kuhn (1962) being classic texts. Many general research methods books include more immediately applicable information. Both the Scientific Method and the more general "Method of Science" approach are described in the context of Computer Science Education Research by Fincher *et al.* (2003). Dodig-Crnkovic (2002) provides a perspetive on Scientific Methods in the context of Computer Science.

The CHARM (Choosing Human-Computer Interaction (HCI) Appropriate Research Methods) website (www.otal.umd.edu/charm/) maintained at the University of Maryland contains detailed descriptions of the specific techniques used in HCI.

Simulation

Theory and experimentation deal with tangible facts, and usually provide “yes/no” answers. Much of Computer Science is not so simple, however. Consider, for example, a novel item of software which performs a “large” task, such as might be encountered in Artificial Intelligence, or massively parallel supercomputers. It would be difficult even to state a theorem about such a system, and experiments would be difficult to devise or infeasible to perform. In such cases, computer simulation of the system under investigation yields a means of investigating that system.

It is perhaps helpful to think of simulation as *pre-theory*, and activity to be undertaken as an exploratory precursor to formulating a theory which can either be reasoned about formally or tested by concrete experiment.

Pros

- Appropriate to many computing activities, especially those related to software.

Cons

- Results may be difficult to validate.
- A variety of concerns have been expressed about the validity of using simulations and of the conclusions which may be drawn (see the Further Reading section).

Examples

A Virtual Reality tool is proposed which will assist a learner by simulating a face-to-face meeting with their tutor. A simulation of the software will suggest whether or not the model proposed is realistic.

An “Eliza”-like program has been written which interacts with students and gives them learning support. How well does it work? This would be similar to the “Turing Test”.

A pedagogic architecture with novel neural net support is proposed, but the neural network is poorly understood and difficult to reason about. A simulation of the system is appropriate to explore whether it actually works.

Further Reading

Dodig-Crnkovic (2002) expands on the relevance of simulation to Computer Science research. Cohen *et al.* (2000) discuss the use of simulations in Education research. They cover a range of criticisms made of the approach and, in a number of cases, suggest examples to counter the criticisms.

Educational Research

In contrast to the scientific focus of the Computer Scientist, the Education researcher has available a relatively large portfolio of methods and techniques, many of which are used throughout the Social Science communities.

Social Science research is typically *interpretative*, and seeks to develop theories that model observed data. The approaches taken are often classified as *quantitative* or *qualitative*. The former rely on the collection and analysis of numerical data, and may require the application of statistical techniques. Qualitative techniques use data collected (for example) in interviews and surveys, with a view to identifying patterns which may support or refute the research hypotheses.

Few results in educational research are in any sense “precise” — it is seldom possible to be 100% valid and reliable. Statistical analysis, for example, depends on the “level of significance” required, and data collected from a given experiment performed on two separate occasions will not be identical. More fundamentally, a research activity will not be able to control all the variables which may affect the outcomes.

Researchers therefore try to maximise the validity of a research exercise, and to maximise the confidence level in their findings. Methodologies used in the Social Sciences include mechanisms, such as triangulation techniques, designed to ensure that the results of a research exercise are as reliable as possible. For example, a questionnaire may contain a question which is repeated but phrased differently, to check that the respondent is answering consistently.

In this section, we give an overview of the principal methods and techniques used in educational research. We have tried to avoid excessive use of jargon — research methods in education are a focus of education research — and we have deliberately not stressed the subtle, but fundamental, differences between a *method*, a *methodology*, and a *research style*.

Further Reading

There are many books available which discuss research methods in the Social Sciences. We have found Blaxter *et al.* (2001) to be a very accessible introduction to the subject, and Cohen *et al.* (2000) is a comprehensive text which covers research in Education, and serves both as a tutorial guide and as an authoritative reference work. Other textbooks which have comprehensive coverage of Education research include Gall *et al.* (2002), Best and Kahn (2006) and Gay *et al.* (2006).

Quantitative Approaches

Quantitative research is all about numbers and statistics. The numbers come from data collection exercises (such as questionnaires and many other sources), and the purpose of the research is to confirm (or refute) hypotheses. Typically, this might involve relationships and patterns being identified by other means (such as qualitative studies), and the use of a significantly large set of data to validate their existence.

Pros

- The method of analysis, which is normally statistical, is one which a scientist can relate to easily.

Cons

- Care must be taken with formulating the hypotheses being tested to ensure that the analysis is externally valid.
- Statistics is not to everyone's liking.
- Some social scientists would claim that what can be learned from this type of approach is very limited.

Further reading

All Education Research textbooks describe quantitative research in detail, including Cohen *et al.* (2000), and Gall *et al.* (2002). A good book on statistics is also essential, such as Rees (2000), or — if you choose to use SPSS to analyse your data — Miller *et al.* (2002).

Descriptive Research

The name is deceptively simple — descriptive research *describes* phenomena based on data collected by a variety of means. However, the *purpose* of the research is *assessment* — evaluating the prevalence of attitudes, opinions, processes, and other measurable data that affect the phenomena. The data collection is often by means of surveys, and is normally (but not necessarily) quantitative.

Pros

- Appropriate for evaluating attitudes and opinions of large groups of subjects.

Cons

- Potentially time-consuming to collect and analyse data.
- Can only describe the situation (eg; who, what, when) but does not address causes.

Examples

What methods are employed for teaching Java programming in UK universities?

What components of the Computer Science curriculum do students in the UK perceive as positively affecting their future employability?

Further Reading

Best *et al.* (2005) address the topic of descriptive research, relating it both to quantitative and qualitative methods.

Causal Comparative

In this type of research, the “independent variable” (for which the researcher wishes to find the cause) has already been set, and is not under the control of the researcher. There is therefore no possibility of a controlled experiment or quasi-experiment, the researcher must examine the data which may suggest a causal relationship between dependent and independent variables.

The independent variables are usually categorised into groups, perhaps nominally (such as gender), on an ordinal scale (such as degree classification), or numerically on an interval scale, and a statistical analysis will then be used to provide evidence of causality.

Pros

- A standard approach where experimentation cannot be performed, yet statistical data is available.
- Many cause-and-effect relationships can, in principle, be tested in a single study.

Cons

- Alternative hypotheses for the observed phenomena must be explored.
- A study may suggest the existence of multiple cause-and-effect relationships.

Example

It is suggested that first year students who have taken a “gap year” between school and university perform better in their first year assessments and examinations than students who have not. Is this true, and what are the reasons for it?

Further Reading

The causal comparative approach is discussed by Cohen *et al.* (2000,205-206) and by Best *et al.* (2005, 134-137).

Correlational Research

This is an exploratory technique for finding *associations* between variables. It involves identifying when the change in the value of one variable is accompanied by a related change in the value of a second variable. It is widely used, and typically employs basic statistical techniques, including Pearson or Spearman correlation tests.

Subsidiary questions that might be asked include “what is the *direction* of the correlation?” and “what is its *magnitude*?”

A clear distinction must be drawn here between correlating two variables *as an experimental test*, and identifying correlations between variables *in order to formulate hypotheses* (which can then become the subject of an experiment or quasi-experiment). Correlation research refers to the latter.

Pros

- Good for exploratory studies, especially where the variables are located in different fields where the relationship has not been explored in detail.

Cons

- A correlation between two variables does not indicate cause or effect.
- Statistical tests should always be used with care.

Example

It is conjectured that a student’s progress during the first year of the course is associated with the level of programming skill achieved at school. Is this worth investigating further?

Further reading

Cohen *et al.* (2000, 191-204) discusses the statistical tests appropriate to measuring correlations. The textbook by Miller *et al.* (2002) provides a more detailed overview of statistical techniques in the context of the SPSS software.

Experiments and Quasi-experiments

Experiments can be used to test a theory by considering “cause-effect” hypotheses, and are typically used as part of the Scientific Method. Repeated positive experimental data can support (but not prove) a theoretical hypothesis, whereas a negative (and repeatable) experimental result can refute such an hypothesis. Experiments can also be used to explore, to investigate the relationships of variables to each other, prior to formulating a theoretical hypothesis.

In the context of the physical sciences, experimentation is a common activity, and one which is appropriate and is straightforward to justify. In the context of Computer Science, its relevance is not so obvious.

Within our domain of interest — educational research in Computer Science — experimentation can take place with either a pedagogic or a technical focus.

Experiments rely on identifying variables which can be measured. *Independent* (or *treatment*) variables are known values but cannot be changed (such as a person’s age, or the size of a memory chip), and *dependent* variables are values which are measured both before (*pretest*) and after (*posttest*) the experiment. A (randomly assigned) control group may be used to measure the values of dependent variables when not subject to the experiment, so that they can be compared with values after the experiment has taken place.

A problem with experiments is that it is actually quite difficult to set up a good one. In particular, if you wish to investigate the relationship between two variables, you need to filter the effects of any other variables. In an educational setting this is often difficult — not only do we not have control over the other variables, we may not even be sure what they are. In effect, we are unable to identify the “control group” as being a random data set.

In an experiment, we seek to establish cause and effect. In a quasi-experiment, we merely find *indicators* of what *might* be cause and effect, based on our understanding of the other factors which may affect the exercise, and the validity will depend on how carefully those factors have been addressed. A feature of a quasi-experiment is that the control group is *not* randomised.

In both experiments and quasi-experiments, a *pilot* is highly recommended, in order to double-check that the process to be used is effective.

Single case research is an experimental technique performed over a period of time, in which a single scenario (such as a particular classroom interaction) is repeated with the conditions changed. Using an “ABAB design”, the scenario can initially be done under “normal” conditions; it would then be repeated with the conditions changed; then again under the previous conditions, and finally with the conditions again changed to what they were for the second instance.

Pros

- Experiments yield explicit concrete evidence which can be used to support (or refute) an hypothesis.
- Experiments can be replicated.
- Quasi-experiments are relatively easy to perform.
- A quasi-experiment is sometimes the only methodology available, especially if access to the resources needed (typically students or staff) are highly constrained, or if a desired experiment cannot be performed for ethical reasons.

Cons

- Experiments with small samples, or run over too short a period of time, may not yield sufficient data to provide a result.
- A single experiment will typically only test a single hypothesis.
- Some phenomena cannot be controlled or managed, in which case experiments are impossible. This is a particular issue if the research has an education focus.
- Results from quasi-experimental research do not exhibit the same internal or external validity as experimental results. This does not mean they are invalid, it just means that the results must be carefully presented in context, and may have to be guarded with phrases like “suggest that” and “indicate that”.

Examples

Technical experiments

Investigating the performance of a neural-net based learning support tool, where the theoretical understanding of the neural net model is insufficient to predict the performance.

Educational experiments

A new tool for comparing document similarity is used to detect instances of plagiarism. How effective is it?

A new educational tool has been developed. It is hypothesised that the tool helps students to learn *topic X* quicker than traditional methods. A group of students who are about to learn topic X is selected and that group uses the new tool to aid in understanding that topic. The results of questionnaire and interview data (from the students) together with quantitative data provided by the tool (a comparison of their examination results with equivalent cohorts) are used to provide evidence.

Educational quasi-experiment

An exercise in testing the efficacy of a new learning tool or method might involve its use on a group of students. However, that set of students is unlikely to be representative — for example, the students’ past experiences, their educational level and achievement, ethnic background, and many other attributes are unique to each student. Without a large sample of students to truly provide a control group whose content is randomised, a true experiment cannot be performed.

Further reading

Tichy (1998) argues the case for experimentation as a research method in Computer Science, and offers numerous examples. Basili (1996) presents a Software Engineering perspective, and Zelkowitz and Wallace (1998) have developed a detailed taxonomy of experimental techniques appropriate to Computer Science. Cohen *et al.* (2000, 211-225) compare and contrast experimental and quasi-experimental research in an educational context.

Shadish *et al.* (2002) provide a comprehensive textbook which considers social science aspects of experiments and quasi-experiments.

Ex Post Facto Research

The name of this technique means ‘retrospectively’, and involves exploring cause and effect relationships for events which have already occurred. In other words, the “independent variables” have already taken place, and the researcher is performing a “pseudo-experiment”. This is not unlike the procedure that police officers might adopt when engaging in detective activities.

This is a technique which may be appropriate when the research interest relates to social issues — for example, differences in student performance or attitude as they relate to cultural or ethic background.

Pros

- For some areas of enquiry, this may be the only possible approach.
- Provides hypotheses which may be explored in subsequent experiments.
- Can be used in realistic scenarios where experiments cannot easily be set up.

Cons

- Lack of control over the data.
- Identifying control groups is problematic, and data samples cannot be randomised.
- The technique does *not* establish cause and effect, it merely suggests it.
- Results may not be reproducible.

Example

Students entering an undergraduate computing course who have followed a specific computing IT syllabus at school (which has since been discontinued) appear to have gained unusually good grades. Is this due to the syllabus, and if so, what are the contributory factors?

Further Reading

Cohen *et al.* (2000, 205-210) provides a concise discussion of the technique.

Qualitative Approaches

Qualitative (or *interpretative*) research is the study of cases, rather than of whole populations or samples of populations. Qualitative studies may be used to explore data, discover possible relationships, and thereby gain insight and understanding by representation and interpretation of the social environment.

Qualititive research covers a diverse range of strategies from different philosophical perspectives, each involving different methods of inquiry and different procedures. Each may draw on a wide range of data, such as interview, text, image or audiovisual, and will have associated methods of analysis and interpretation.

In contrast to the scientific method, qualitative approaches are based on a relativist philosophy which holds that reality can only be defined subjectively. Observations can never be fully objective but are always interpreted by the observer. A quantitative view may be criticised as being reductionist, with overemphasis on numerical representation and measurement. In contrast, a qualitative (or hermeneutic) approach interprets the available data to construct a model within the framework of the approach. Further data may be collected, and the model refined, until a sufficiently deep understanding of the domain of interest is reached.

Although qualitative approaches are most widely used within areas such as the Social Sciences, they are now appearing more regularly in Computer Science Education research.

Pros

- A large corpus of material on qualitative research practices is available.
- Qualitative approaches are appropriate for research using non-numerical data.
- Counter the “reductionist” criticism of quantitative approaches.

Cons

- The methods used are very different from those usually employed by Scientists, and you are advised to “do your homework” before commencing a qualitative research exercise.

Further reading

All Education Research textbooks describe qualitative research in detail, including Cohen *et al.* (2000), and Gall *et al.* (2002).

Case Studies

A case study is the detailed analysis of a single thing, which might for example be a person, a system, an organisation, a course, a process, a group, or a methodology. The phenomenon under investigation is not under the total control of the researcher, and may be influenced by multiple factors. The tools employed might be a selection of any of those we have discussed in this booklet.

A case study may be *exploratory* (piloting further research), *descriptive* (narrative), or *explanatory* (testing theories) (Yin, 2002).

In addition to any issues arising from the techniques used within a case study, care should be taken with the following.

1. Anonymity is not an option, and the rights of participants (privacy, intellectual property, data ownership) must be observed.
2. Data validation is relatively difficult, and any opportunities for (for example) triangulation should be pursued.
3. The conduct of the exercise should minimise disruption to (and influence on) the subject of (and participants in) the study.

Pros

- Easy to disseminate to a non-technical audience.
- The effect of a “real context” can be observed.
- Comparison can be made with similar cases and situations.
- Contributing factors do not all have to have been identified prior to the start of the study.

Cons

- Generalisations cannot be made easily.
- Cannot be reproduced easily (or even verified)
- There may be observer bias.

Example

A new educational tool is introduced into a particular module. Its use, and the effects on the module, are observed over a semester.

Further reading

Cohen *et al.* (2000, 181-190) provides a more detailed overview, and Yin (2002) provides in-depth discussion and guidance.

Other Techniques

Many qualitative approaches have evolved and the area continues to develop. In addition to case studies, four main approaches are identified by Creswell (2003) and these are outlined briefly below. A fuller account of these and a further 23 approaches is given by Tesch (1990). These are unlikely to be the techniques you would first choose, but some are now being applied in Computer Science Education research. Some qualitative methods are based on a rather subtle conceptual view and you will need to follow the references to find out more.

Ethnographic research

Ethnography (or “cultural anthropology” or “naturalistic enquiry”) relates to the study of sociocultural phenomena, and may be descriptive or analytic. A community or cultural grouping is usually the focus of study, and the researcher will be interested in how cultural factors affect that group in particular situations and contexts, with emphasis placed on portraying everyday experiences. Multiple and repeated interviews are typically used by ethnographers as a primary data collection tool, with emphasis placed on portraying everyday experiences. Taylor’s collection of ten studies (2001) gives a helpful insight into the variety of ethnographic research activities.

Phenomenographic research

Phenomenography involves the study and interpretation of other peoples’ experiences, perceptions of, and understandings of specific phenomena. The data used are subjective and qualitative. This is a relatively recent methodology, in the phenomenological tradition which offers a humanistic and individualistic interpretation of the world. Moustakas (1995) is a good primary source, and Bruce maintains a website with resources relating to phenomenographic research within IT (sky.fit.qut.edu.au/~bruce/Phenomenography/).

Grounded Theory

Grounded Theory research uses repeated stages of data collection (usually interviews) to obtain views from the study participants. Theory is generated from the data, and this is tested and refined through iterations of the data collection process. It can be useful in relatively new areas where there is little existing theory to draw upon. Data collection, theory formulation and testing are all interleaved throughout the research. The Grounded Theory approach is explained further by Strauss and Corbin (1998).

Narrative research and discourse analysis

Human interaction relies on communication. Studying this interaction in various ways can provide insight into the social processes underlying the communication. Narrative research is used to study individuals by asking them to provide stories about their lives. The narrative is then given a structure by the researcher so that the final research provides a blended narrative combining the input of both participant and researcher. Clandinin and Connelly (2000) provide further information on this approach. Discourse analysis refers to the study of conversation or other exchanges, such as on-line messaging (Renkema 2004), and is discussed by Cohen *et al.* (2000, 298-300).

Mixed Approaches

In many cases, a single technique will not be appropriate, and multiple methodologies and data collection techniques may be used to investigate a particular problem. Mixed method research has become increasingly popular, with the new Journal of Mixed Methods Research (2007) now devoted to the topic. Some researchers, such as Newman and Benz (1998) have moved away from the divide between quantitative and qualitative approaches towards viewing all research practices as being on a continuum between the two. All methods have limitations and possible biases, and a mixed approach may be able to achieve a more balanced result by triangulating data sources. Various ways to combine methods are proposed. These include: sequential procedures, where the results of one method are used to feed into another; concurrent procedures, where different methods provide different perspectives for a comprehensive analysis; transformative procedures, where a particular theoretical perspective is taken as a framework for other methods.

Pros

- Flexibility.
- A fuller picture of the topic can be built up.
- Bias inherent in one approach can be compensated for.

Cons

- Care must be taken that each approach is valid and reliable on its own.
- Care must be taken that the different approaches are combined in a valid way.
- May be time-consuming to carry out the necessary work for a number of different approaches.

Example

Research is undertaken to investigate whether female undergraduates studying Computer Science have a different experience to their male counterparts. This might start with a broad survey of available statistical data which could then feed into a detailed qualitative interview-based study.

Further reading

A good account of mixed methods research is given by Creswell (2003). This also includes many further useful references.

Longitudinal Studies

The observation of given entities (usually individual people) over an extended period. Detailed data is collected on those entities.

Pros

- Effective at establishing causal relationships.
- Eliminates chance occurrences.

Cons

- Time consuming.
- Entities may disappear (e.g. by death) during the period of study.
- Repeated viewing of the same data may change that data.
- New circumstances may affect the original research plan.
- It may be difficult to get suitable participants.
- The data collected may be complex.

Example

It is hypothesised that use of CPD tools improves students' ability to get part-time employment during their course. A group of students is closely monitored over the period of their studies and data collected on their CPD tool use and on their applications for jobs.

Further reading

Cohen *et al.* (2000, 169-180) compares longitudinal studies with other developmental research methods.

Historical Research

Computer Science has been taught for over 50 years, and in that time the discipline, our understanding of pedagogy, and the tools available to help us teach, have changed radically. The history of Computer Science Education is a valid research area.

The process of performing historical research is as follows.

1. Formulate hypothesis
2. Collect data
3. Evaluate data
4. Confirm or refute hypotheses

Data collection

The process of conducting an historical investigation is initially an exercise in finding information. That's the difficult bit — standard data collection techniques are seldom appropriate.

A distinction must usually be drawn between *primary* and *secondary* sources. Primary sources are data where the researcher has access to the *original* data set. Examples of primary data might be:

- original program code;
- interviews with living historical figures;
- original institution documents, such as syllabi;
- government statistics.

Secondary sources are data which have already been processed by some other third party, and might include material from books, radio and television. Secondary sources must be treated with the greatest of care, since the author may have introduced factual errors or misinterpretations.

Sources of data — especially primary data — may be hard to find. Archives of documents in institutions or companies are not usually easy to access (but do exist), and persistence and diplomacy are desirable attributes of a successful researcher! Universities will normally hold back copies of syllabi and course regulations, and summary statistical data. Local authorities hold records which are available to the public, as do central government agencies such as the Office for National Statistics (www.statistics.gov.uk) and the Higher Education Statistics Agency (www.hesa.ac.uk).

Any document (published or otherwise) is potentially a data source, and notes and articles from long-standing publications, such as Communications of the ACM (www.acm.org/pubs/cacm/) and the BCS Computer Bulletin (recently renamed ITNOW) (www.bcs.org/server.php?show=nav.5922) may provide high-quality information. Textbooks are a particularly useful source of pedagogic data, although consultation with a copyright library may be required, since many university libraries "purge" old textbooks. The copyright libraries are: the British Library (www.bl.uk), the Bodleian Library in Oxford (www.bodley.ox.ac.uk), Cambridge University Library (www.lib.cam.ac.uk) the National Libraries of Scotland (www.nls.uk) and Wales (www.llgc.org.uk), and the Library of Trinity College Dublin (www2.tcd.ie/Library/).

The period of time that we are interested in is still relatively recent, and many people who have witnessed the early developments in Computer Science Education (or who knew deceased colleagues) are still alive, and contacting such people — either formally or informally — should be considered. We are interested in the events that took place, the people involved and the activities they were involved in. Not only will Computer Science Educators be helpful — you may find that (for example) a long-

standing administrator in your institution may recall unrecorded political or financial issues.

Research results

The answers to an historical question will seldom be clear cut, and historical research yields books and articles which are usually narrative in style. The data must be distilled, and relevant portions selected for use.

Historical research is potentially interesting to a wider audience than academic peers, and consideration should be given to dissemination through other avenues, in addition to scholarly publication. For example, presentations to schools may be valued by institutions seeking to enhance their profile for recruitment purposes.

Pros

- This research approach is essentially the same as that used by the much larger community of researchers in the History of Science, which has produced a substantial corpus of published material which can be consulted. Good starting points to access this related research include the History of Science Society (www.hssonline.org), and the British Society for the History of Mathematics (www.bshm.org),
- Recurrent trends over time can be identified, and may be assessed.

Cons

- Historical research is, by its very nature, a specialised activity for a Computer Scientist, and is inappropriate for most Computer Science Education research activities.
- Data sources may be inadequate or inaccurate.
- Author bias may be an issue.

Examples

How has Mathematics in the Computer Science curriculum developed over time, and why?

What external factors have affected the choice of programming languages used in Computer Science courses during the 1980s and 1990s?

Further reading

The History of Computing (not specifically Computer Science Education) is the theme of several research-focused web sites including the Charles Babbage Institute at the University of Minnesota (www.cbi.umn.edu) and the American University Computer History Museum (www.computinghistorymuseum.org). The major specialised journal related to the history of computing is the IEEE Annals of the History of Computing (www.computer.org/portal/site/annals/).

Theoretical

Our research should always be situated within an appropriate theoretical context, and that may be an appropriate educational theory. However, if you are reading this booklet, you are probably not a pure educationalist, and an awareness of some basic concepts may be sufficient.

That having been said, a *good* grasp of educational theory may make it much easier for you to discuss your results, and may open up possibilities of targeting publications at pure educational journals and conferences.

This is where it starts to get complicated. There is no such thing as the "theory of education" — there are *many* theories, and you will need to set aside quality time to read about them. There are, however, a number of theories which are frequently referred to, and which offer an entry point.

Some educational theories

The theory which is perhaps most commonly mentioned is *Bloom's Taxonomy*. Bloom classified a student's cognitive abilities on a scale of 1 through 6, the first three (knowledge, comprehension, application) relate to "surface" learning, the latter (analysis, synthesis, evaluation) to "deep" learning. The assumption is that it is desirable for a student's activity to be at a deep rather that a surface level. Anderson and Krathwohl's book (2001) provides a comprehensive discussion of the Taxonomy, and discusses how our understanding of it has developed in recent years.

"Constructivist" theories take the view that students actively construct their own understanding and meaning, and include Bruner's work building on the child development framework of Piaget. Vygotsky's "Zone of Proximal Development" is a conceptually useful tool for understanding how students' social environment affect their learning. Daniels (2005) provides an accessible overview of Vygotsky's work, together with reprints of some of his key papers.

In contrast to the constructivist view, "behaviourist" theories assume that learners can be conditioned to acquire modified behaviour, in other words, that it is possible to teach. This view was propounded by Skinner, and Richelle's book (1993) explains Skinner's ideas and compares them with those of other leading theorists. The B.F. Skinner Foundation website (www.bfskinner.org) is an authoritative source.

Pros

- Offers the possibility of high-quality theoretically sound research.

Cons

- Not easily accessible, due to the volume of published material.
- Alien to many scientists.
- Many educational theories are — or have been — controversial.

Example

A novel approach to teaching programming might be founded on the theories of a given educationalist, and its effectiveness measured by reference to that theoretical framework.

Further reading

Greg Kearsley's "Theory into Practice" database (tip.psychology.org) contains a list of over 50 educational theories, together with a (1 page) overview of each.

Literature Reviews

Although not strictly a research methodology, a literature review will form part of any sound research exercise, and should be of sufficient breadth and depth to give the reader confidence that the research is appropriately situated. In particular, the results should be compared and contrasted with similar results elsewhere.

Occasionally, it may be appropriate for an extended literature review to form a data collection activity, and the results of the review analysed to give an understanding of the nature of the material reviewed. In Computer Science, this type of research is often published in *ACM Computing Reviews*.

Pros

- Information from a substantial literature review can be used to support multiple research activities.

Cons

- Time-consuming.

Example

What techniques have been used to teach programming to novice undergraduate students?

Further Reading

Many general books on research and research methods contains sections about the literature, for example, see Blaxter *et al.* (2001, 120-127). There are also books such as Fink (1998) which are devoted to the topic and describe each step in detail.

Action Research

Action research is a practical activity which takes place “real-time”, and to solve immediate and pressing problems. The researcher is typically immersed in the process as part of, and influencing, the subject matter under investigation. The process is as follows.

1. Planning
2. Action
3. Observation
4. Reflection

This is perhaps the “softest” research methodology in use, and one which not all practitioners consider to be valid. Indeed, some funding bodies will not entertain proposals based on this methodology. To be fair, the other side of the coin is that action research is accessible, and opens up possibilities which are not available using other techniques.

There is seldom an “answer” — results may suggest changes to processes, or to solve micro-problems set in a particular environment. It is perhaps helpful here to present a selection of descriptions of the role of action research.

“Action research is a process in which practitioners study problems scientifically so that they can evaluate, improve and steer decision-marking and practice.” (Corey, 1953, in Cohen *et al.*, 2000)

Action research is “the study of a social situation with a view to improving the quality of action within it.” (Elliott, 1981, in McKernan, 1998)

“Action research represents a different approach to research, i.e. a pluralist research approach that is based on the assumption that when studying complex social settings, the mere recording of events and formulation of explanations by an uninvolved researcher, typical of positivism, is inadequate in and of itself.” (McPherson and Nunes, 2004)

“Action research should contribute not only to practice but to a theory of education and teaching which is accessible to other teachers, making educational practice more reflective.” (Stenhouse, 1979, in Cohen *et al.*, 2000)

“The aims of any action research project or program are to bring about practical improvement, innovation, change or development of social practice, and the practitioner’s better understanding or their practices.” (Zuber-Skerritt, 1996b, in Cohen *et al.*, 2000)

“The aim of action research is to solve the immediate and pressing day-to-day problems of practitioners.” (McKernan, 1998)

“As a research device it combines six notions:

1. a straightforward cycle of: identifying a problem, planning an intervention, implementing the intervention, evaluating the outcome;
2. reflective practice;
3. political emancipation;
4. critical theory;
5. professional development; and
6. participatory practitioner research.” (Cohen *et al.*, 2000)

Pros

- Can be used in almost any setting.
- Extremely flexible.
- Particularly suited to e-learning environments.

Cons

- Potentially high workload for the researcher.
- Difficult to focus activities.
- An alien methodology for a researcher with a conventional training.
- Lack of rigour.

Example

The topic of interest is the type of interaction between tutor and student during regular tutorial sessions, and where the researcher is involved in such sessions as a tutor. The motivation is that the researcher wishes to investigate approaches to the sessions which may improve them. This is not appropriate to a longitudinal study since the researcher is not merely an observer, but is part of the process.

Further reading

Several books on action research are available, including McKernan (1998) and McPherson and Nunes (2004). There are also many web sites, including Norton's (www.psychology.heacademy.ac.uk/Specialist/sp005.htm) which forms part of the Higher Education Academy's Psychology Network site.

Data Collection

Most research in Education — and some in Computer Science — relies on data. This can be quantitative data collected from questionnaires or experiments, or qualitative data from interviews, observations and other activities.

In Computer Science, the data collection is often implicit in the activity being undertaken. In Education, it must be explicit, and the validity of the research exercise relies heavily on the validity of the data collected.

Three principal collection methods are commonly used. Questionnaires are ubiquitous, and are straightforward for getting data quickly. Interviews enable us to explore in depth an individual's perspective, and observations permit us to gain first-hand information about a situation or activity.

Interviews

A primary method of qualitative data collection is the interview. There are various types of interview, including the following.

A *structured* or *closed* interview involves a fixed set of questions and a limited range of responses from the interviewee which may be open or closed. This is similar to a questionnaire, in that the data is principally quantitative, but is good for helping to clarify the interviewee's thoughts.

An *unstructured* or *informal* interview allows the interviewee free reign to discuss whatever seems appropriate. This is helpful for exploratory data gathering, and for identifying personal or emotional issues.

A *semi-structured* interview predetermines the topics to be covered, but the sequence, and the exact details of the questions asked, are left to the interviewer to decide. This is appropriate when both qualitative and quantitative data are sought.

It is usually helpful (with the interviewee's permission) to record the interview electronically, and transcribe the recording subsequently, so that the record of the interview is accurate. This is data and is subject to data protection legislation — the interviewee should be reassured that their words will be used only for the purposes of the research, will not be divulged to a third party, and that their anonymity will be preserved unless they explicitly consent otherwise. You may find it helpful to provide such assurances as a written document to give to the interviewee. Furthermore, data obtained from an interview must be archived so that if there were to be any issue arising relating to the validity of the research at a later time, then the data could be checked. A period of 10 years is usually recommended, during which time the data should be inaccessible, either in a "locked filing cabinet", or electronically stored in an encrypted form.

The place at which an interview is conducted is important. A staff office may be intimidating to a student interviewee (and liable to interruption), for example, and thought should be given to a neutral venue. A room devoted to interviews is ideal (but might be infeasible). In some cases, it may be appropriate to consider a public venue, such as a coffee shop.

Pros

- Interviews are good for finding individuals' personal perspectives on issues, and consequently the reasons for actions they have taken.
- The interviewer has the opportunity to explore specific issues in detail, and to be flexible as to which questions are asked, and how they are articulated.
- Nonverbal communication can be observed, and visual aids employed.

Cons

- The interviewer must be knowledgeable in the topic under investigation.
- Interviewing is a skill requiring practice.
- Interviewees may be unreliable, forgetful or biased.
- Interviewees may respond according to what they think the interviewer expects.
- Questions may be misunderstood.
- The interviewer's mannerisms (tone, appearance) may affect the interviewee.
- There may be interviewer bias.
- Transcription may be difficult if the interviewee does not speak clearly.

Example

A computing module is using innovative delivery mechanisms, and the research interest is whether the approach is effective (and why). Interviews with students are used to explore the factors which influence the students' perception of the approach.

Further reading

Interview techniques are covered by most books on social science research, including Cohen *et al.* (2000, 267-292). Foddy (1993) and Oppenheim (1992) are two books we have found particularly helpful.

Observations

Observations are a data collection activity during which the researcher looks at a situation or activity and collects first-hand information. The typical type of situation we are interested in would be a classroom setting in which the physical activities of the students are the data useful to us.

An observation can range from *structured* (the observer knows in advance exactly what they are looking for, and is likely to be testing hypotheses) through to *unstructured* (exploratory data is being sought to help formulate an hypothesis).

The interaction of the observer can range from that of a *participant* (such as would be the case in action research) through to that of a *detached observer*.

A key factor in a successful observation is careful planning together with systematic and accurate data recording. In the case of structured observations, the observer has identified the categories of data to be collected in advance, and recording the data may be a relatively simple matter of entering marks on a grid or spreadsheet.

If the observations are unstructured, especial care must be taken to ensure validity and reliability of the data. A technique commonly employed is to use several observers and to ensure that the data recorded by each one has a high percentage agreement with the others.

There needs to be a clear separation between the factual data, as recorded, and the interpretation of those data.

Pros

- A powerful tool for understanding complex situations in context.
- Appropriate where the data relates to human behaviour.

Cons

- The observations chosen are selective, and significant events may not be recorded.
- Interpretation of observed events may require additional data from other sources.
- Data capture and analysis may be demanding.
- Data may be unreliable.
- Observers may be biased.
- Multiple observers may be needed to ensure validity of data.

Example

Observation of students in an electronics laboratory can yield data relating to how the students are interacting with the equipment.

Further reading

Cohen *et al.* (2000, 305-316) and Best and Kahn (2005, 174-181). offer straightforward introductions.

Questionnaires

A questionnaire is one of the simplest data gathering mechanisms, and one which is well-suited to classroom use — most academics, for example, use questionnaires during or at the end of modules to ascertain the effectiveness of the teaching/learning during the module.

Questionnaires are a good way of ascertaining *simple* information *quickly*, but writing an effective questionnaire is a skill which is much more difficult to master than might be expected. Each question included — whatever type is chosen — must be carefully worded so as to be clear and unambiguous, and to allow for a full range of possible responses, and each question should be "neutral", so as not to influence the choice of response. The layout of the questionnaire must not confuse the respondents, and should assist them in its completion. Furthermore, a questionnaire should be attractive so as to enthuse the respondent to complete it fully.

A questionnaire should be *piloted* (that is, trialled on a small group of respondents — possibly even colleagues) before it is actually deployed. This is really important — however well a questionnaire has been written, it is still possible for ambiguous or misleading phrases to have been accidentally used.

The *types* of question may be used for different purposes. Basic *factual* questions can help to provide a framework within which further questions make sense (such as age, gender, course enrolment, etc.). Questions about *behaviour* yield factual "added value" which is of direct interest. Other questions, which rely on the respondents' *opinions or judgements*, may be difficult to interpret.

Questionnaires can be delivered on paper or online. Paper has the advantage that copies can be distributed at a suitable moment when respondents are co-located (for example, the start of a lecture), however they would then need manual or semi-manual processing (although OCR technology can assist). Online questionnaires can be managed with minimal human intervention, and consequent avoidance of transcription errors, but response rates may be low unless it must be completed as part of another online activity. The online approach, however, allows for innovative presentation (possibly inclusion of multimedia), for rapid turnround rates, and if appropriate for a questionnaire to be customised for individual respondents. Further issues to be considered include preserving anonymity online, since responses are potentially traceable, and avoiding duplicate responses.

Questions can include the following basic types:

- *yes/no* are quick to code responses, and forces the respondent to make a decision;
- *multiple choice* questions assume a range of expected responses;
- *rank orderings* are similar to multiple choice, but with added information about "priorities";
- *rating scales* (such as Likert scales) offer flexible responses; and
- *free response* (open-ended) questions are appropriate when there is no expected range of answers.

Analysis of questionnaire data is normally quantitative, since a (relatively) large number of responses may be aimed for, sufficient to perform basic statistical analyses. Questions which require a "text field" response may need a simple qualitative analysis, but a questionnaire is normally inappropriate to elicit good qualitative data.

Anonymity is an issue. If a questionnaire asks for a respondent's name or ID, then the responses to questions may not be accurate — for example, a student may not believe assurances that the data will not be used to grade them. On the other hand, knowledge of a respondent's identity may help to correlate the data with other information, such as identifying factors which might have affected a student's grade. This is a sensitive issue.

An approach which can be employed is the "follow-up" — respondents may be asked permission to be

approached subsequently in order to gather further data. Also, where a significant proportion of potential respondents have failed to respond, it may be appropriate to contact them again for a second (or even a third) attempt at getting them to complete the questionnaire.

Pros

- Fast to administer.
- A good source of quantitative data.
- Anonymity may elicit genuine responses.
- Online questionnaires can be unintrusive.

Cons

- Significant time and resources are required to design a questionnaire.
- Anonymity may prevent the answers being correlated with other data.
- Responses may be inaccurate because respondents may give answers they think are expected.

Example

How does students' expertise in programming before University affect the perceived difficulty of their introductory programming module?

Further reading

Most books on social science research address the basics of questionnaire writing, including Cohen (2000, 245-266), and we have found Foddy (1993), Gillham (2000) and Oppenheim (1992) particularly helpful. Oppenheim's text, in particular, is accessible and easy to source.

Surveys

A survey requires large scale quantitative data capture, and draws on other techniques we have discussed in detail, such as questionnaires and interviews. Surveys can use a variety of data collection methods, including the following.

- Email (or web-based surveys) — cheap and quick, can be done by a single researcher, but may reduce anonymity.
- Mail surveys — as for email, with the advantage that anonymity can be guaranteed, however the mail may be intercepted and answered by someone other than the target respondent.
- Telephone interviews — these allow the interviewer to control the order of questions, and to intervene if the respondent misunderstands a question. However, the exercise is time-consuming, and an interview may be curtailed. Anonymity is an issue, and there may be interviewer bias.
- Face-to-face interviews — as for telephone interviews, but nonverbal communication can be observed.

There are a number of steps in conducting a survey, and can be summarised as follows.

1. Decide the hypothesis
2. Decide survey type (email, mail, phone interview, face-to-face interview)
3. Decide data recording mechanism
4. Decide target population (size and selection)
5. Pilot
6. Perform the survey and record the data
7. Data analysis

The choice of *target population* is important. The size of the population will be constrained by resources (financial and human) and if the size is smaller than the available pool of respondents, an appropriate selection mechanism must be in place.

It is also vitally important to *pilot* the survey. The size of a survey means that it can normally only be performed once, and a poorly phrased question could ruin the exercise.

Pros

- Good for profiling a population.
- Effective where the “social context” is important, and the issues of interest include social or cognitive factors.

Cons

- A survey will generate data which the survey questions ask for, and no more — issues not factored into the question design will remain unaddressed.

Example

What policies do computing departments have for plagiarism prevention and detection, and which ones are effective? A survey combining email questionnaires to and telephone interviews with appropriate academics would be appropriate.

Further reading

Cohen (2000, 169-180) and Neuman (1999, 246-289) discuss in more detail the types of survey which may be conducted.

Tests

When conducting an experiment or quasi-experiment on a group of people, it may be desirable to conduct pre- and post-tests on those people in order to measure the effect of the experiment.

In general terms, tests can be classified as either *parametric* or *non-parametric*. The former refer to tests which are applied to a large population, and for which the distribution of results is statistically regular (for example, normally distributed). These are typically commercially produced, and might include IQ tests, or national school examinations.

At Higher Education level in the UK, there are few, if any, parametric tests available in the computing disciplines. Non-parametric tests, where the target population is not representative (for example small, or with specific characteristics), are therefore the most likely to be used. Some test sets are available commercially, such as ETS' Major Field Tests (MFTs) in Computer Science (www.ets.org), but the financial implications of using such a product would have to be considered very carefully.

Constructing tests for use in a specific experiment is, of course, an option, subject to the skill of the researcher in designing appropriate tests.

Pros

- Appropriate tests can yield accurate pedagogic data.

Cons

- Commercial products are expensive and not necessarily appropriate.
- Creating tests takes skill and time.

Example

A novel technique for teaching programming has been developed, and it is necessary to establish whether the technique is effective. This could be approached in the form of an experiment, whereby a group of students might use the technique, and would be given a test both before and after, in order to establish the change in their understanding of programming caused by the new technique.

Further reading

Bull and McKenna's text on Computer-Assisted Assessment (2003) offers a large amount of knowledge on how to create different types of tests, and deliver them online.

Focus Groups

A focus group is used to explore a specific subject and to gather inviduals' opinions on that subject. A group is usually structured as a meeting in which a number of participants, led by a co-ordinator, are physically co-located (although video-conferencing could be used).

The size of a focus group can typically vary from four to twelve, although six participants is normally a minimum size to ensure that sufficiently diverse perspectives and opinions are represented.

Focus groups were originally used as a qualitative data collection method in marketing and public policy research. They are useful for gathering diverse perspectives on a subject, acquiring more information, looking for new ideas, establishing why the participants have particular views on a topic, and other exploratory tasks.

Care needs to be taken in selecting participants for a focus group in order to ensure that the discussion within the group relates clearly to the research question. Moderating the discussion must be carefully performed in order to keep the group discussion focused.

Pros

- Efficient method of gaining multiple opinions.
- Useful for preliminary data capture, and to help identify the research questions suitable for further investigation.
- Useful for exploratory research and getting new ideas.
- Effective when the topic is complex or sensitive.

Cons

- It may be difficult to separate individuals' views from the "group perspective".
- Potential for bias, or for individuals to dominate the group.
- Potential difficulty identifying suitable (and willing) participants.
- Data will be specific to the group, and not generalisable.
- Complex and resource-intensive to set up and conduct.

Example

Exploratory investigations of social factors (such as gender or culture) in Computer Science education.

Further reading

Litosseliti (2003) is an accessible pocket-sized handbook which covers all aspects of planning and conducting a focus group, and Puchta and Potter (2004) provide a more in-depth discussion with many detailed examples and case-studies.

Social Artefacts

The term “social artefact” refers to anything produced by a person or group of people. The most commonly studied artefacts are documents, which may be text documents, but could equally well contain code or specification. Documents can provide the input for discourse analysis as described above. A standard technique for deriving information from text documents is content analysis. This provides a systematic way of identifying specified characteristics of a text and for making inferences from it. The use of documents in historical research is detailed in the appropriate section above.

Artefacts need not be documents. A range of different artifacts would commonly be studied by anthropologists, and in the area of Computer Science, research into the history of computing machinery, for example, could involve study of the actual machines.

Pros

- Documents and other artifacts can provide a rich source of information and can be analysed on a number of different levels.
- Documents may be readily available.
- In some cases, particularly historic research, this may be all that is available.

Cons

- Care must be taken in interpreting the artefacts.
- Limited to the information derivable from those artifacts — for example, cannot ask further questions as in an interview.

Example

How have students’ approaches to answering exam questions on a specific Computer Science module changed over recent years?

Further reading

The references from the Historical Research section are relevant here too. An introduction to content analysis is provided by Krippendorf (2004).

Validity and Reliability

The concept of *validity* is fundamental to a research result. For most social science research, the concept of “correctness” does not make any sense, since there are few issues which are “black and white”. Instead, we look for evidence and arguments which are compelling. Two principal types of validity are often referred to.

Internal validity

In the specific instance under consideration, and with a given data set, is the conclusion sensible and repeatable?

For example, is a quantitative result statistically significant? Does the analysis of a set of interviews yield a result which enhances our understanding of *that particular group* of interviewees?

A result is internally valid if an appropriate methodology has been correctly followed in order to yield that result.

External validity

Do the results from the instances under consideration, and the data sets which have been analysed, generalise to other instances and variations of data sets which might be encountered? That is, does the result relate to a wider phenomenon in the “real world”?

For example, would a statistically significant quantitative result still be significant if a different data set were chosen? Is a set of respondents to a questionnaire representative of the whole population of possible respondents?

A result is externally valid if it is internally valid *and* can be shown to apply outside of the confines of the study.

Reliability

A result is *reliable* — or *replicable* — if it can be repeated with a similar data set and yield a similar outcome. The expectation of a good research result is that it would be reliable.

We must be cautious about reliability. With large, controlled experiments, and careful researchers, reliability should not be a problem. However, in a niche subject area, where access to data may be heavily restricted, and where the environment may be rapidly changing (such as in the Computing disciplines), it may be impossible for a given study to be repeated. Such a study may well be valid and important, but perceived as possibly unreliable, and consequently it must be reported very carefully.

Further reading

Cohen *et al.* (2000, 105-13) give an overview of validity and reliability for a variety of different research activities.

Ethics

This section is *not* about "ethics in computing" — the general issues which we teach students in modules about professional issues. It is specifically about ethics in the context of pursuing research in computer science education.

Ethics is all about "doing the right thing" when performing research involving real people. This is a subject we all hear about in the context of medicine, and raises questions like *Can we use treatment X on patient Y, when X is not fully tested?*

The effect of applying an inadvisable treatment to a patient is something which will be of great importance both to the patient and to their medics. From the research point of view, a medic cannot just try out a new idea on a patient without stringent safeguards, and *ethics committees* are set up to check each and every research proposal before the research begins.

In education, we deal with people as much, if not more, than in medicine. However, the results of our work are often not obvious (failure to grasp the complexities of quadratic equations seldom has a deep impact on the student's life), and may not be apparent for a long time. For example, how well we deliver the introductory programming module may have an effect on the students' final degree classifications, but except in extreme cases this would be very hard to quantify.

It is clear to us, however, that our interactions with students and colleagues *must* have *some* influence on students' learning and academic progress, and therefore there is an ethical dimension to our work.

Ethics has perhaps been neglected in the UK, compared to countries such as the US and Canada, but this is changing. The changing climate in higher education — the perception of students as being customers, and the changing legal and financial frameworks — has forced universities to re-examine their ethical policies, and this has resulted in frameworks being implemented which cover *any* research which involves human participants.

Ethical consent

Check out your institution's ethical policy (probably available on the institution's intranet). If you wish to do research which involves students, you must follow a formal procedure to obtain consent. This is probably simpler than it sounds — no-one wants to burden you with excessive paperwork — but you will need to provide a document explaining what you wish to do (it is likely that a proforma will be provided for this purpose), to be checked by an ethics committee. In most cases this will be a formality.

Caveats

Giving a questionnaire to students is likely to be completely uncontroversial, as is performing interviews. Problems might occur if you choose to perform an activity which might impinge on the students' learning process. As an example, consider the following: you wish to investigate the effectiveness of a new educational tool which assists students when learning *topic X*. The following activity would probably be unethical.

> Divide the students randomly into two groups A and B. Give group A the new tool to use when learning topic X, and give group B alternative tools and material. Compare the two groups.

There are many problems with this "control group" model. Perhaps the most obvious is that if the experiment succeeds, and a significant difference is identified, then the students in the group which

performs less well will be disadvantaged.

Children

Since you are teaching at a University, we are assuming that your proposed research does not involve persons under 18 years of age. However, there are two circumstances when this may not be the case.

First, you may wish to perform an experiment involving schoolchildren, for example if your interest lies in the linkage between computing taught at school and the undergraduate curriculum. In this case you *must* take advice from your institution — the law is increasingly proscriptive regarding what you are allowed to do, and great care is needed.

Second, you may occasionally encounter undergraduate students who have not yet reached their eighteenth birthday. Again, your institution will have a policy regarding such students. Although this is not an issue you need to worry about, you will probably need to be careful and, for example, avoid situations such as interviews which leave you alone with such students.

Further reading

This is an area where we can take advantage of the corpus of literature within education, and the AARE web site (www.aare.edu.au/ethics/aareethc.htm) provides a comprehensive list of relevant texts.

Types of Research Paper

A useful way of familiarising yourself with what type of activity might constitute an appropriate subject for Computer Science Education research, is to view the classifications of topics and approaches which have been observed or proposed.

An approach based on the *content* has been proposed by Fincher and Petre (2003), who suggest the following categories:

1. student understanding;
2. animation, visualisation and simulation;
3. teaching methods;
4. assessment;
5. educational technology;
6. transferring professional practice into the classroom;
7. incorporating new developments and new technologies;
8. transferring from campus-based teaching to distance education;
9. recruitment and retention; and
10. construction of the discipline.

This has the advantage of being precise about the focus of the research activity, but since technology (and the educational agenda) change rapidly, such a categorisation may require regular revision.

An alternative approach was taken by Valentine (2004), who chose six pragmatic categories based on the contributions relating to first year Computer Science students, and published the last 20 years' proceedings of SIGCSE Technical Symposium Proceedings:

- "Tools" (24.6%): descriptions of new hardware or software;
- "Marco Polo" (23.9%): "Been there, done that" – reporting classroom experiences;
- "Experimental" (22.1%): scientific evaluations of techniques or technologies applied in the classroom;
- "Nifty" (17.8%): single ideas used in a specific context;
- "Philosophy" (9.1%): general (fundamental) issues to do with Computer Science Education; and
- "John Henry" (2.5%): difficult and unusual ideas.

The percentages relate to the proportion of papers which fall into each category during the period 1994-2003.

A New Approach

These classifications are interesting in their own right, but they do not offer an insight as to *where* a given paper should be submitted for publication. If you are reading this booklet, you are probably unfamiliar with the journals and conferences which publish Computer Science Education papers, and to assist in directing you to an appropriate publication we suggest a new categorisation scheme.

Classification Scheme

It seemed to us that a very pragmatic approach was appropriate. The vast majority of Computer Science Education paper that we have seen can be viewed as being predominately technical (such as presentation of a novel software tool, discussed an a mainly technical fashion), or principally of educational interest (such as a pedagogic analysis of a software tool applied in a classroom context). This suggested to us that a linear classification would be appropriate as a starting point.

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Technical perspective <============> Education perspective
```

Categories of articles

We divided this scale into sub-categories, and attempted to assign each paper we read in the publications to one sub-category. Where ambiguities arose, or other sub-categories suggested themselves, the category descriptions were modified, and the previously categorised papers re-visited and, if appropriate re-categorised.

We work on the premise that each paper has a principal focus, and categorise each paper according to that focus. The algorithm is: categorise according to the first of the following eleven categories which applies.

Any such categorisation is, by its nature, approximate, and there were papers for which the choice of category was debatable. However, the proportion of these was only about 5%. For the purposes of this exercise, the classification is sufficiently accurate to indicate the profile of each of the journals and conferences which we have surveyed.

Technical Perspective

System
: Any Computer Aided Learning system, where there is a **detailed and concrete system** (or tool, or architecture, or algorithm) reported and/or evaluated.

Technology
: Any learning technology (such as AI, multimedia, VR, LOs) where the technology (or framework, or model, or environment) is reported in the **absence of a concrete implementation** or proposal.

Resources
: Learning and teaching resources are reported (for example, a repository of LOs, a web site, or a portal).

Other technical
: The paper has **no clear educational interest**; examples might include
- a mixture of topics/foci with no clear theme
- an evaluation of an IT system applied to a domain which is not educational.

Education Perspective

Theoretical pedagogy
: The focus of the paper is principally educational, and reports results **grounded in** education theory (i.e. explicitly references, discusses and applies pure education theory). This category is used for “Learning Psychology” where the “learning” is the predominant focus of the theory, such as Bruner and Vygotsky.

Practical pedagogy
: The focus of the paper is principally educational, and reports results **supported by** education theory (i.e. the theory may be implicit and may not be supported by pure educational references).

Curriculum
: The focus of the paper is the **curriculum** (or syllabus) for a course (or module).

Social factors
: The paper reports educational-related results where the principal interest is the **social context** (such as age, gender, culture).

Psychology factors
: The paper reports results which are **grounded in psychological theory**.

Other educational
: The paper is educational but with **no technical interest**; this is a paper which is probably not of interest to a Computer Scientist.

Other Perspectives

Other
: Anything with **neither IT nor Education** content.

Where to Publish?

Research is valuable only when it's disseminated, and getting your work published is important. What's the next step after you've completed your research activity?

We'll address this from three angles.

First of all, we'll talk through the basics of getting papers accepted for publication. If you're research active and used to publishing, you can skip this section.

Secondly, we look at how certain types of publication require conventions to be applied (in terms of presentation style or content), and how refereeing is carried out.

Finally, we discuss the content, scope and approach of individual conferences and journals, in order to help you select the most appropriate target for your paper.

Before you Begin

In you are already research active in your own (technical) area, you will know how to publish, which appropriate journals and conferences you would submit papers to, and what the basic protocols are for getting a paper accepted. If so, you may wish to skip this section. If you are not used to writing papers, there are some rules of thumb which you need to know about.

The purpose of (most) papers is to communicate to the audience something interesting that you have done. Before even starting to write a paper, decide what that "message" (or "contribution to the field") is — if you're not clear yourself, you won't be able to articulate it to an audience. Choose a publication (conference or journal) to send it to — you need to ask the following questions at this stage.

- Does the stated scope of the publication fit in with the topic your paper addresses? Looking at some past issues of the journal or proceedings will also give you a good idea of the areas of research which are being accepted and of the correct form of presentation.
- How good is the research? An international journal will require more work, and a higher quality, that a national conference. A paper which describes "work in progress" may be suitable for a conference initially (which serves as an opportunity to get feedback from referees, and valuable discussion with peers if you attend the conference), with a polished paper submitted to a journal later on.
- How difficult is to get accepted in the publication? Some make available the "acceptance rates" (the ratio of acceptances to submissions), others rely on word of mouth for that information to be known. A good international conference may have an acceptance rate around 30% — don't let this put you off, any experienced reviewer will tell you how many poorly written submissions they have deemed a "reject", and if you write a clear, coherent document which follows normal guidelines for a technical paper, you stand a much better chance of acceptance.
- Is the publication refereed? Most are nowadays, but an unrefereed publication will not look as good on your CV as a fully peer-reviewed one.
- How long do you want the paper to be? Conference proceedings are typically 4-6 pages (and strictly enforced), whereas some journals allow arbitrarily long articles.
- If the publication is a conference, where will it be held? If a paper is published in conference proceedings, you are normally expected to attend the conference (and in some cases that is a condition of publication). You would need to explore funding to allow you to attend the conference, and if it is in Hawaii then this may prove a problem compared to, say, Huddersfield. Furthermore, there will usually be a fee associated with a conference, whereas publication in a journal is free.

Having selected an appropriate target, find out the "guidelines for publication" *and follow them!* The publishers will usually provide a template, together with a clear description of what they require as style (e.g. referencing). Then write the paper. The reviewers are likely to be asking themselves the following questions - make sure the paper addresses all of them.

- Is the message *clear*?
- Is the message *interesting* (that is, novel, and appropriate for the publication's readership)?
- Is the message supported by *appropriate evidence*? See most of the rest of this booklet for a discussion of what is appropriate in the context of Computer Science Education.
- Is the English of *high quality*? Spell checkers should be used, and the document proof-read by a colleague (who is a native English speaker, if you are not).
- Are the references/bibliography *up to date*?
- Is the formatting correct (according to the guidelines)?

Conventions and Refereeing

Within the Computing communities, the conventions used for structuring a paper are relatively loosely defined. Provided a paper is clear, contains the “usual” elements, and conforms to the published guidelines of the target journal or conference, then there should not be a problem with the structure of the document. However, you should be aware that in other disciplines — such as Psychology — the format of a paper may be more rigidly constrained. This is perhaps a comment on the relative maturity of such disciplines compared to Computing.

The journals and conferences we have identified below do not fall into that category, but should you choose to target a specialised publication, you would be well advised to check if there are any unexpected requirements for the structure or contents of your submission.

As a general “rule of thumb”, publications which originate from the Computing community tend to be shorter (often just 5 pages in some conferences) and their physical layout is often tightly prescribed.

Refereeing

All the publications we discuss below are peer reviewed — that is, each paper submitted will be read by multiple academics from a similar field. Their reports are used by the editor to decide on the inclusion (or otherwise) of the paper, and returned to the authors to assist them in improving the content of the paper. This process is not perfect — rejection of a paper does not necessarily mean that it’s a bad paper, it might be a reflection of the views of an inappropriately chosen referee.

The rigour of the refereeing process varies. Some international journals will require detailed reports from at least three academics of international standing, and take the process extremely seriously. At the other end of the spectrum, a heavily-subscribed conference may use any competent and willing academics who are available, and due to the pressure of the time constraints may accept relatively brief reports with minimal feedback to the authors.

The exact process used by a given publication is seldom made public, not least because there must be flexibility for editors to make professional judgements about referees and their reports. However, you should expect to receive at least two referees’ reports within a published time scale.

Acceptance of a paper — especially for a conference — may be constrained by other factors than the paper quality. Conferences may only have a limited number of slots, and the editor will top-slice what appear to be the best papers submitted. Furthermore, a paper may be rejected if its subject matter is deemed to be inappropriate to the journal or conference. Some publications make available the “acceptance ratio” — the ratio of submissions to acceptances — which may help you rate your chances! The ratio may vary between perhaps 25% for a heavily oversubscribed internationally renowned event, to occasionally near 100%. A typical figure for a good conference might be around 40%.

Journals and Conferences

A difficulty associated with publishing in an interdisciplinary area such as Computer Science Education, is that it is not always clear which the appropriate publications are. Pure Computer Science journals — even those with no specific theme — tend to regard education-related papers to be too “soft”, and conversely publications in the Education community often perceive computing education papers as too “techie”. We have surveyed the major journals and conferences that focus on Computer Science Education, or support a significant number of contributions which can be considered as relevant to the discipline.

In the following sections we present information about these publications, including information about what types of paper each *really* publishes (as opposed to what the publicity advertises the area of interest as).

The classification scheme has been used to “profile” each publication. We took one volume or year for each, in 2004 or 2005 (according to availability). We have also included other information as follows.

Description
: A brief overview of the publication.

Scope
: The areas of interest which the publication will accept sumbission in, using the publication’s own words.

Volume
: The number and/or year of the publication which we reviewed.

Paper length
: The limits (usually upper) on the size of paper which can be submitted.

Ratio of submissions to acceptances
: If known.

Papers reviewed
: The total number of papers in the sample.

URL
: Where you can get hold of more information.

Notes
: Any further information not covered in the above categories.

Piechart
: A piechart illustrating the spread of paper types (full papers only) in the publication, followed by a short table with the numerical data (as raw data and as percentages).

Journals

This page contains the data from the classification exercise, as raw data, and as percentages. The column headers are abbreviations for the eleven classifications for the papers.

Raw Data

Title	Sys	Tech	Res	OthTech	ThPed	PrPed	Curr	Soc	Psych	OthEd	Other	Total
AACEJ	2	3	1	1	3	4	2	0	0	5	0	21
AJDE	0	3	0	0	0	7	0	2	0	2	0	14
BJET	0	14	1	0	0	38	0	5	0	0	0	58
CAEE	9	3	0	0	0	0	1	0	0	0	0	13
CSE	1	0	0	0	8	6	1	0	0	1	0	17
CandE	7	1	0	0	6	6	2	3	0	0	0	25
EIT	4	0	0	0	1	5	4	0	0	9	1	24
ETRD	1	1	0	0	5	6	0	0	9	1	0	23
IEEEToE	13	3	0	0	0	2	48	0	0	1	0	67
IJAIED	6	1	0	0	0	6	0	0	0	0	0	13
IJCEELL	4	5	0	0	0	9	2	1	1	0	0	22
ITALICS	0	0	2	0	1	2	0	1	0	2	0	8
JCAL	1	1	0	0	0	7	1	1	0	0	0	11
JEMH	8	2	0	0	4	2	0	0	4	4	0	24
JERIC	2	1	0	1	0	1	4	5	0	0	0	14
JETS	12	12	1	1	11	2	0	0	2	4	0	45
JILR	4	10	1	0	0	7	0	0	0	0	0	22
JTATE	0	2	2	0	0	16	6	0	1	0	0	27
MOJIT	1	5	0	1	1	2	0	2	1	2	0	15
SIGCSE	6	1	1	1	1	21	6	0	0	0	0	37

Data as Percentages

Title	Sys	Tech	Res	OthTech	ThPed	PrPed	Curr	Soc	Psych	OthEd	Other	Total
AACEJ	9.52	14.29	4.76	4.76	14.29	19.05	9.52	0.00	0.00	23.81	0.00	100.00
AJDE	0.00	21.43	0.00	0.00	0.00	50.00	0.00	14.29	0.00	14.29	0.00	100.00
BJET	0.00	24.14	1.72	0.00	0.00	65.52	0.00	8.62	0.00	0.00	0.00	100.00
CAEE	69.23	23.08	0.00	0.00	0.00	0.00	7.69	0.00	0.00	0.00	0.00	100.00
CSE	5.88	0.00	0.00	0.00	47.06	35.29	5.88	0.00	0.00	5.88	0.00	100.00
CandE	28.00	4.00	0.00	0.00	24.00	24.00	8.00	12.00	0.00	0.00	0.00	100.00
EIT	16.67	0.00	0.00	0.00	4.17	20.83	16.67	0.00	0.00	37.50	4.17	100.00
ETRD	4.35	4.35	0.00	0.00	21.74	26.09	0.00	0.00	39.13	4.35	0.00	100.00
IEEEToE	19.40	4.48	0.00	0.00	0.00	2.99	71.64	0.00	0.00	1.49	0.00	100.00

IJAIED	46.15	7.69	0.00	0.00	0.00	46.15	0.00	0.00	0.00	0.00	0.00	100.00
IJCEELL	18.18	22.73	0.00	0.00	0.00	40.91	9.09	4.55	4.55	0.00	0.00	100.00
ITALICS	0.00	0.00	25.00	0.00	12.50	25.00	0.00	12.50	0.00	25.00	0.00	100.00
JCAL	9.09	9.09	0.00	0.00	0.00	63.64	9.09	9.09	0.00	0.00	0.00	100.00
JEMH	33.33	8.33	0.00	0.00	16.67	8.33	0.00	0.00	16.67	16.67	0.00	100.00
JERIC	14.29	7.14	0.00	7.14	0.00	7.14	28.57	35.71	0.00	0.00	0.00	100.00
JETS	26.67	26.67	2.22	2.22	24.44	4.44	0.00	0.00	4.44	8.89	0.00	100.00
JILR	18.18	45.45	4.55	0.00	0.00	31.82	0.00	0.00	0.00	0.00	0.00	100.00
JTATE	0.00	7.41	7.41	0.00	0.00	59.26	22.22	0.00	3.70	0.00	0.00	100.00
MOJIT	6.67	33.33	0.00	6.67	6.67	13.33	0.00	13.33	6.67	13.33	0.00	100.00
SIGCSE	16.22	2.70	2.70	2.70	2.70	56.76	16.22	0.00	0.00	0.00	0.00	100.00

AACEJ - AACE Journal

Description

This journal is a publication of the Association for the Advancement of Computing in Education (AACE) (www.aace.org). However, it is not suitable for pure academic research, and the topics of interest in the published scope are strictly adhered to.

Research articles should therefore not be submitted to the AACE Journal, other AACE journals may be appropriate, such as the Journal of Interactive Learning Research (JILR), the Journal of Technology and Teacher Education (JTATE) or the International Journal on E-Learning (IJEL).

Scope

“This online periodical is devoted to the issues and applications of educational technology to enhance learning and teaching. This publication is designed to provide a multi-disciplinary forum to present and discuss all aspects of educational technology in all learning environments. Articles are invited on any aspect of educational technology and e-learning. Contributions may include:

- Current issues and discussions
- Review papers
- Reports on innovative applications and projects
- Courseware experiences
- Opinions”

Notes

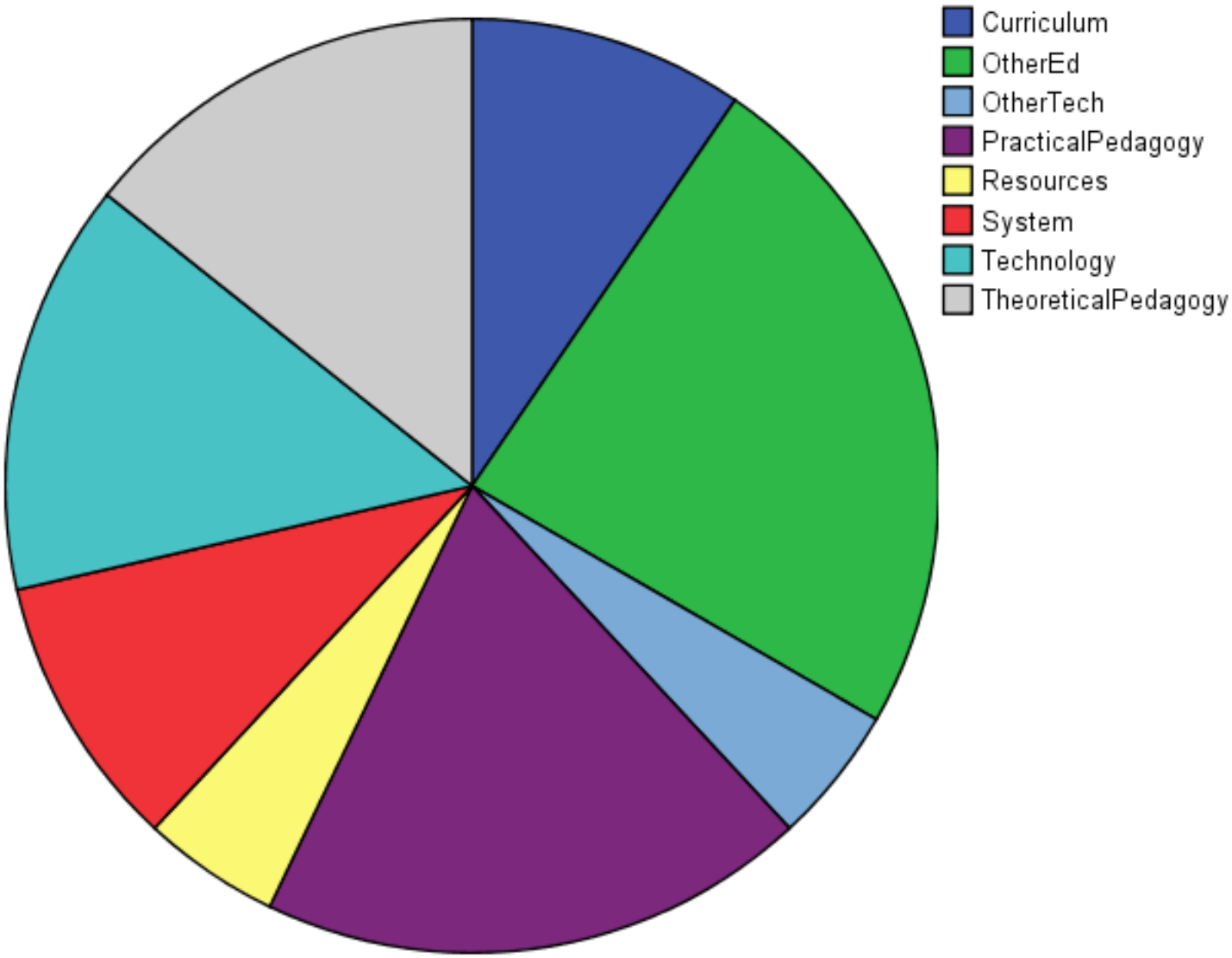
Abstracts available online.

Total papers reviewed: 21

Paper length: unspecified, but suggested limit of 30 pages double-spaced

Volume reviewed: 12 (2004)

URL: www.aace.org/pubs/aacej/



Category	No. of Papers	% of Total
System	2	9.52
Technology	3	14.29
Resources	1	4.76
Other Technical	1	4.76
Theoretical Pedagogy	3	14.29
Practical Pedagogy	4	19.05
Curriculum	2	9.52
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	5	23.81
Other	0	0.00
Total	21	100.00

AJDE - American Journal of Distance Education

Description

An international journal with a US focus published by Erlbaum, this may not be easy to obtain in the UK (although document supply from the British Library is possible).

Scope

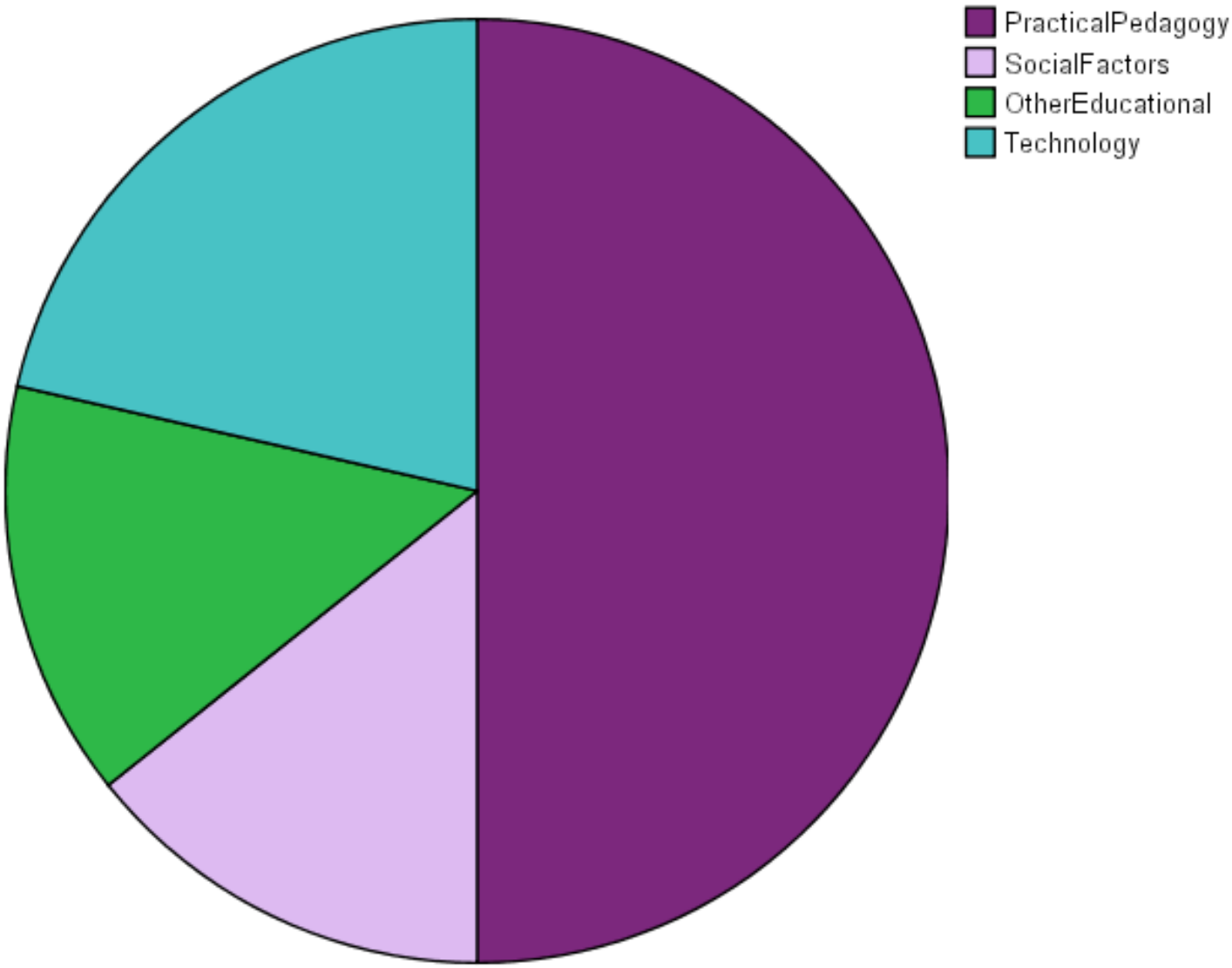
“AJDE encourages the submission of articles about methods and techniques of teaching at a distance, about learning, and about management and administration but also encourages authors to write about policies, theories, and values that drive distance education. Articles should be based on research, although all methods and approaches to research are welcome.”

Total papers reviewed: 14

Paper length: 4,000 words (max)

Volume reviewed: 18 (2004)

URL: www.ajde.com



Category	No. of Papers	% of Total
System	0	0.00
Technology	3	21.43
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	7	50.00
Curriculum	0	0.00
Social Factors	2	14.29
Psychology	0	0.00
Other Educational	2	14.29
Other	0	0.00
Total	14	100.00

BJET - British Journal of Educational Technology

Description

This is a journal with a very wide area of interest, which is published bi-monthly on behalf of the British Educational Communications and Technology Agency (BECTA) (becta.org.uk).

Scope

“Articles cover the whole range of education and training, concentrating on the theory, applications and development of educational technology and communications. There is a particular interest in the application of new information and communications technologies. The Colloquium section publishes shorter contributions, summarising work in progress, raising queries, and questioning received wisdom.”

Notes

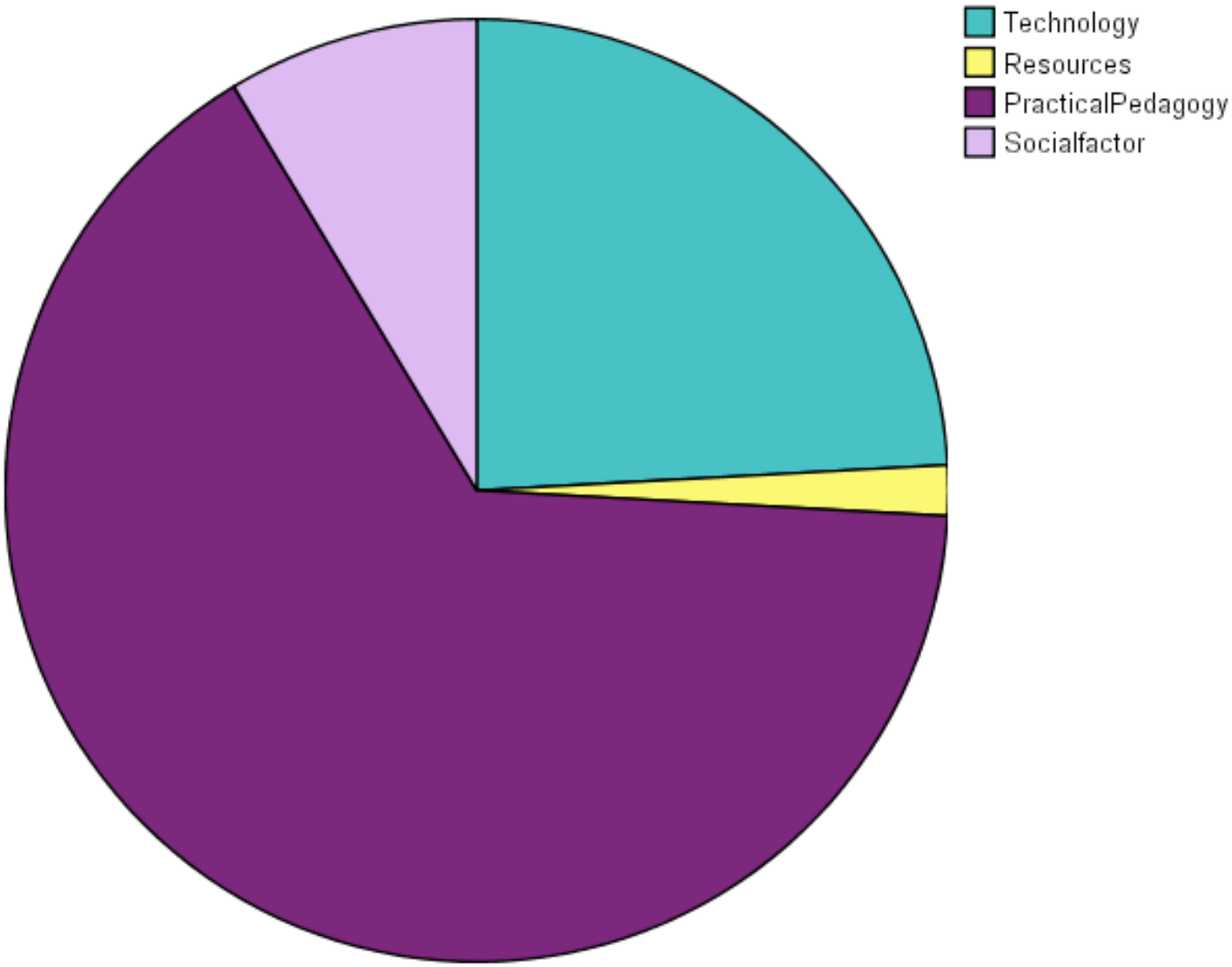
BJET also publishes *Hybrid Articles*: “In addition to full, refereed articles and shorter Colloquium pieces, BJET includes a hybrid genre in which printed articles are linked to materials on the Blackwell website. This gives authors the opportunity of linking their contributions to interactive multimedia material or to refer to large datasets.”

Total papers reviewed: 58

Paper length: 16 pages (max), 10 pages (min)

Volume reviewed: 36 (2005)

URL: www.blackwellpublishing.com/journal.asp?ref=0007-1013



Category	No. of Papers	% of Total
System	0	0.00
Technology	14	24.14
Resources	1	1.72
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	38	65.52
Curriculum	0	0.00
Social Factors	5	8.62
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	58	100.00

CAEE - Computer Applications in Engineering Education

Description

This publication deals with the use of computers across the Engineering disciplines. However, the number of articles which are technically focused on computing issues, or on Software Engineering, is relatively high.

Scope

“Computer Applications in Engineering Education provides a forum for publishing peer-reviewed, timely information on the innovative uses of computers and software tools in education, and for accelerating the integration of computers into the engineering curriculum.

The journal encourages articles that present:

- New software for engineering education
- New educational technologies, such as interactive video and multimedia presentations
- Computer use in laboratories
- Visualization, computer graphics, video, and I/O issues
- Computer-based engineering curricula
- Computer uses in classroom or independent study situations
- Use of commercial and government-owned software in education
- Engineering software development and funding opportunities

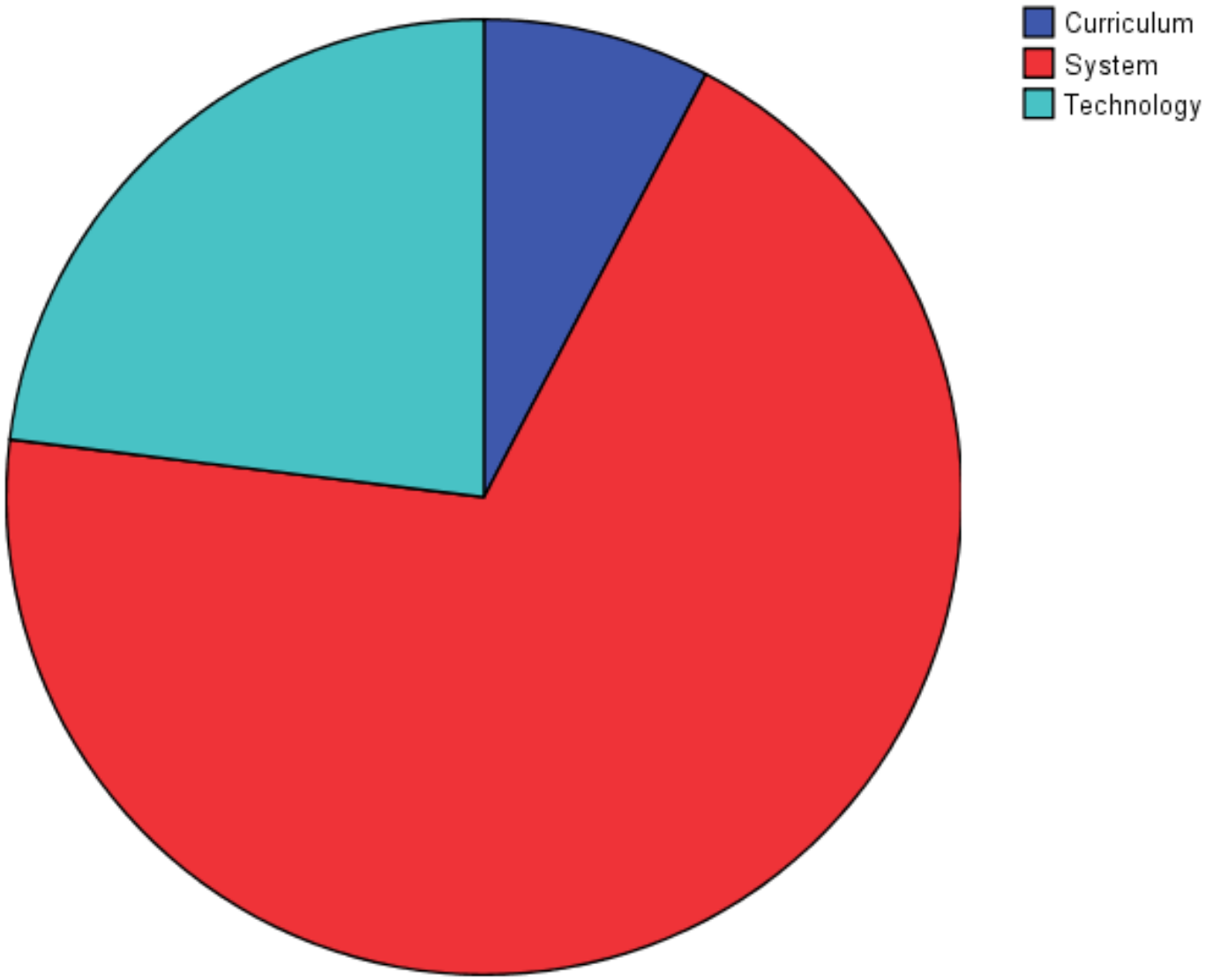
Papers crossing boundaries between engineering disciplines are welcomed.”

Total papers reviewed: 13

Paper length: 13 pages (max)

Volume reviewed: 12 (2004)

URL: www.interscience.wiley.com/jpages/1061-3773/



Category	No. of Papers	% of Total
System	9	69.23
Technology	3	23.08
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	0	0.00
Curriculum	1	7.69
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	13	100.00

CSE - Computer Science Education

Description

This journal is a highly respected international academic publication with a strong educational flavour. It is published quarterly and each issue generally carries 4 or 5 substantial papers. Occasional special issues invite submissions on a given theme.

Scope

“Computer Science Education aims to publish high-quality papers with a specific focus on teaching and learning within the computing discipline that are accessible and of interest to educators, researchers, and practitioners alike.

Depending on their special interests, those working in the field may draw on subject areas as diverse as statistics, educational theory and the cognitive sciences in addition to technical computing knowledge.

Papers may present work at different scales, from classroom-based empirical studies through evaluative comparisons of pedagogic approaches across institutions or countries and of different types from the practical to the theoretical.

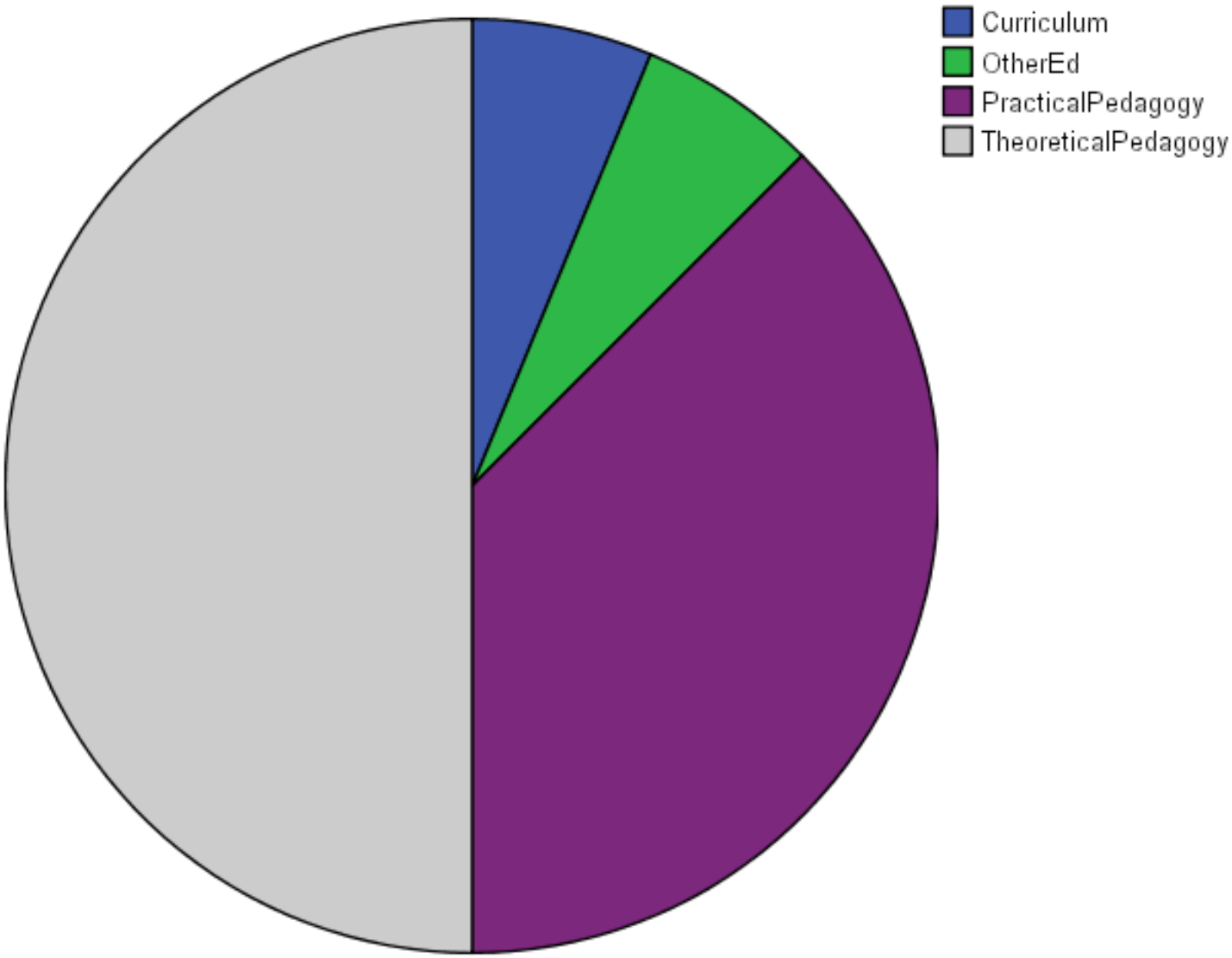
The journal is not dedicated to any single research orientation. Studies based on qualitative data, such as case studies, historical analysis and theoretical, analytical or philosophical material, are equally highly regarded as studies based on quantitative data and experimental methods.”

Total papers reviewed: 17

Paper length: 5,000 words (guideline only)

Volume reviewed: 14 (2004)

URL: www.tandf.co.uk/journals/titles/08993408.asp



Category	No. of Papers	% of Total
System	1	5.88
Technology	0	0.00
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	8	47.06
Practical Pedagogy	6	35.29
Curriculum	1	5.88
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	1	5.88
Other	0	0.00
Total	17	100.00

CandE - Computers and Education

Description

This is an international journal with two volumes, each of four issues, published each year.

Scope

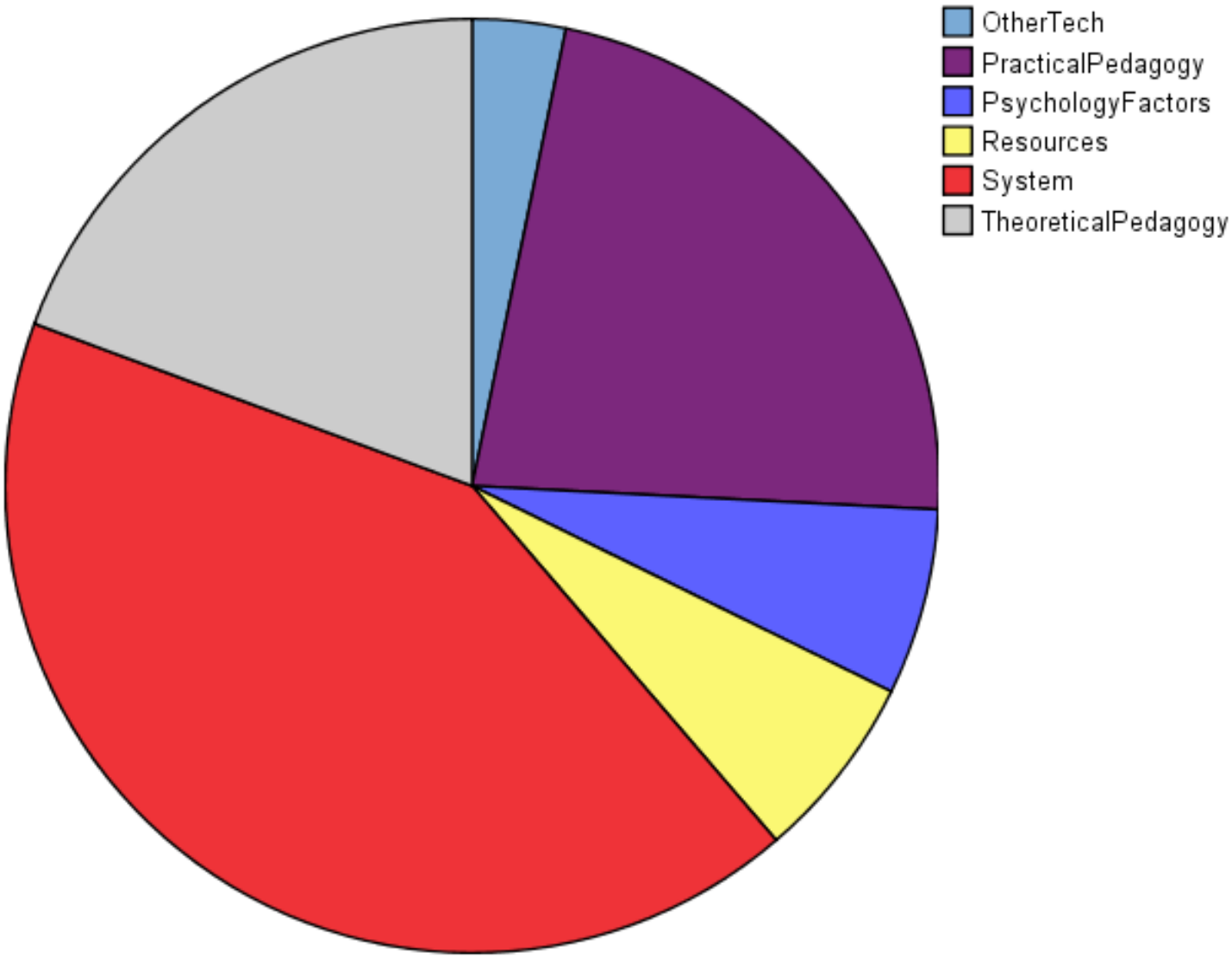
“The Editors welcome any papers on cognition, educational or training systems development using techniques from and applications in any technical knowledge domain: social issues and gender issues; curricula considerations, graphics, simulations, computer-aided design, computer integrated manufacture, artificial intelligence and its applications including intelligent tutoring systems and computer assisted language learning; hypertext and hypermedia; user interfaces to learning systems; management of technological change on campus and in local education; uses of advanced technology information systems, networks, terrestrial and satellite transmissions and distributed processing; and virtual reality in an educational context; state-of-the-art summaries and review articles.”

Total papers reviewed: 25

Paper length: no maximum; 16 typical, 11 minimum

Volume reviewed: 44 (2005)

URL: www.elsevier.com/wps/find/journaldescription.cws_home/347/description



Category	No. of Papers	% of Total
System	7	28.00
Technology	1	4.00
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	6	24.00
Practical Pedagogy	6	24.00
Curriculum	2	8.00
Social Factors	3	12.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	25	100.00

EIT - Education and Information Technologies

Description

This is a quarterly journal on the uses of technology in education, and content ranges from small-scale individual studies to broader issues such as policy.

Scope

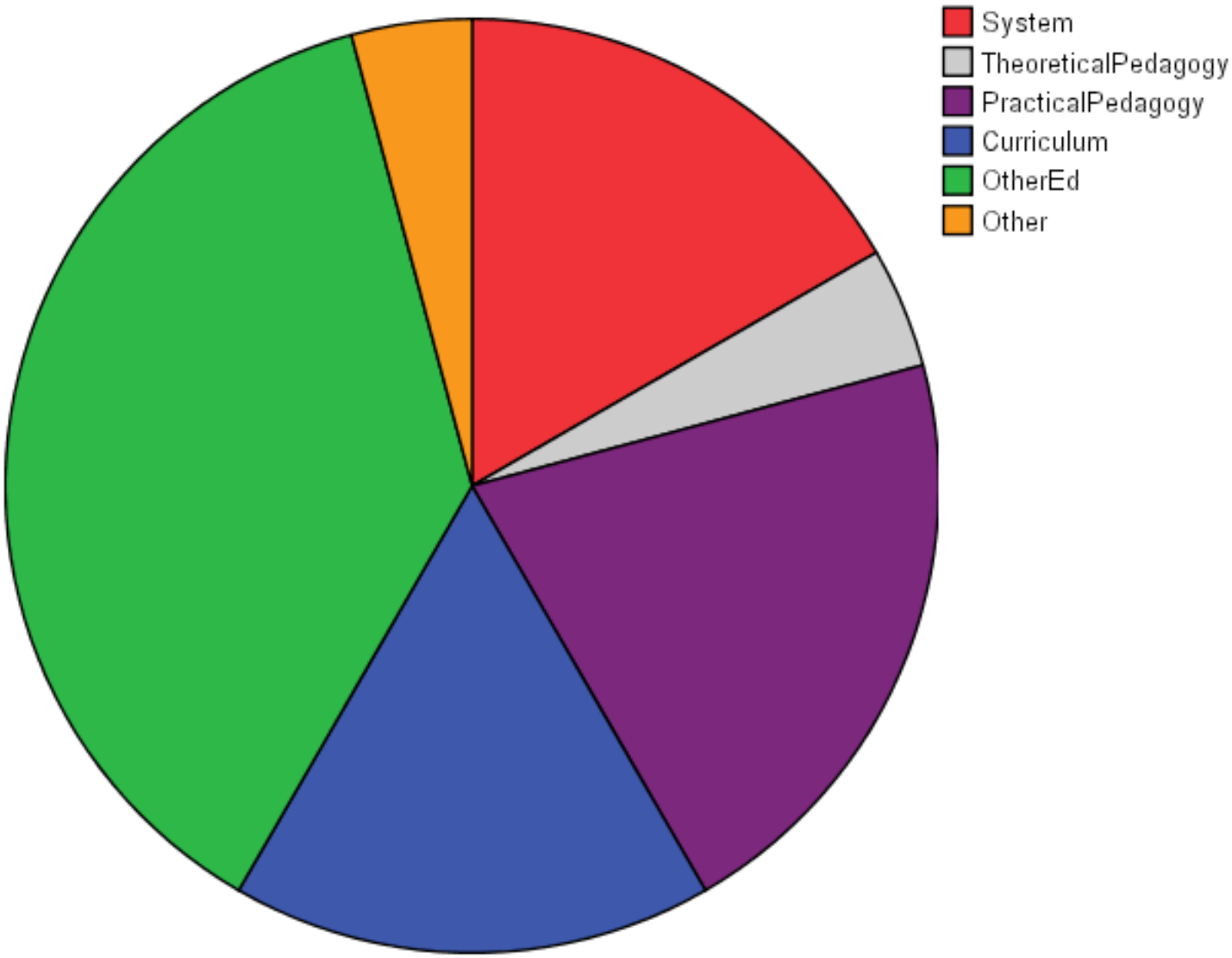
“This journal is a platform for the range of debates and issues that are current in our field. It is a broad field; we aim to provide perspectives at all levels, from the micro of specific applications or instances of use in classrooms to macro concerns of national policies and major projects; from classes of five year olds to adults in tertiary institutions; from teachers and administrators, to researchers and designers; from institutions to open, distance and lifelong learning. The strength of this breadth lies in the opportunity to raise and debate fundamental issues at all levels, to discuss specific instances and cases, draw inference and probe theory. This journal is embedded in the research and practice of professionals. It will not proselytise on behalf of the technologies but rather provoke debate on all the complex relationships between information and communication technologies and education.”

Total papers reviewed: 24

Paper length: none stated, but in practice articles were up to 22 pages

Volume reviewed: 9 (2004)

URL: www.springer.com/journal/10639/



Category	No. of Papers	% of Total
System	4	16.67
Technology	0	0.00
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	1	4.17
Practical Pedagogy	5	20.83
Curriculum	4	16.67
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	9	37.50
Other	1	4.17
Total	24	100.00

ETRD - Educational Technology Research and Development

Description

Published four times a year by the Association for Educational Communications and Technology (AECT) (www.aect.org), this journal has a particular interest in Instructional Design, in addition to more general technical and pedagogic topics. In consequence, the journal's focus is heavily theoretical, both from an educational and a psychological perspective.

Scope

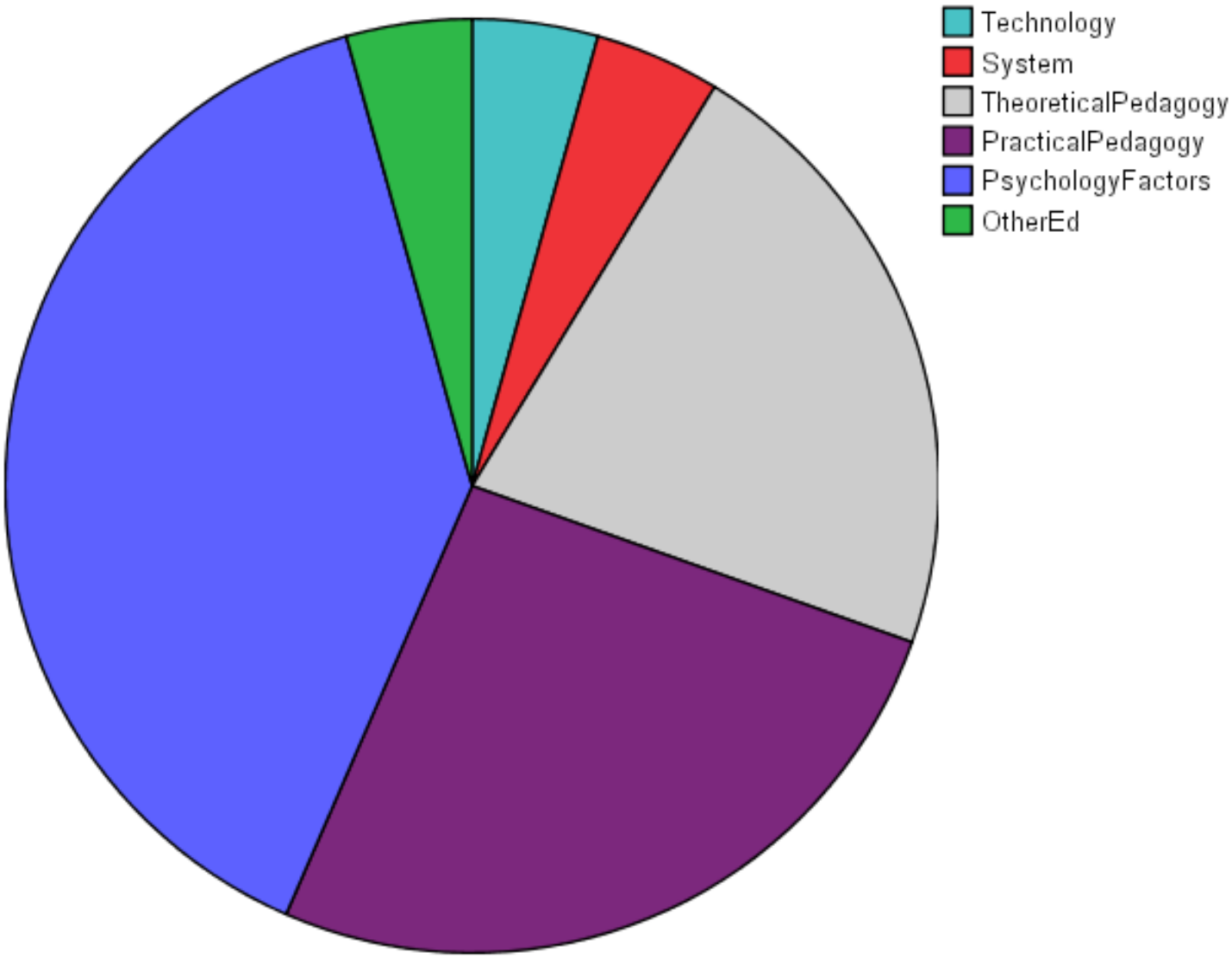
"The only scholarly journal for the field focusing entirely on research and development in educational technology. Research Section features well documented articles on the practical aspects of research as well as applied theory in educational practice. A comprehensive source of current research information in instructional technology. Each issue also includes book reviews, international reviews, and research abstracts."

Total papers reviewed: 23

Paper length: 10-30 pages

Volume reviewed: 53 (2005)

URL: www.aect.org/Intranet/Publications/



Category	No. of Papers	% of Total
System	1	4.35
Technology	1	4.35
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	5	21.74
Practical Pedagogy	6	26.09
Curriculum	0	0.00
Social Factors	0	0.00
Psychology	9	39.13
Other Educational	1	4.35
Other	0	0.00
Total	23	100.00

IEEETOE - IEEE Transactions on Education

Description

This highly-regarded quarterly publication is the research journal of the IEEE Education Society.

Scope

The scope of the Transactions encompasses “Educational Methods, Educational Technology, Instructional Materials, History of Science and Technology, and Educational and Professional Development Programs within Electrical Engineering, Computer Engineering, and allied disciplines.”

Notes

The website for this journal includes a link to a useful discussion on “Getting published in the IEEE Transactions on Education.”

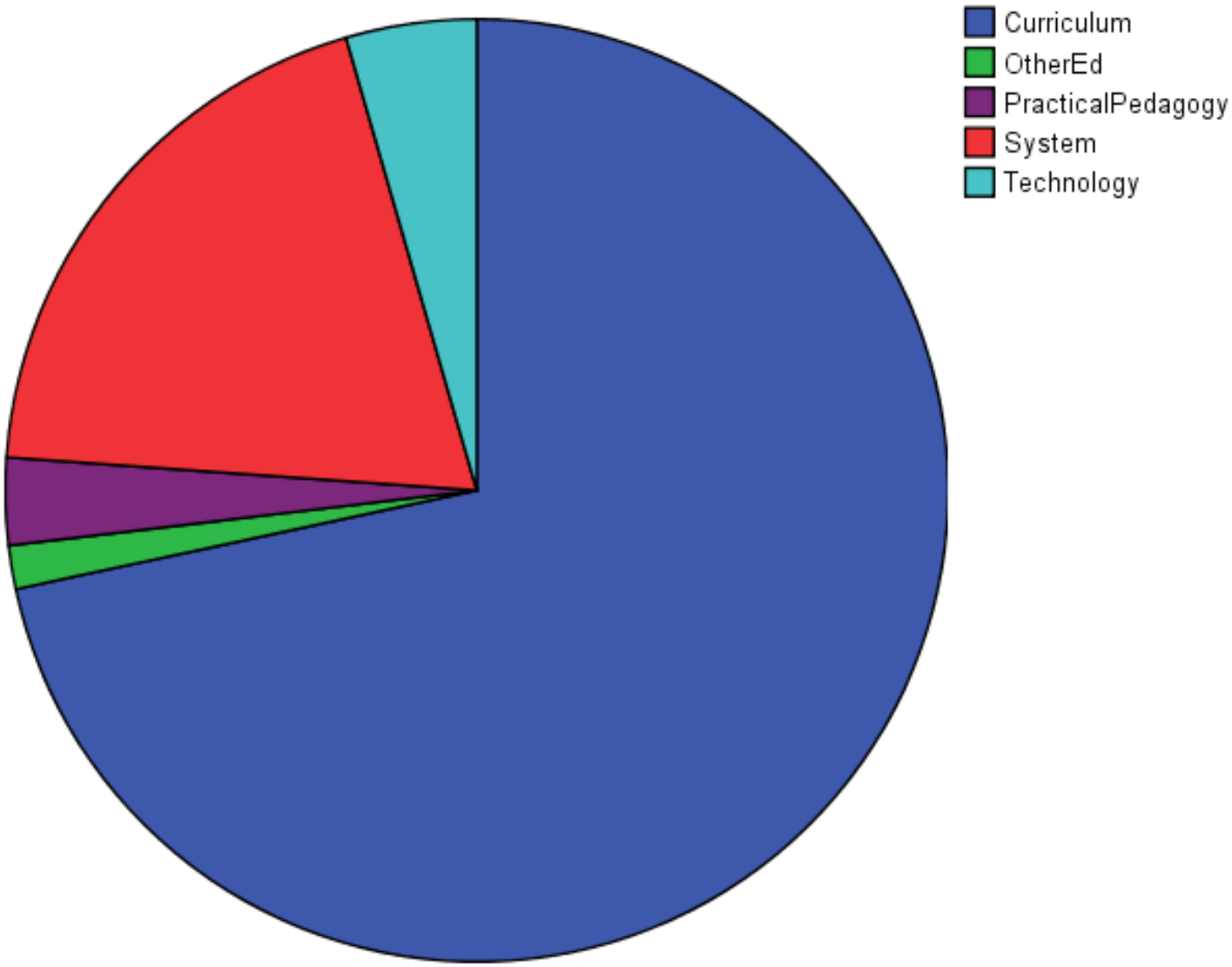
A recent IEEE Education Society Member survey indicated that past Transactions’ papers contained too much “technical content” and failed to contain an appropriate focus on “educational content”. Presumably this will influence future content of the Journal.

Total papers reviewed: 67

Paper length: 8-10 pages (typical)

Volume reviewed: 47 (2004)

URL: www.ewh.ieee.org/soc/es/esinfo.html



Category	No. of Papers	% of Total
System	13	19.40
Technology	3	4.48
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	2	2.99
Curriculum	48	71.64
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	1	1.49
Other	0	0.00
Total	67	100.00

IJAIED - International Journal of Artificial Intelligence in Education

Description

This journal also publishes workshop proceedings, together with news and other items of interest to members of the International AIED Society.

Scope

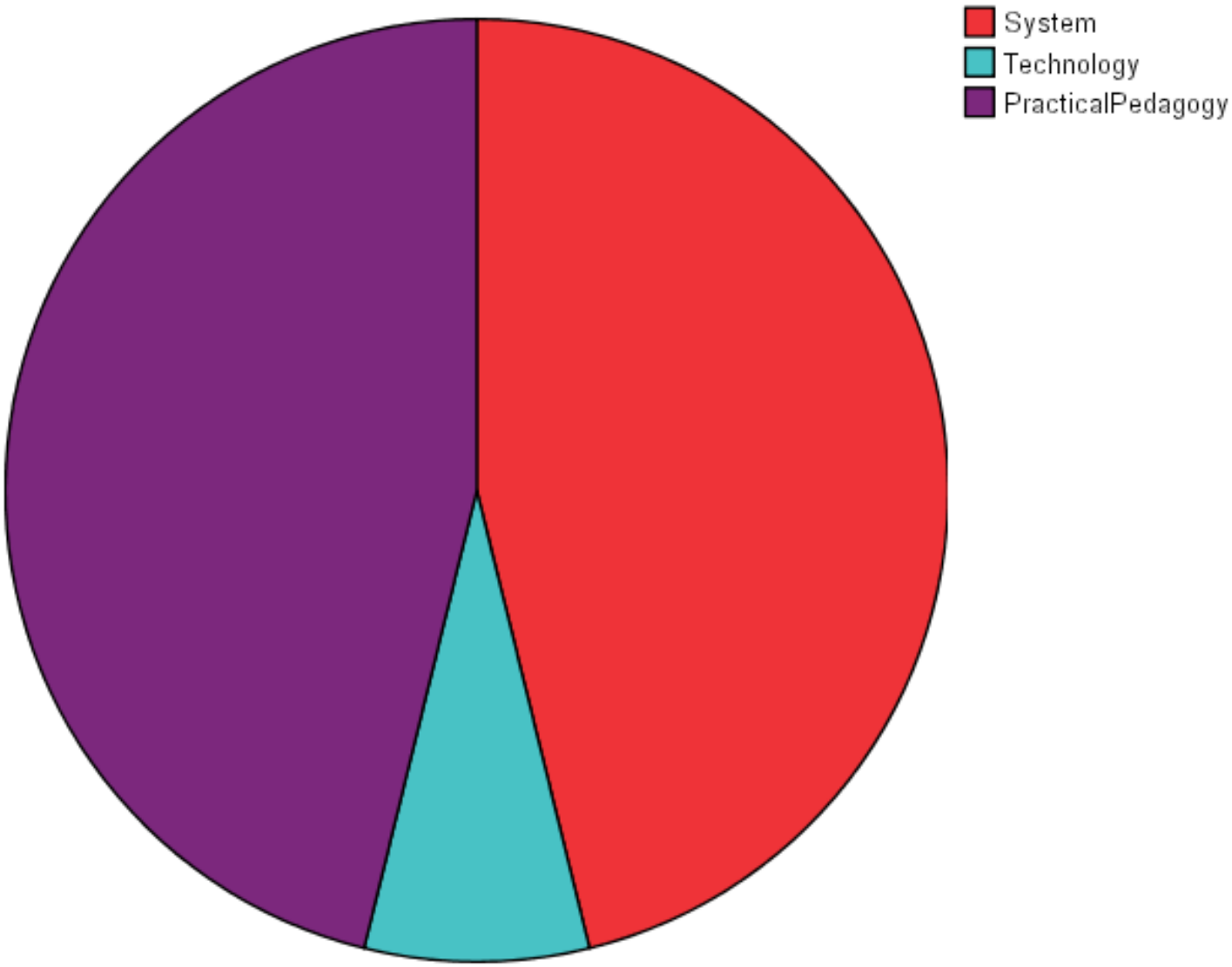
“IJAIED publishes papers and other items concerned with the application of artificial intelligence techniques and concepts to the design of systems to support learning.”

Total papers reviewed: 13

Paper length: 10,000 words (max)

Volume reviewed: 14 (2004)

URL: aied.inf.ed.ac.uk



Category	No. of Papers	% of Total
System	6	46.15
Technology	1	7.69
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	6	46.15
Curriculum	0	0.00
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	13	100.00

IJCEELL - International Journal of Continuing Engineering Education and Lifelong Learning

Description

IJCEELL is published in 6 issues per year by Inderscience Enterprises Limited.

Scope

“The objectives of the IJCEELL are to help professionals working in the field, educators, training providers and policy-makers to disseminate information and to learn from each other’s work. The journal publishes original papers, case studies, technical reports, conference reports, book reviews, commentaries and news items. Commentaries on papers and reports published in the Journal are encouraged. Authors will have the opportunity to respond to a commentary on their work before the correspondence is published.

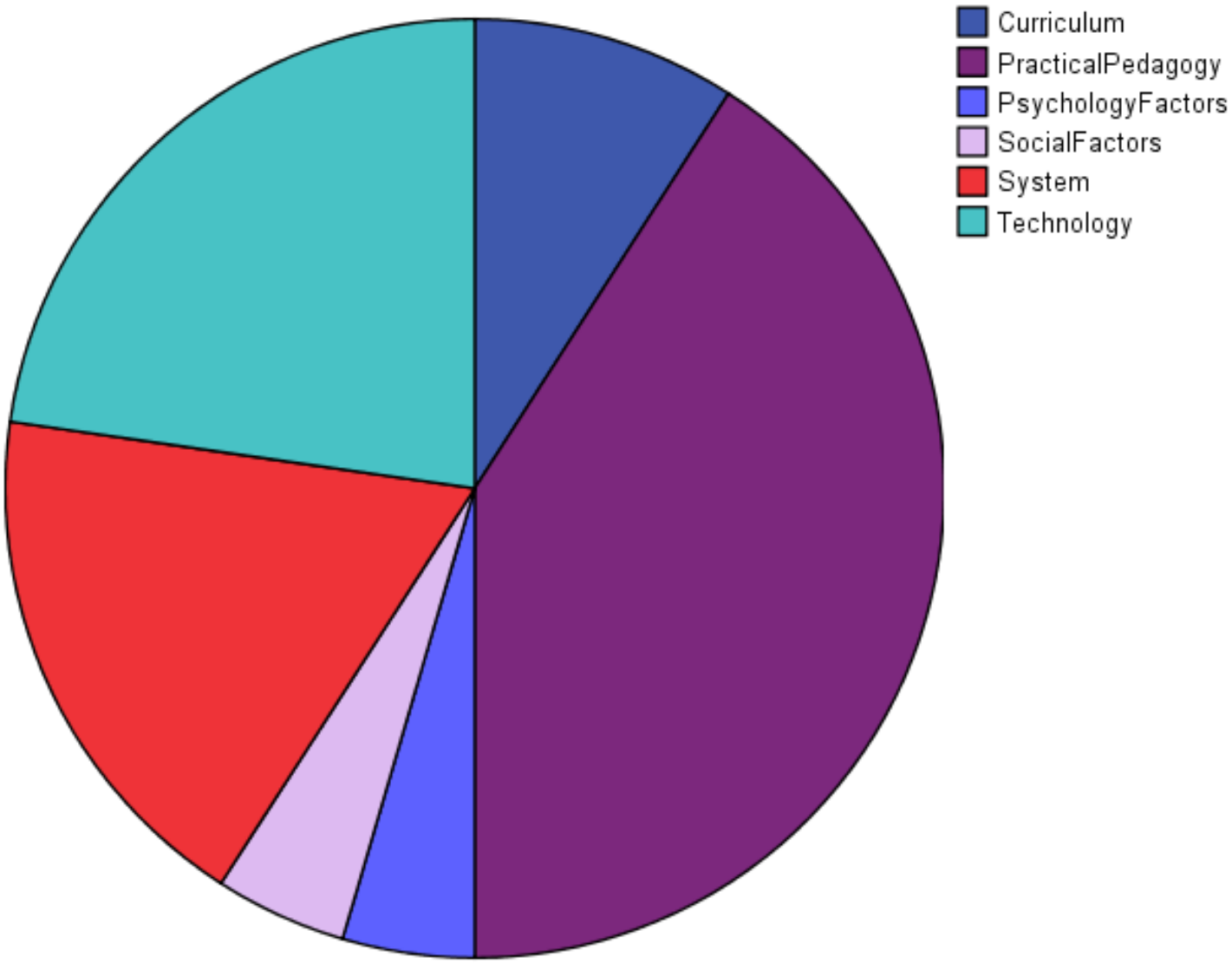
The IJCEELL is a refereed, international journal that provides a forum and an authoritative source of information in the field of continuing engineering and management education, training and career development.”

Total papers reviewed: 22

Paper length: 5000-7000 words

Volume reviewed: 15 (2005)

URL: www.inderscience.com/ijceell/



Category	No. of Papers	% of Total
System	4	18.18
Technology	5	22.73
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	9	40.91
Curriculum	2	9.09
Social Factors	1	4.55
Psychology	1	4.55
Other Educational	0	0.00
Other	0	0.00
Total	22	100.00

ITALICS - Innovations in Teaching And Learning in ICS

Description

ITALICS is a relatively new journal, and published online only. For this reason, the number of articles published so far is small. However, articles are fully refereed to the same standard as other major journals, and submissions are keenly encouraged.

Scope

“ITALICS aims to highlight current issues in learning and teaching Information and Computer Sciences at HE level including:

- Innovative approaches to learning and teaching
- Developments in computer-based learning and assessment
- Open, distance, collaborative and independent learning approaches
- The variety of contexts in which students in HE learn including work-based learning, placements and study visits
- Improving the student experience
- Continuous professional development
- The integration of theory and practice.”

Notes

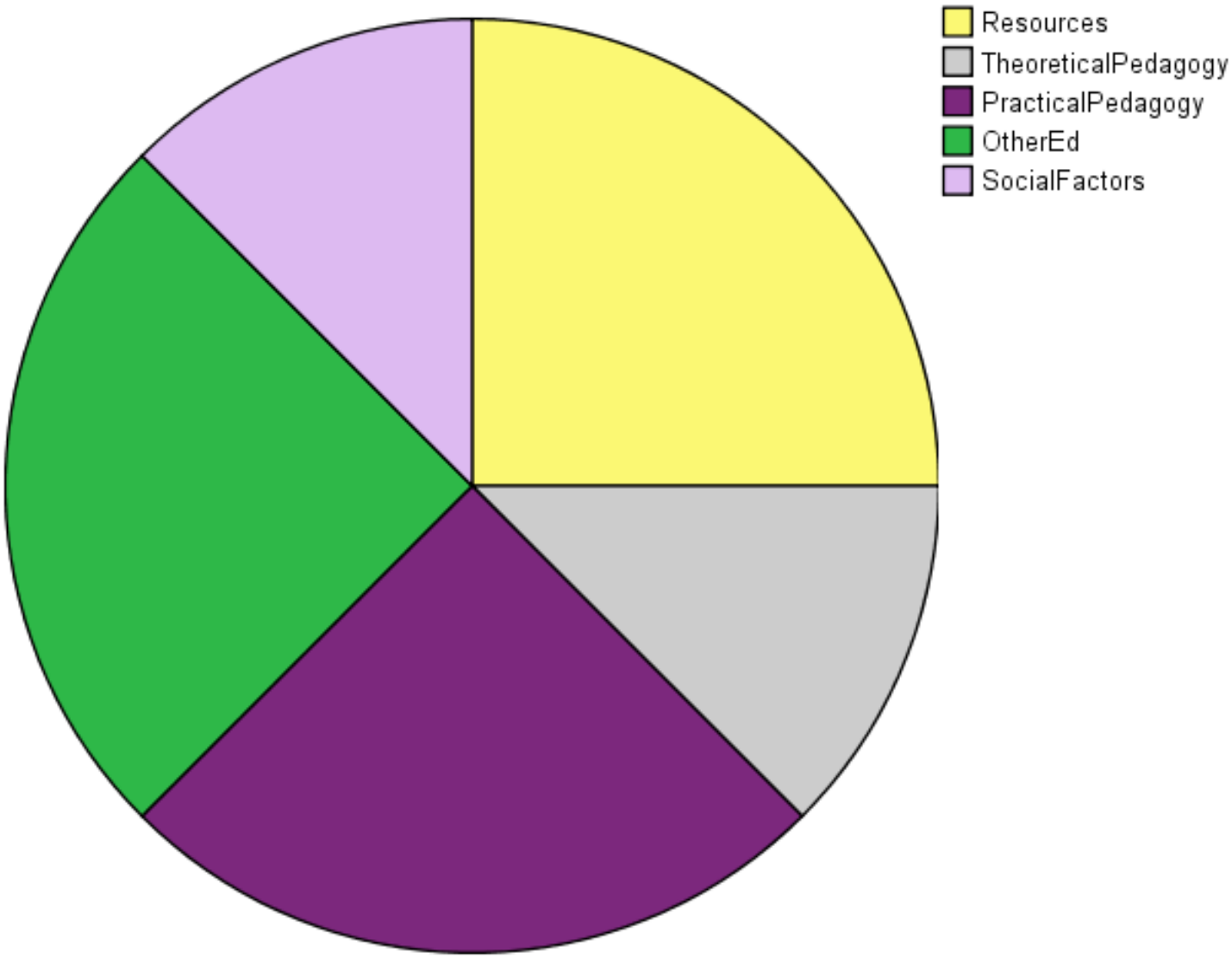
ITALICS is free online.

Total papers reviewed: 8

Paper length: unlimited

Volume reviewed: 3 (2004)

URL: www.ics.ltsn.ac.uk/pub/italics/



Category	No. of Papers	% of Total
System	0	0.00
Technology	0	0.00
Resources	2	25.00
Other Technical	0	0.00
Theoretical Pedagogy	1	12.50
Practical Pedagogy	2	25.00
Curriculum	0	0.00
Social Factors	1	12.50
Psychology	0	0.00
Other Educational	2	25.00
Other	0	0.00
Total	8	100.00

JCAL - Journal of Computer Assisted Learning

Description

This is a long-established international journal (it begain in 1985) with a strong educational focus, which appears bi-monthly.

Scope

JCAL covers the “whole range of uses of information and communication technology to support learning and knowledge exchange ... in areas such as collaborative learning, knowledge engineering, open, distance and networked learning, developmental psychology and evaluation.”

Notes

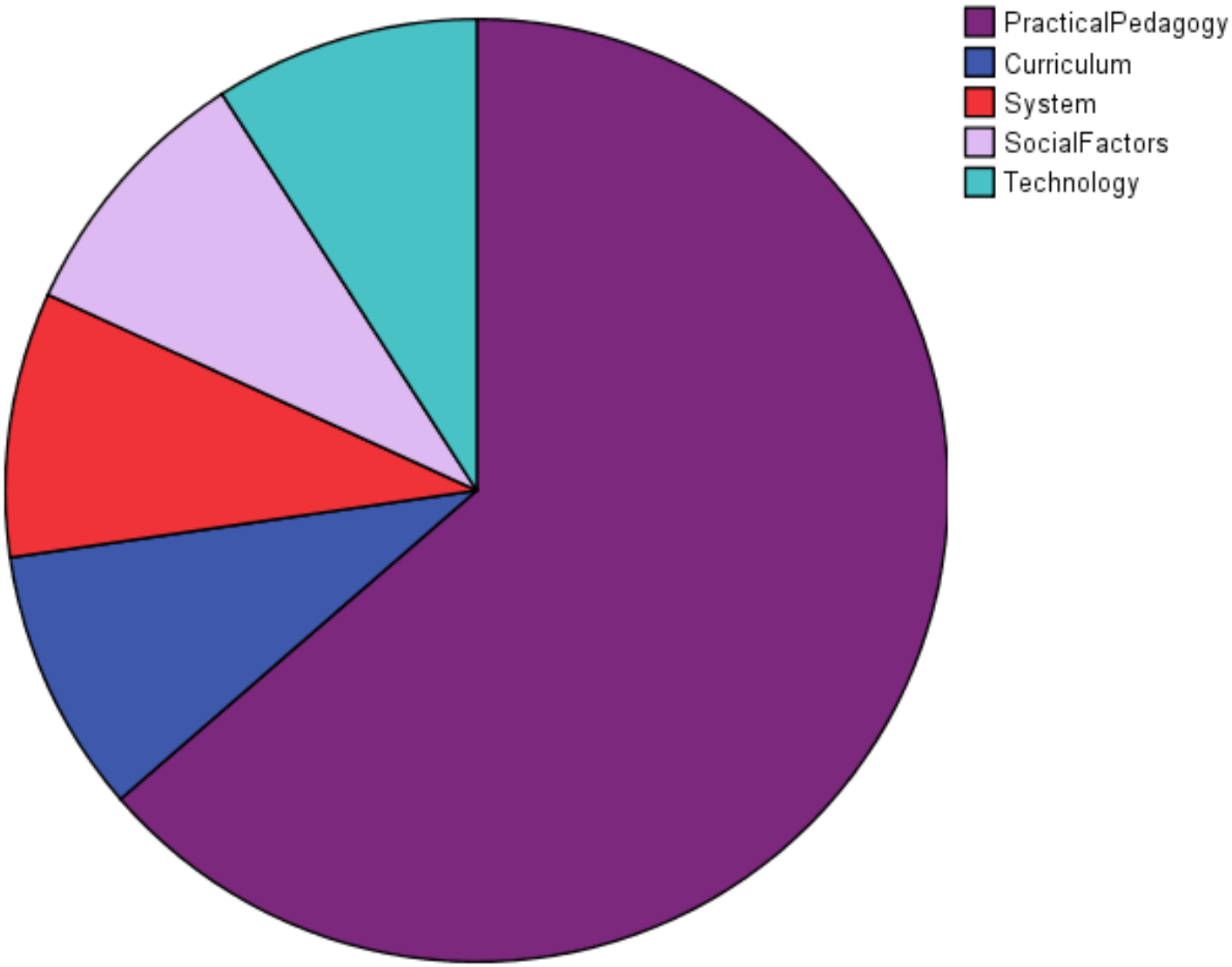
Each volume contains one or two special issues.

Total papers reviewed: 11

Paper length: normally 4,000-7,000 words

Volume reviewed: 20 (2004)

URL: www.blackwellpublishing.com/journal.asp?ref=0266-4909



Category	No. of Papers	% of Total
System	1	9.09
Technology	1	9.09
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	7	63.64
Curriculum	1	9.09
Social Factors	1	9.09
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	11	100.00

JEMH - Journal of Educational Multimedia and Hypermedia

Description

This journal is one of several published by the AACE (www.aace.org), and accepts papers with technical, educational or psychological foci. It is published quarterly, and contains typically five papers per issue, with more in special issues. The refereeing process is “double-blind”, and may take up to five months to be completed.

Scope

“JEMH is designed to provide a multi-disciplinary forum to present and discuss research, development and applications of multimedia and hypermedia in education.

The main goal of the Journal is to contribute to the advancement of the theory and practice of learning and teaching using these powerful and promising technological tools that allow the integration of images, sound, text, and data.”

Notes

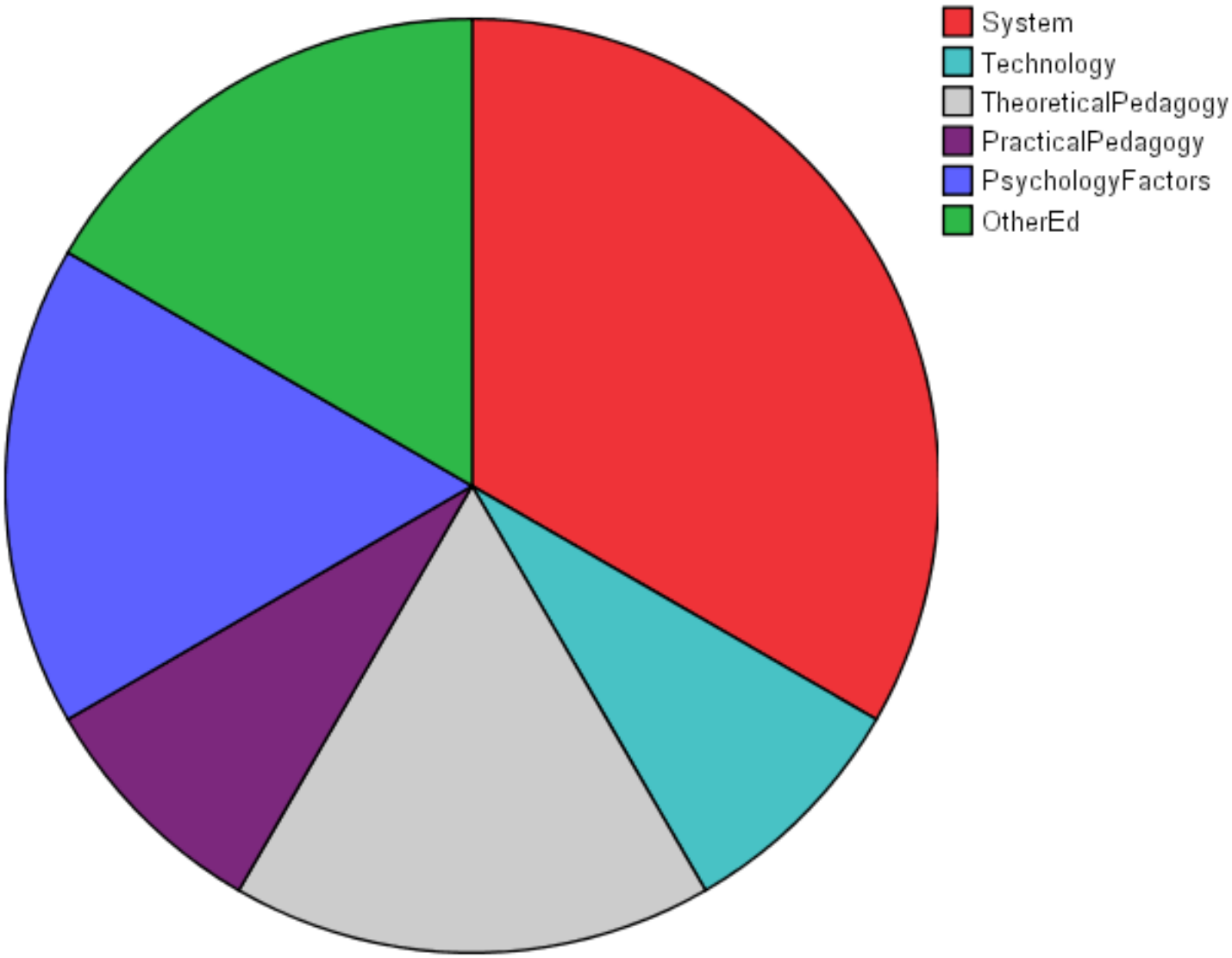
Abstracts available online without subscription.

Total papers reviewed: 24

Paper length: 30 pages (max)

Volume reviewed: 13 (2004)

URL: www.aace.org/pubs/jemh/



Category	No. of Papers	% of Total
System	8	33.33
Technology	2	8.33
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	4	16.67
Practical Pedagogy	2	8.33
Curriculum	0	0.00
Social Factors	0	0.00
Psychology	4	16.67
Other Educational	4	16.67
Other	0	0.00
Total	24	100.00

JERIC - ACM Journal on Educational Resources in Computing

Description

ACM JERIC is a fully online publication with approximately four issues per year, each containing only a few articles (the maximum to date has been nine, and some contain only one), and approximately half are “special issues”. Contributions can be relatively long, and the reviewing process is of the same high standard as other ACM journals.

Scope

“A small number of articles of broad potential impact on the computing education community will be included in the materials provided through JERIC. Other resources include laboratory materials, curricular resources in interactive multimedia, visualizations, and other materials of direct use in course presentation or informal learning, either locally or through distance education activities. JERIC defines computing broadly to include all aspects of the computing disciplines. The areas of interest include, but are not limited to, computer science, computer engineering, information systems, information science, and software engineering. While the primary focus of JERIC is materials for use in undergraduate learning, other levels of instruction are welcomed.”

Notes

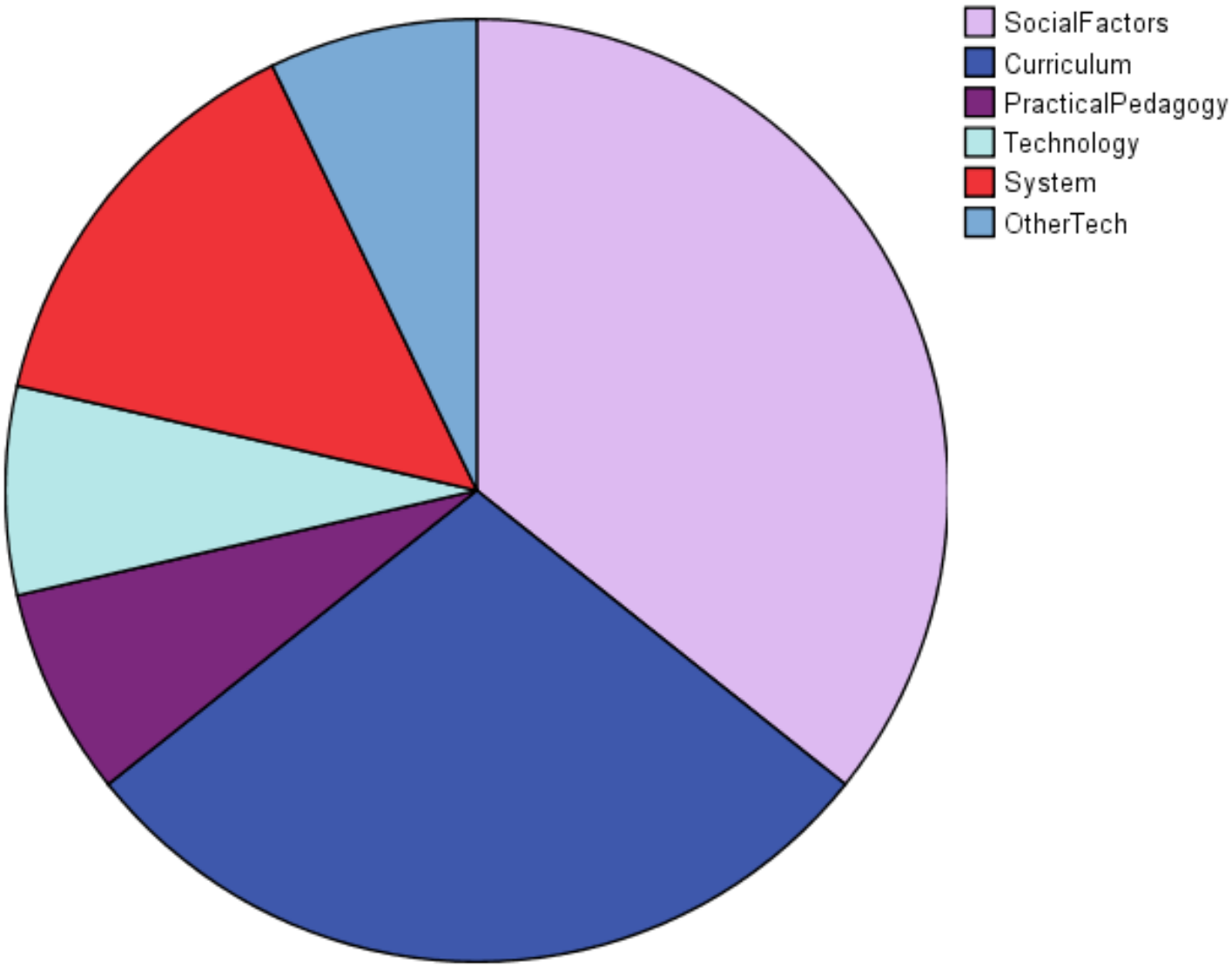
JERIC frequently publishes special issues devoted to specific topics. This volume contained one on “Gender-Balancing Computer Education” and two on “Robotics in Undergraduate Education”, and so the mixture of paper types reflects this.

Total papers reviewed: 14

Paper length: unlimited

Volume reviewed: 4 (2004)

URL: www.acm.org/pubs/jeric/



Category	No. of Papers	% of Total
System	2	14.29
Technology	1	7.14
Resources	0	0.00
Other Technical	1	7.14
Theoretical Pedagogy	0	0.00
Practical Pedagogy	1	7.14
Curriculum	4	28.57
Social Factors	5	35.71
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	14	100.00

JETS - Journal of Educational Technology and Society

Description

This relatively new journal is published quarterly by International Forum of Educational Technology and Society, and contains a broad spectrum of types of article.

Scope

JETS “seeks academic articles on the issues affecting the developers of educational systems and educators who implement and manage such systems. The articles should discuss the perspectives of both communities and their relation to each other.”

Notes

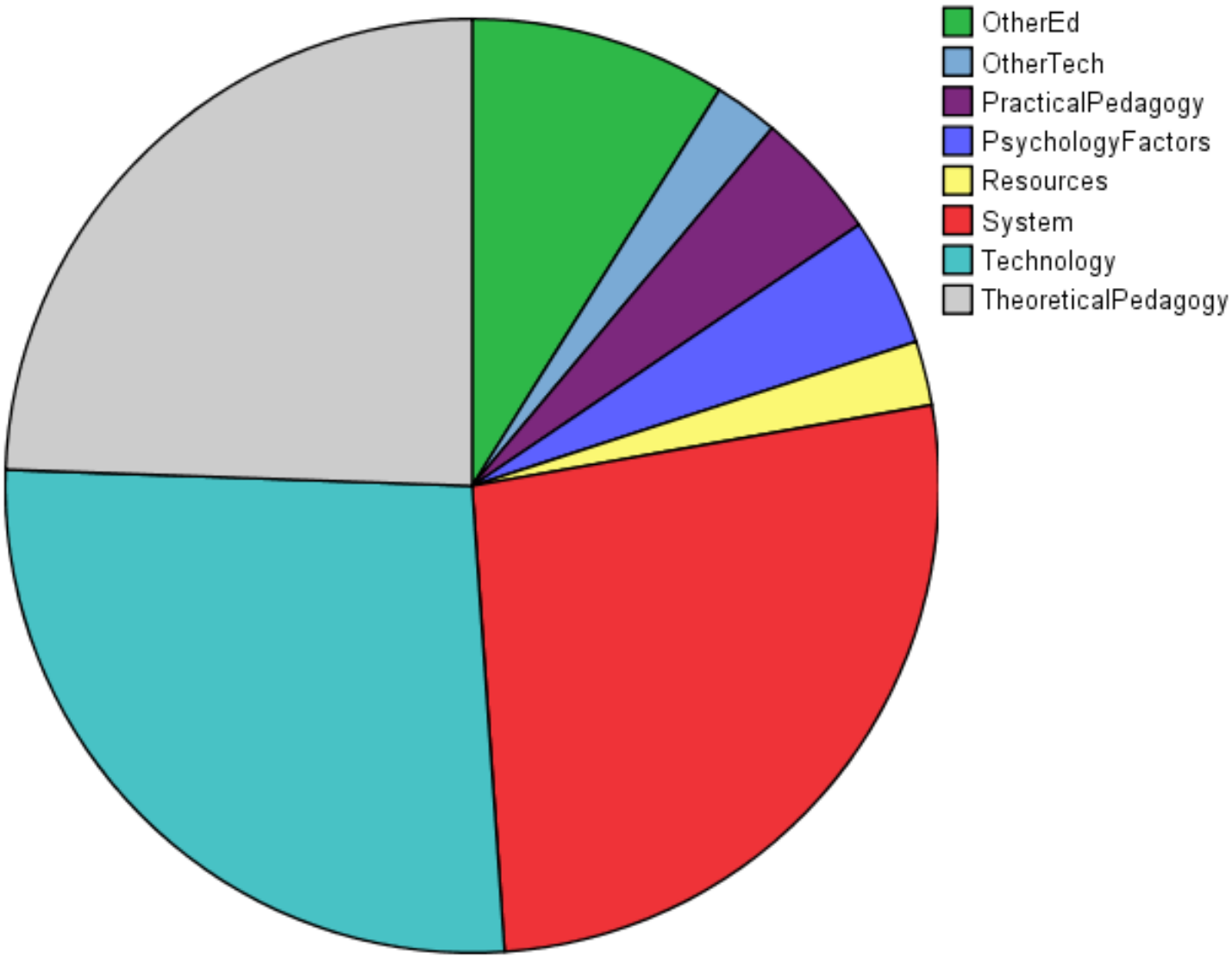
Includes book, software and website reviews. The content is available free online.

Total papers reviewed: 45

Paper length: Full papers 4,000-7,000 words; short papers 3,000 words max.

Volume reviewed: 7 (2004)

URL: www.ifets.info



Category	No. of Papers	% of Total
System	12	26.67
Technology	12	26.67
Resources	1	2.22
Other Technical	1	2.22
Theoretical Pedagogy	11	24.44
Practical Pedagogy	2	4.44
Curriculum	0	0.00
Social Factors	0	0.00
Psychology	2	4.44
Other Educational	4	8.89
Other	0	0.00
Total	45	100.00

JILR - Journal of Interactive Learning Research

Description

This is a high-quality international refereed journal. The web site describes in fine detail exactly what types of paper are acceptable (and the standard of authorship which is appropriate) — this should be read carefully before submitting a paper to the journal.

Scope

“The Journal of Interactive Learning Research (JILR) publishes papers related to the underlying theory, design, implementation, effectiveness, and impact on education and training of the following interactive learning environments:

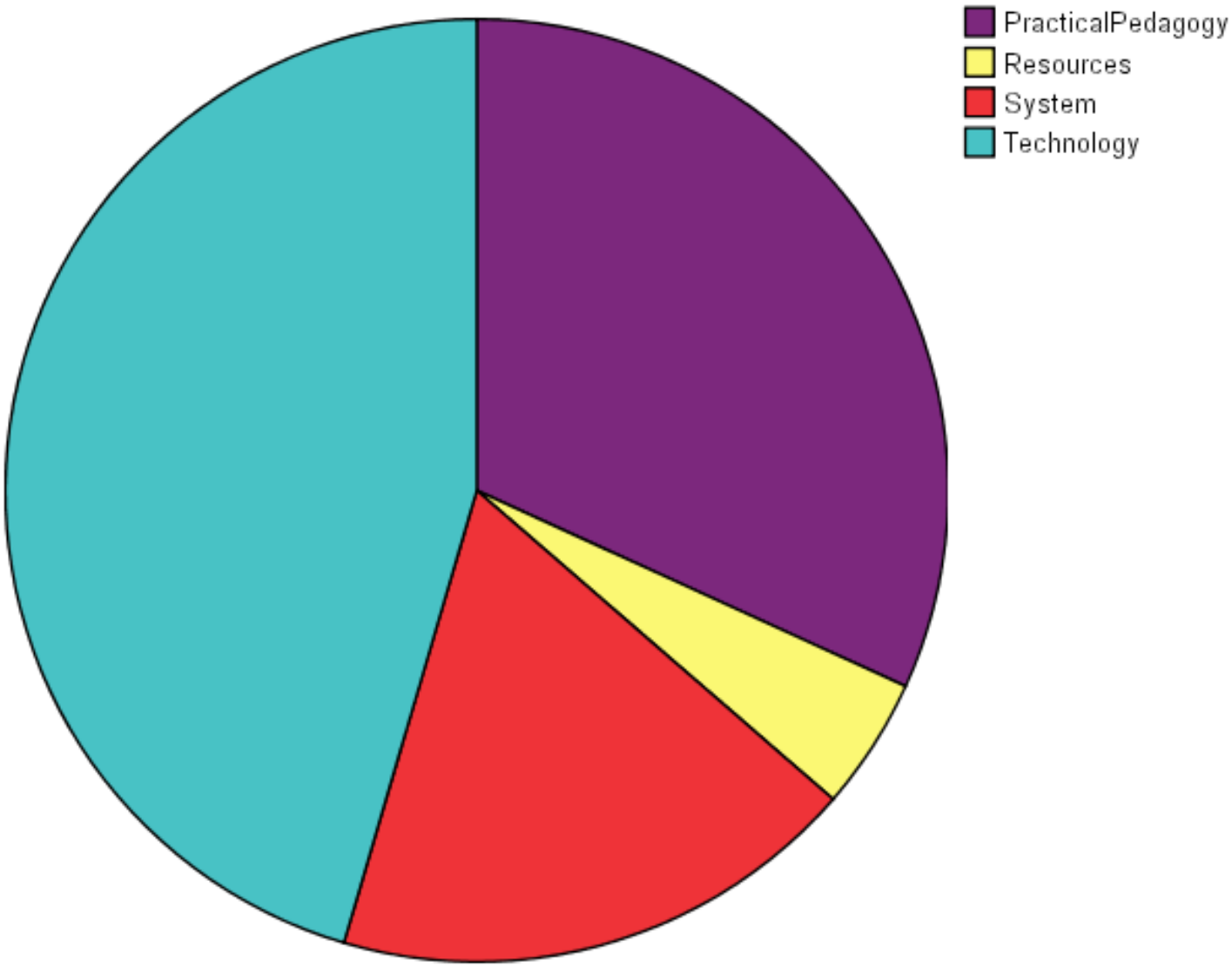
authoring systems, cognitive tools for learning computer-assisted language learning, computer-based assessment systems, computer-based training, computer-mediated communications, computer-supported collaborative learning, distributed learning environments, electronic performance support systems, interactive learning environments, interactive multimedia systems, interactive simulations and games, intelligent agents on the Internet, intelligent tutoring systems, microworlds, virtual reality based learning systems.”

Total papers reviewed: 22

Paper length: 30 pages (max, double-spaced)

Volume reviewed: 15 (2004)

URL: www.aace.org/pubs/jilr/



Category	No. of Papers	% of Total
System	4	18.18
Technology	10	45.45
Resources	1	4.55
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	7	31.82
Curriculum	0	0.00
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	22	100.00

JTATE - Journal of Technology and Teacher Education

Description

This journal is not perhaps an obvious target for a CSE paper, but its content overlaps sufficiently for it to be considered.

Scope

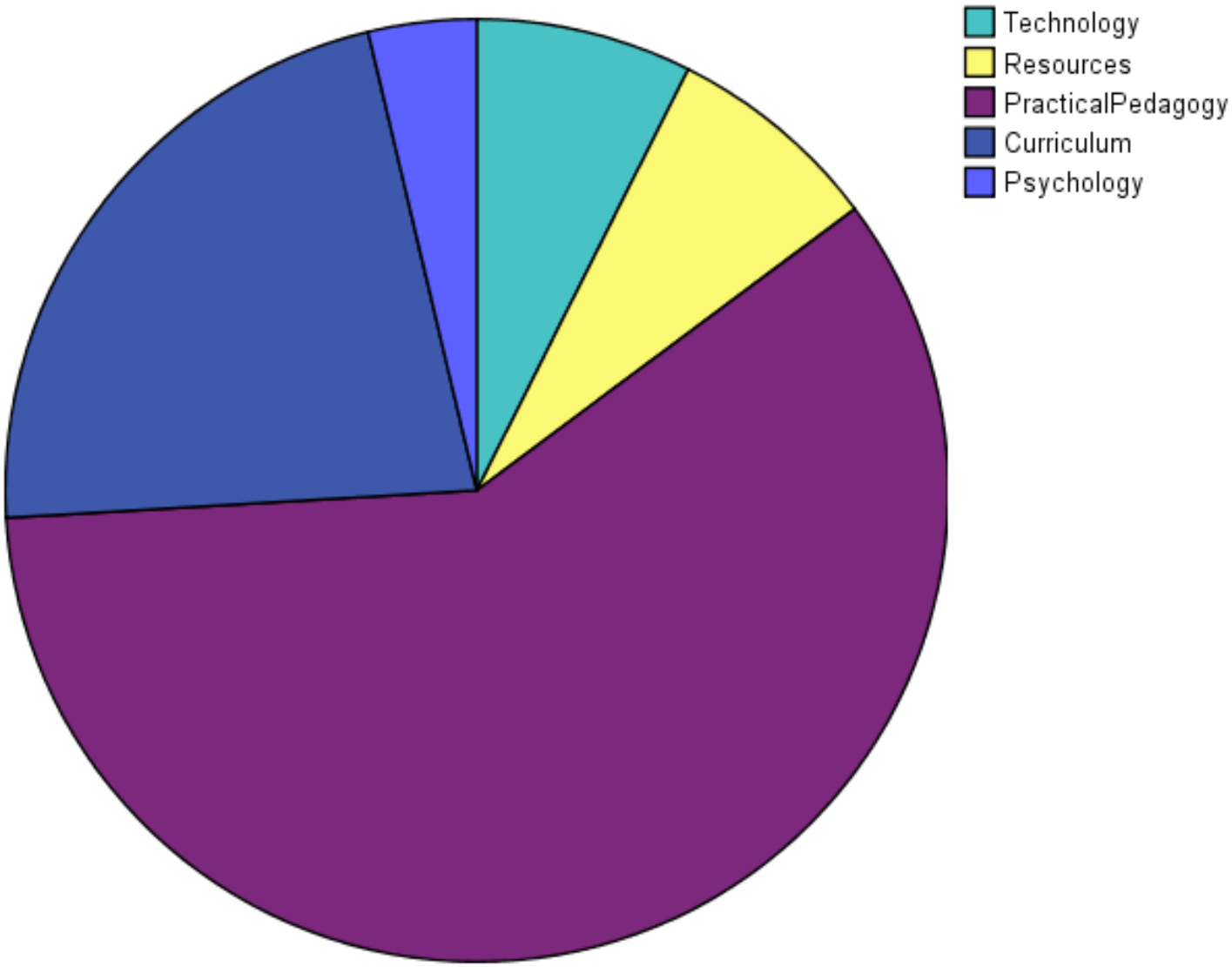
JTATE is " a forum for the exchange of knowledge about the use of information technology in teacher education. Journal content covers preservice and inservice teacher education, graduate programs in areas such as curriculum and instruction, educational administration, instructional technology, and educational computing."

Total papers reviewed: 27

Paper length: 30 pages (max, double-spaced)

Volume reviewed: 12 (2004)

URL: www.aace.org/pubs/jtate/



Category	No. of Papers	% of Total
System	0	0.00
Technology	2	7.41
Resources	2	7.41
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	16	59.26
Curriculum	6	22.22
Social Factors	0	0.00
Psychology	1	3.70
Other Educational	0	0.00
Other	0	0.00
Total	27	100.00

MOJIT - Malaysian Online Journal of Instructional Technology

Description

Published three times a year, MOJIT is an international peer-reviewed electronic journal with two or three issues per year. It is a very recent publication of the Malaysian Educational Technology Association (META) (pppjj.usm.my/mojit/mojit_.html), and it is not at this stage clear how it will develop.

Scope

MOJIT "features reports on research findings, theoretical discussions and technical developments that contribute significantly to knowledge in the area of instructional technology. The issues presented reflect a debate on the wide range of relevant subjects, including the practical usage of technology for instruction, the theory of instructional design, an evaluation of instructional design, management of instructional technology and the future development of technology for instruction. This online format also allows for the incorporation of multimedia elements such as images, sound files and video clips. The content of the journal is potentially of interest to policy makers, administrators, academicians, teachers and students within the area of education and training"

Notes

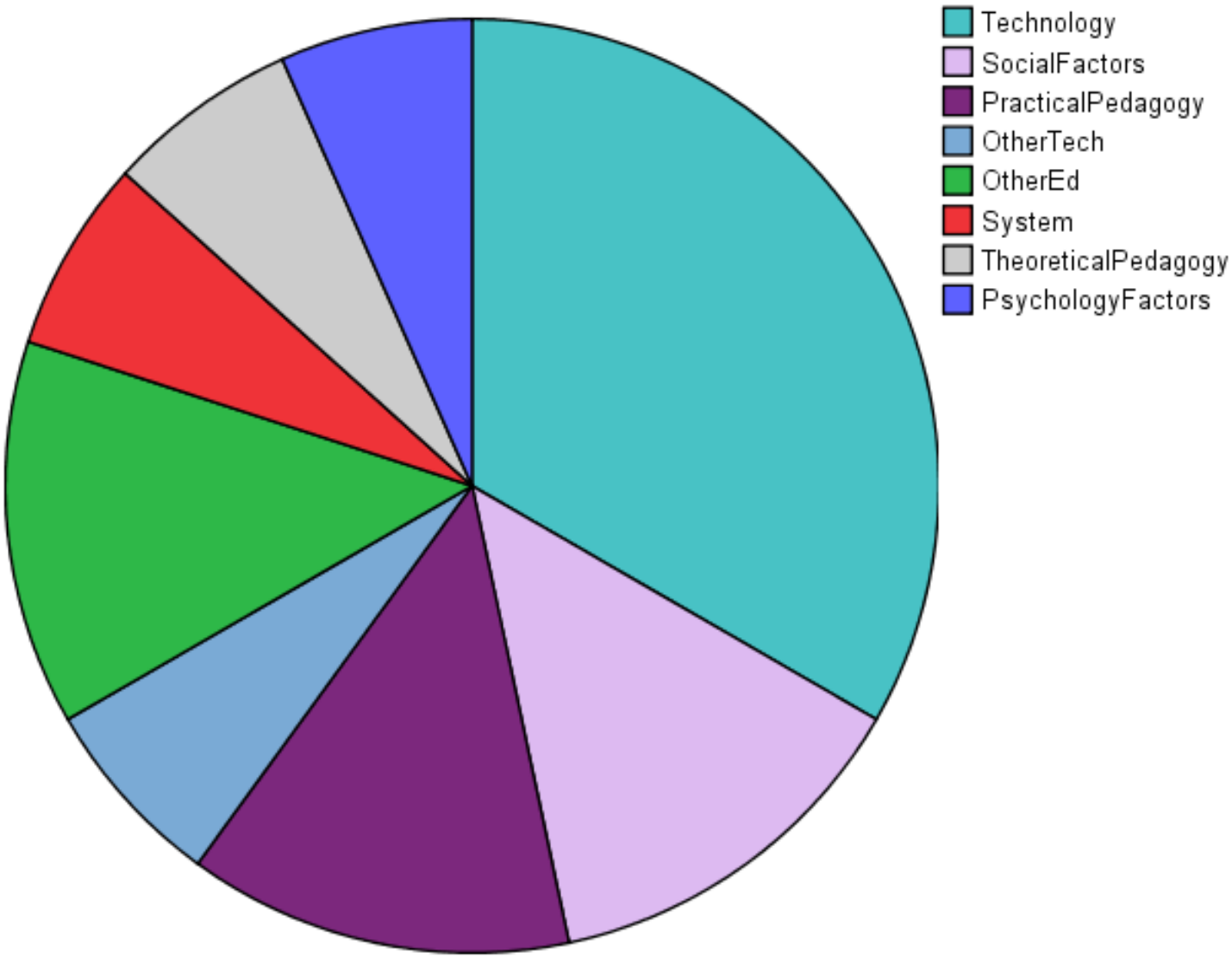
This journal can be viewed free online.

Total papers reviewed: 15

Paper length: 3,000-5,000 words

Volume reviewed: 1 (2004)

URL: pppjj.usm.my/mojit/



Category	No. of Papers	% of Total
System	1	6.67
Technology	5	33.33
Resources	0	0.00
Other Technical	1	6.67
Theoretical Pedagogy	1	6.67
Practical Pedagogy	2	13.33
Curriculum	0	0.00
Social Factors	2	13.33
Psychology	1	6.67
Other Educational	2	13.33
Other	0	0.00
Total	15	100.00

SIGCSE - Bulletin of the ACM Special Interest Group on Computer Science Education

Description

The bulletin of SIGCSE publishes fully peer-reviewed papers in addition to other regular contributions which might be expected in a publication which supports a membership base.

Scope

“SIGCSE provides a forum for university educators to discuss concerns about development, implementation, and evaluation of computer science programs and courses, as well as syllabi and problem sets. It holds an annual conference and co-sponsors events with other ACM SIGs

Areas of Special Interest: Incorporation of curricula into ongoing programs and use of formal labs.”

Notes

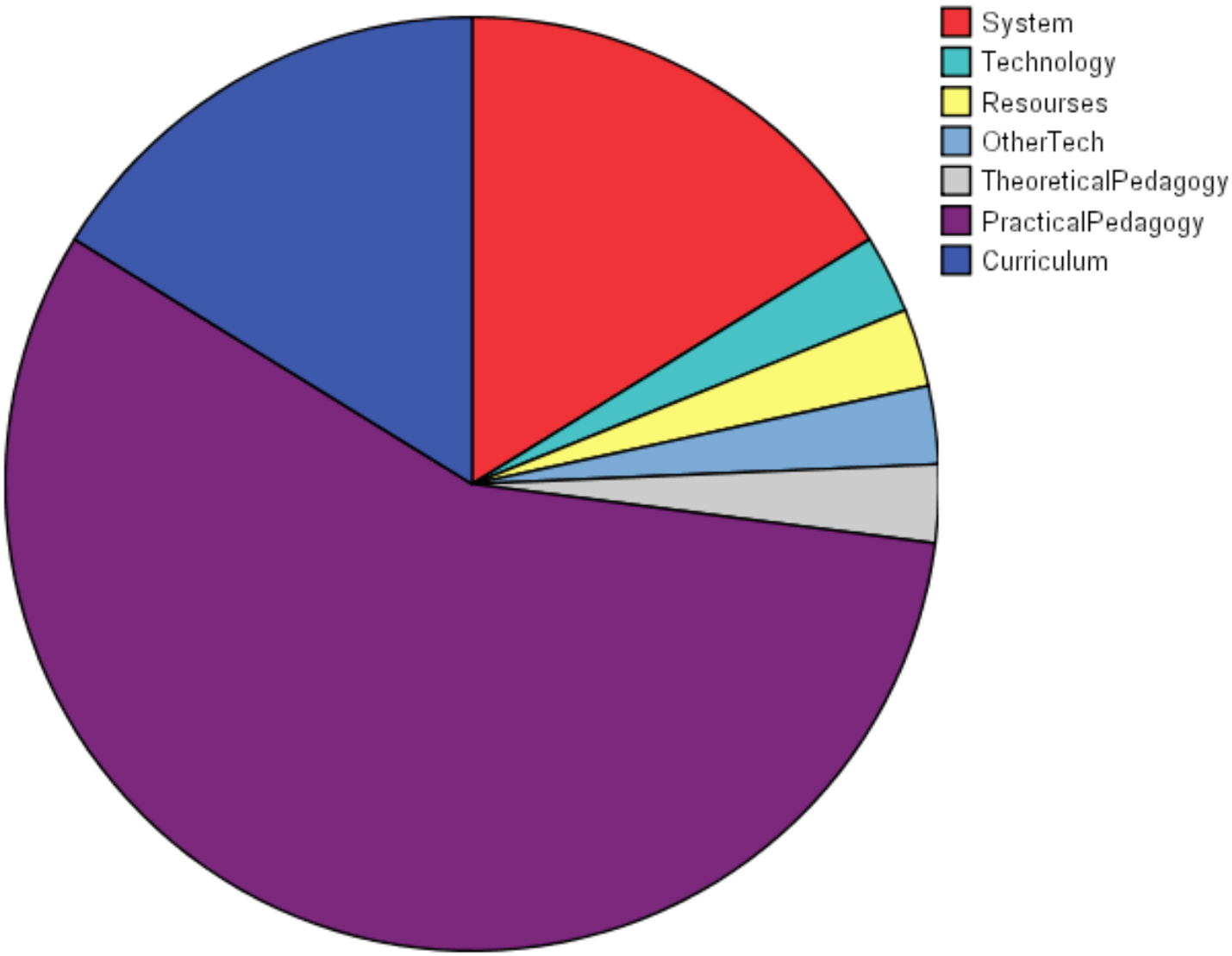
Excludes 1 and 3, which are conferences (ITiCSE and TSCSE), which we have reviewed under conferences.

Total papers reviewed: 37

Paper length: 5 pages and 3,000 words (max)

Volume reviewed: 36 (2004)

URL: www.acm.org/sigcse



Category	No. of Papers	% of Total
System	6	16.22
Technology	1	2.70
Resources	1	2.70
Other Technical	1	2.70
Theoretical Pedagogy	1	2.70
Practical Pedagogy	21	56.76
Curriculum	6	16.22
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	37	100.00

Other Journals

A number of journals were originally considered for this survey, but were not included since there are issues with their scope or availability — if a journal is difficult to access, it will not be effective as a dissemination vehicle. We list these journals here, for completeness.

JRTE - Journal of Research on Technology in Education

This journal is published (online) by ISTE - the International Society for Technology in Education (www.iste.org), however only members of ISTE are allowed access to the papers.

JEE - Journal of Engineering Education

Published by the American Society for Engineering Education (www.asee.org), this journal does not have a significant number of articles which are Computer Science related.

IJEL - International Journal on E-Learning

Published by the Association for the Advancement of Computing in Education (www.aace.org), this journal could not be sourced (including the British Library).

IJET - International Journal of Emerging Technologies in Learning

This journal "aims to focus on the exchange of relevant trends and research results as well as the presentation of practical experiences gained while developing and testing elements of technology enhanced learning." It commenced publication in 2006, too late for this review. Further information is available on the website (www.i-jet.org).

IJMLO - International Journal of Mobile Learning and Organisation

This is a forthcoming journal - see www.inderscience.com/ijmlo/ for further information.

AEHE - Assessment and Evaluation in Higher Education

This journal addresses generic issues related to assessment, and contains very little Computer Science subject related material. More information is available from www.tandf.co.uk/journals/titles/02602938.asp

IJ-SoTL - International Journal for the Scholarship of Teaching and Learning

This is a new journal commencing publication in 2007. The home page is www.georgiasouthern.edu/ijsotl/

Other Peripheral Journals

The following were omitted since they had little relevance to both Computer Science and to Higher

Education:

Australian Educational Computing
Computer Assisted Language Learning
Contemporary Issues in Technology and Teacher Education
Educational Media International
Educational Psychologist
Educational Technology Journal
International Journal For Technology in Mathematics Education
Journal of Design Communication
Journal of Higher Education
Journal of Technology Education
Mathematics and Computer Education
New Horizons for Learning
Oxford Review of Education

Discontinued Titles

The following journals are no longer published.

Education and Computing
Education, Communication and Information
Interactive Multimedia Electronic Journal of Computer-Enhanced Learning

Conferences

This page contains the data from the classification exercise, as raw data, and as percentages. The column headers are abbreviations for the eleven classifications for the papers.

Raw Data

Title	Sys	Tech	Res	OthTech	ThPed	PrPed	Curr	Soc	Psych	OthEd	Other	Total
ABSHL	9	3	0	0	0	0	0	0	0	0	0	12
AIED	33	9	0	0	0	42	0	3	0	0	0	87
CATE	30	22	1	6	1	4	12	1	0	12	0	89
CITE	4	11	2	0	0	19	22	0	0	0	0	58
E-Learn	54	227	17	0	0	144	55	49	0	2	1	549
EDMEDIA	207	25	17	17	52	217	18	19	47	118	3	740
FIE	47	3	5	5	6	30	60	9	6	34	0	205
HEA-ICS	10	2	1	0	0	7	6	0	0	2	1	29
ICALT	114	50	2	7	10	12	5	4	0	9	3	216
ICCE	106	20	1	4	5	55	3	0	5	48	0	247
ICER	1	3	0	0	0	10	2	0	0	0	0	16
ICET	9	8	1	0	0	28	6	0	0	0	0	52
ITHET	39	11	8	1	5	10	25	0	0	3	0	102
ITS	12	26	0	0	0	24	1	7	0	0	0	70
ITiCSE	27	0	2	0	3	22	12	1	1	0	0	68
Koli	7	0	0	0	5	8	1	3	0	2	0	26
MICTE	63	44	7	7	12	25	10	6	1	36	9	220
ML	16	9	1	1	1	8	0	0	1	8	1	46
PPIG	1	14	0	0	0	7	0	4	0	0	0	26
TSCSE	36	5	2	0	1	28	23	8	0	1	0	104
WBE	34	46	2	0	0	31	4	2	0	0	0	119

Data as Percentages

Title	Sys	Tech	Res	OthTech	ThPed	PrPed	Curr	Soc	Psych	OthEd	Other	Total
ABSHL	75.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
AIED	37.93	10.34	0.00	0.00	0.00	48.28	0.00	3.45	0.00	0.00	0.00	100.00
CATE	33.71	24.72	1.12	6.74	1.12	4.49	13.48	1.12	0.00	13.48	0.00	100.00
CITE	6.90	18.97	3.45	0.00	0.00	32.76	37.93	0.00	0.00	0.00	0.00	100.00
E-Learn	9.84	41.35	3.10	0.00	0.00	26.23	10.02	8.93	0.00	0.36	0.18	100.00
EDMEDIA	27.97	3.38	2.30	2.30	7.03	29.32	2.43	2.57	6.35	15.95	0.41	100.00
FIE	22.93	1.46	2.44	2.44	2.93	14.63	29.27	4.39	2.93	16.59	0.00	100.00
HEA-ICS	34.48	6.90	3.45	0.00	0.00	24.14	20.69	0.00	0.00	6.90	3.45	100.00

ICALT	52.78	23.15	0.93	3.24	4.63	5.56	2.31	1.85	0.00	4.17	1.39	100.00
ICCE	42.91	8.10	0.40	1.62	2.02	22.27	1.21	0.00	2.02	19.43	0.00	100.00
ICER	6.25	18.75	0.00	0.00	0.00	62.50	12.50	0.00	0.00	0.00	0.00	100.00
ICET	17.31	15.38	1.92	0.00	0.00	53.85	11.54	0.00	0.00	0.00	0.00	100.00
ITHET	38.24	10.78	7.84	0.98	4.90	9.80	24.51	0.00	0.00	2.94	0.00	100.00
ITS	17.14	37.14	0.00	0.00	0.00	34.29	1.43	10.00	0.00	0.00	0.00	100.00
ITiCSE	39.71	0.00	2.94	0.00	4.41	32.35	17.65	1.47	1.47	0.00	0.00	100.00
Koli	26.92	0.00	0.00	0.00	19.23	30.77	3.85	11.54	0.00	7.69	0.00	100.00
MICTE	28.64	20.00	3.18	3.18	5.45	11.36	4.55	2.73	0.45	16.36	4.09	100.00
ML	34.78	19.57	2.17	2.17	2.17	17.39	0.00	0.00	2.17	17.39	2.17	100.00
PPIG	3.85	53.85	0.00	0.00	0.00	26.92	0.00	15.38	0.00	0.00	0.00	100.00
TSCSE	34.62	4.81	1.92	0.00	0.96	26.92	22.12	7.69	0.00	0.96	0.00	100.00
WBE	28.57	38.66	1.68	0.00	0.00	26.05	3.36	1.68	0.00	0.00	0.00	100.00

ABSHL - Agent-Based Systems for Human Learning Workshop

Description

This workshop is held as part of the annual Autonomous Agents and Multi-Agent Systems (AAMAS). Its focus is to bridge the agent and educational technology communities.

Scope

“We invite submissions that describe and/or demonstrate:

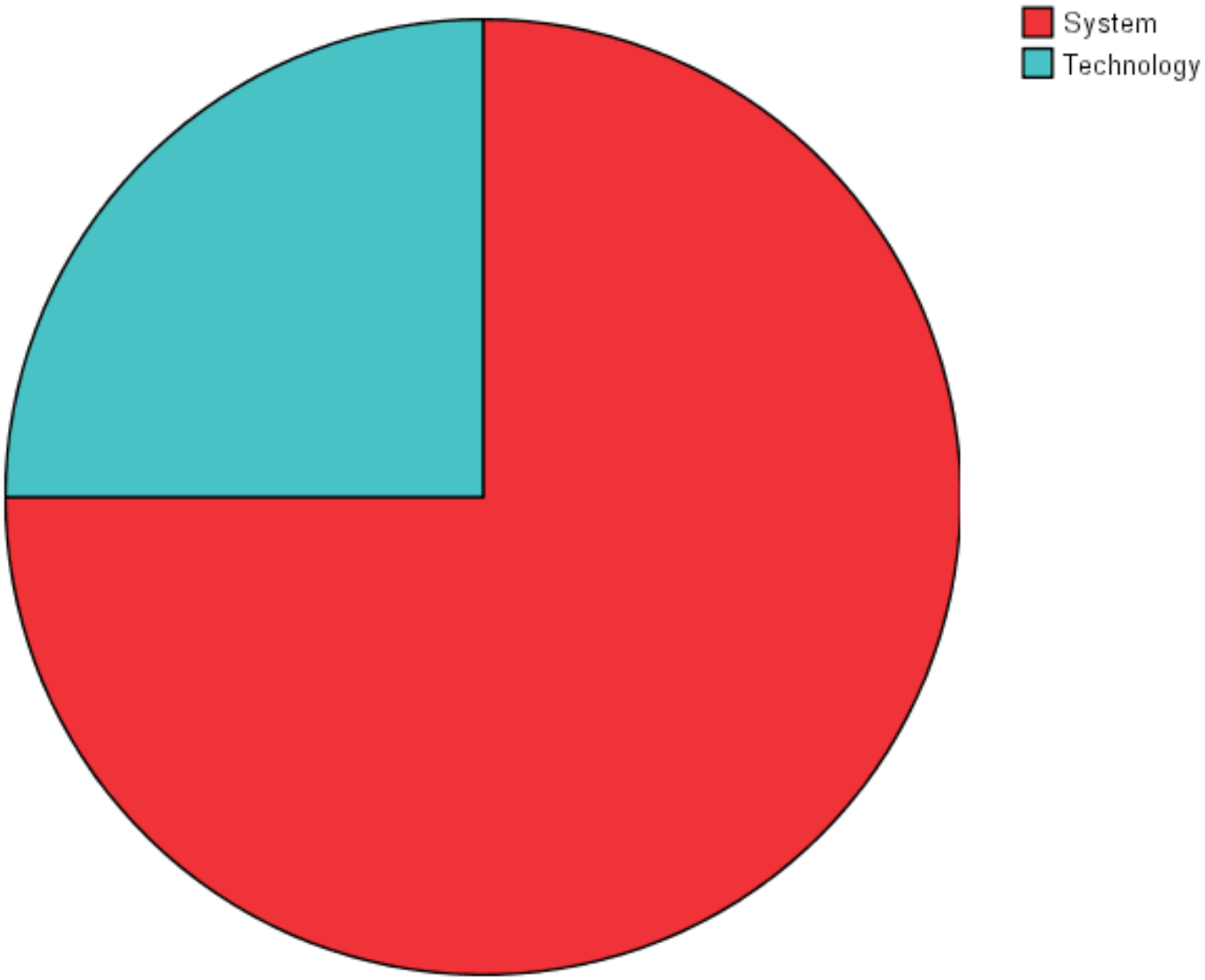
- innovative applications of MAS in human learning activities,
- development of new agent technologies to support human learning tasks,
- development of cognitive, social and emotion models to support human learning,
- development of believable and engaging agent-based environments for human learning,
- evaluation methodologies for agent-based systems for human learning,
- pilot/user/formative studies of agent-based systems for human learning, and
- use of agents within virtual human learning environments, applying approaches such as game technology and virtual reality which can provide more engagement and motivation to enhance the learning experience.”

Total papers reviewed: 12

Other activities: no

Paper length: 8 pages (max, full papers), 4 pages (max, work in progress)

URL: agents.cs.columbia.edu/abshl/



Category	No. of Papers	% of Total
System	9	75.00
Technology	3	25.00
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	0	0.00
Curriculum	0	0.00
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	12	100.00

AIED - International Conference on Artificial Intelligence in Education

Description

The AIED conference is a major international event held biennially.

Scope

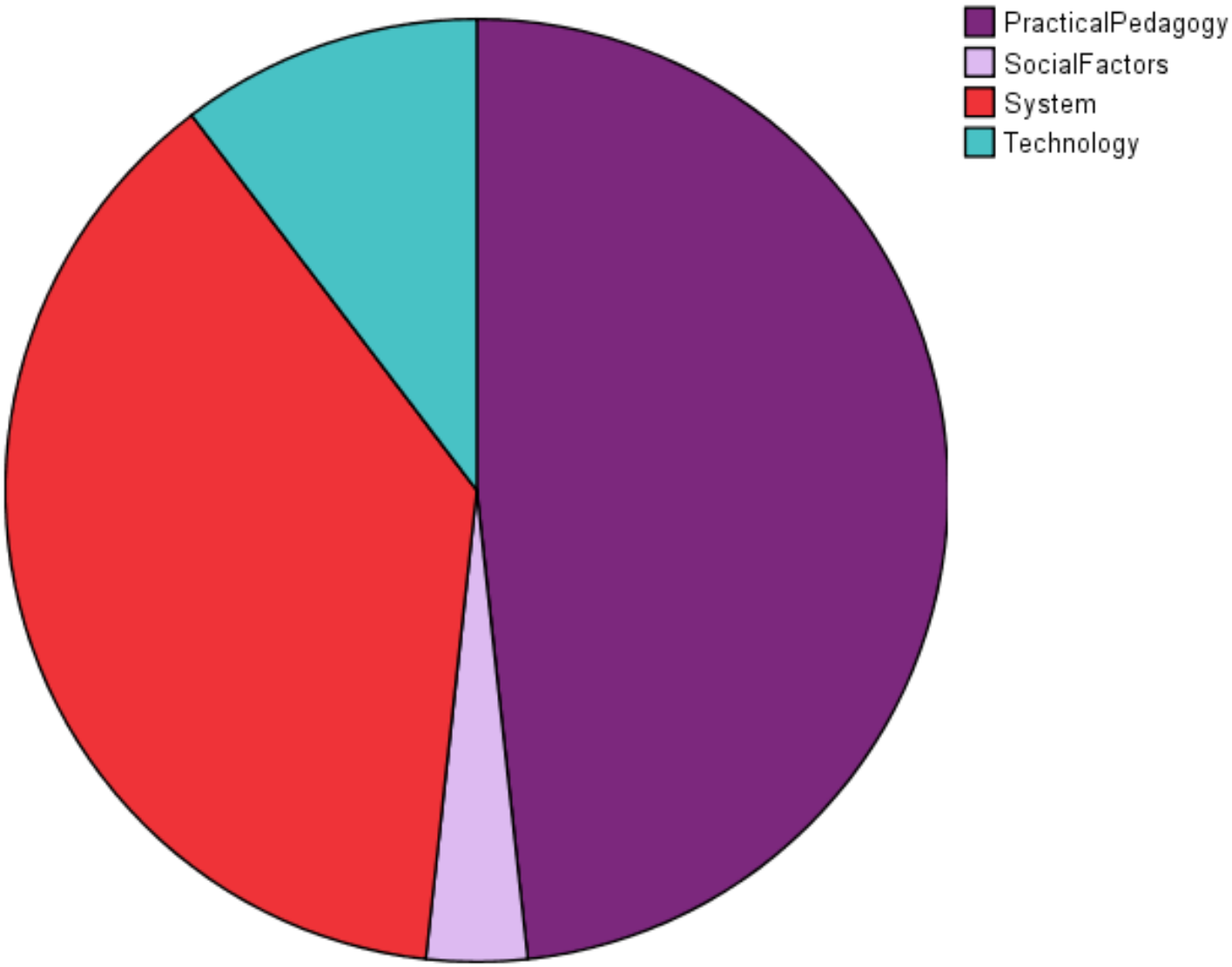
“The AIED field is committed to the belief that true progress in learning technology requires combining advanced technology with advanced understanding of learners, learning, and the context of learning. The conference thus provides opportunities for the cross-fertilization of information and ideas from researchers in the many fields that make up this interdisciplinary research area, including: artificial intelligence, other areas of computer science, cognitive science, education, learning sciences, educational technology, psychology, philosophy, sociology, anthropology, linguistics, and the many domain-specific areas for which AIED systems have been designed and built.”

Total papers reviewed: 87

Other activities: posters, panels, workshops

Paper length: 8 pages

URL: hcs.science.uva.nl/AIED2005/



Category	No. of Papers	% of Total
System	33	37.93
Technology	9	10.34
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	42	48.28
Curriculum	0	0.00
Social Factors	3	3.45
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	87	100.00

CATE - IASTED International Conference on Computers and Advanced Technology in Education

Description

This is an annual conference organised by the International Association of Science and Technology for Development (IASTED). It attracts international participation and has a wide-ranging scope.

Scope

CATE is “a major forum for the presentation of innovative developments and the exchange of information between researchers and practitioners on the use of technology in education.” Submissions are divided into 5 topic areas:

- Advanced Technology in Education and Training
- Advanced Educational Software and Hardware
- Advanced Technology and Human Resource Issues
- Institutional Issues on Technology-based Education and Training
- Policies on Technology-based Education
- Technology-based Blended, Distance and Open Education

Notes

The volume categorised is from 2005 because 2004 was unobtainable by inter-library loan.

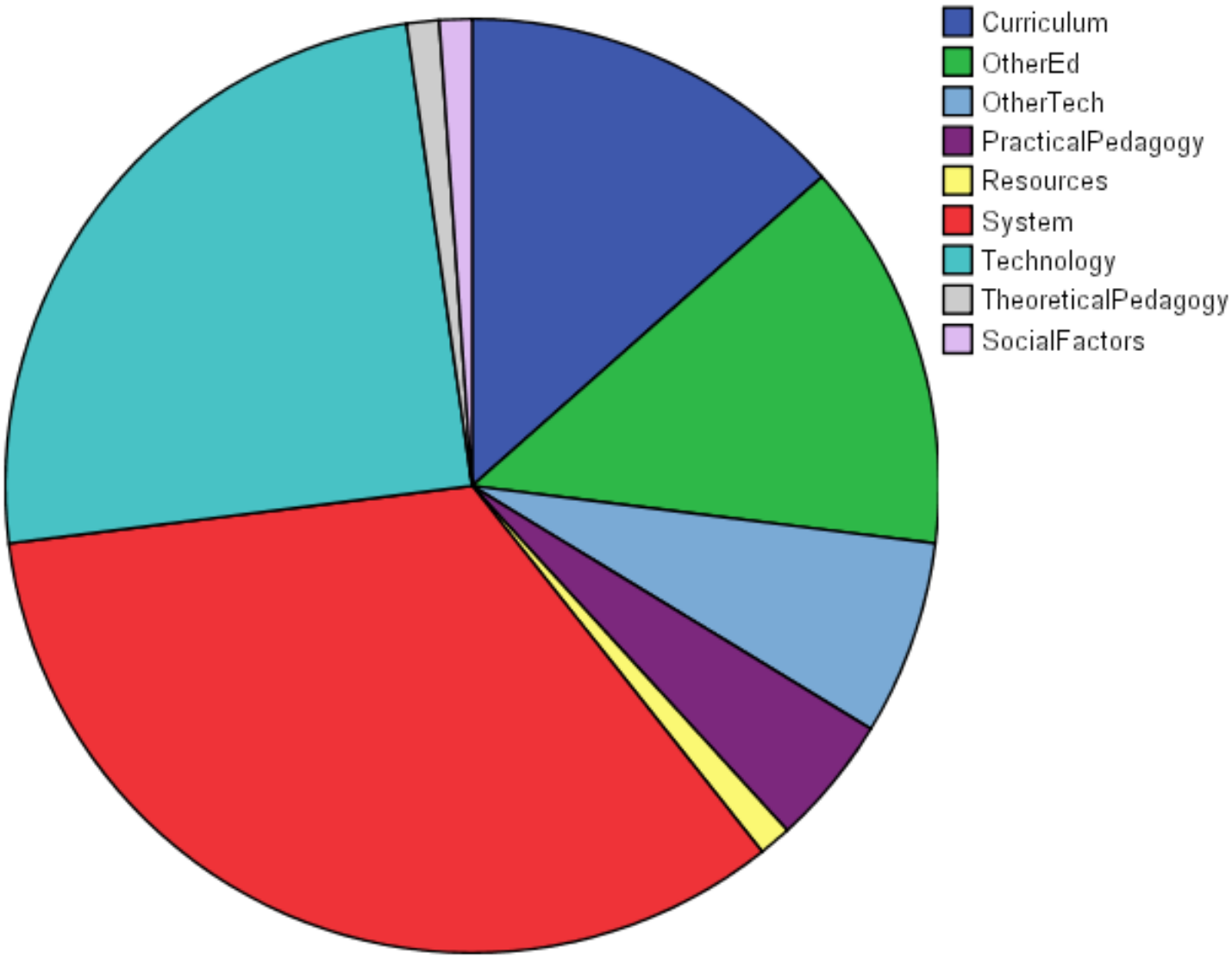
Total papers reviewed: 89

Other activities: tutorials, special sessions

Paper length: 6, but additional pages can be included for a fee

Volume reviewed: 8th (2005)

URL: www.iasted.org/conferences/



Category	No. of Papers	% of Total
System	30	33.71
Technology	22	24.72
Resources	1	1.12
Other Technical	6	6.74
Theoretical Pedagogy	1	1.12
Practical Pedagogy	4	4.49
Curriculum	12	13.48
Social Factors	1	1.12
Psychology	0	0.00
Other Educational	12	13.48
Other	0	0.00
Total	89	100.00

CITE - Conference on Information Technology Education

Description

This annual conference is managed by the ACM Special Interest Group in Information Technology Education.

Scope

“We encourage submissions in areas relating to Information Technology Education, IT-industry-academia relationships and related topics. We are seeking papers that deal with our roles as professionals, educators, students and advocates for the effective use of Information Technology. Authors may submit more than one paper. Papers authored by students are encouraged.”

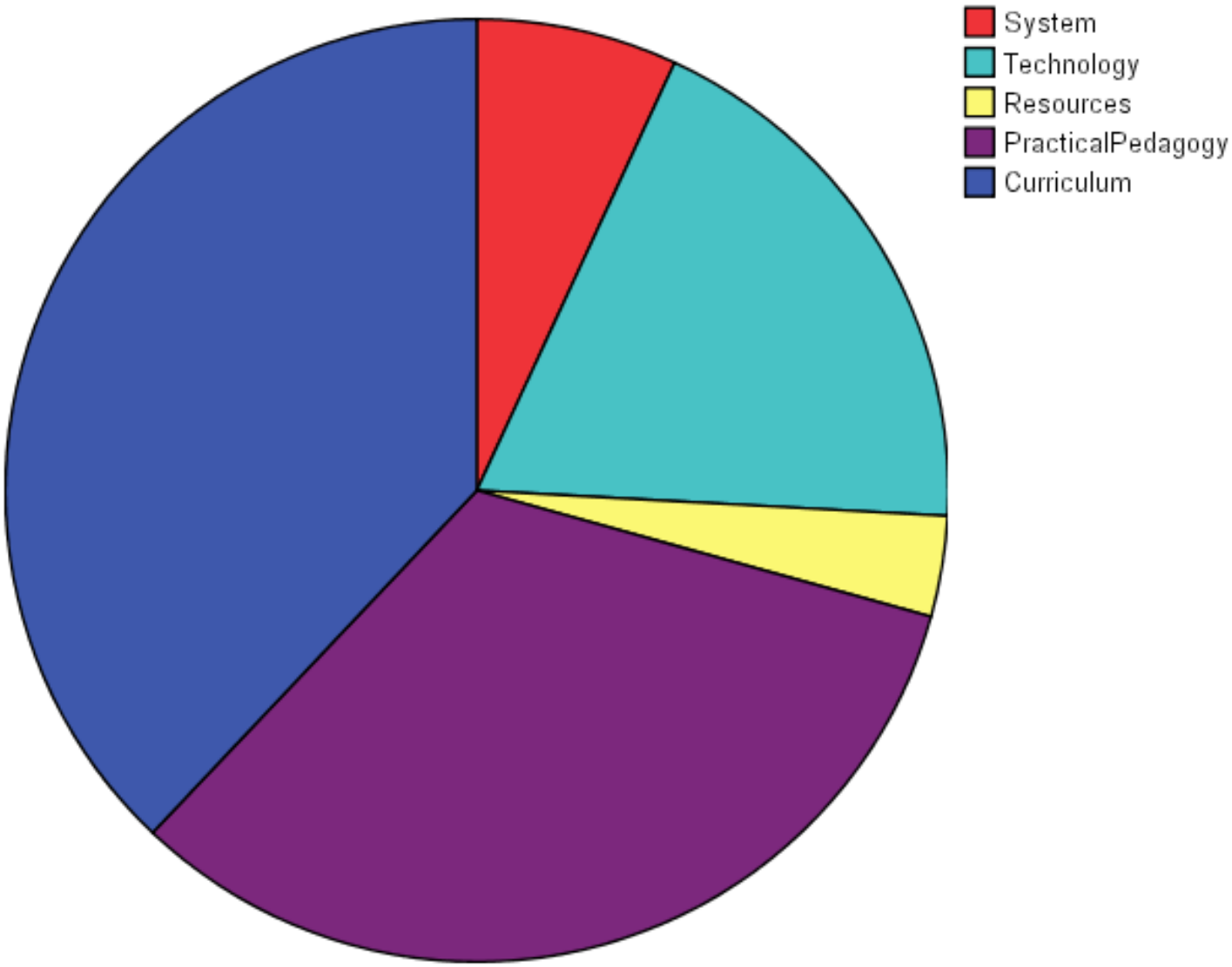
Total papers reviewed: 58

Other activities: posters, panel sessions

Paper length: 10 pages (max)

Volume reviewed: 6th (2005)

URL: portal.acm.org



Category	No. of Papers	% of Total
System	4	6.90
Technology	11	18.97
Resources	2	3.45
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	19	32.76
Curriculum	22	37.93
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	58	100.00

ELearn - World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education

Description

This is a very large annual international conference sponsored by the AACE, attracting over 1000 participants.

Scope

“The E-Learn conference series is about Blending. It is about a coming together or blending of ideas and experiences of the worldâ€™s leading researchers, developers, and practitioners from education, government, healthcare and business to all learn from and inform one another. Too often similar groups only associate with each other and, thus, continually exchange similar ideas.”

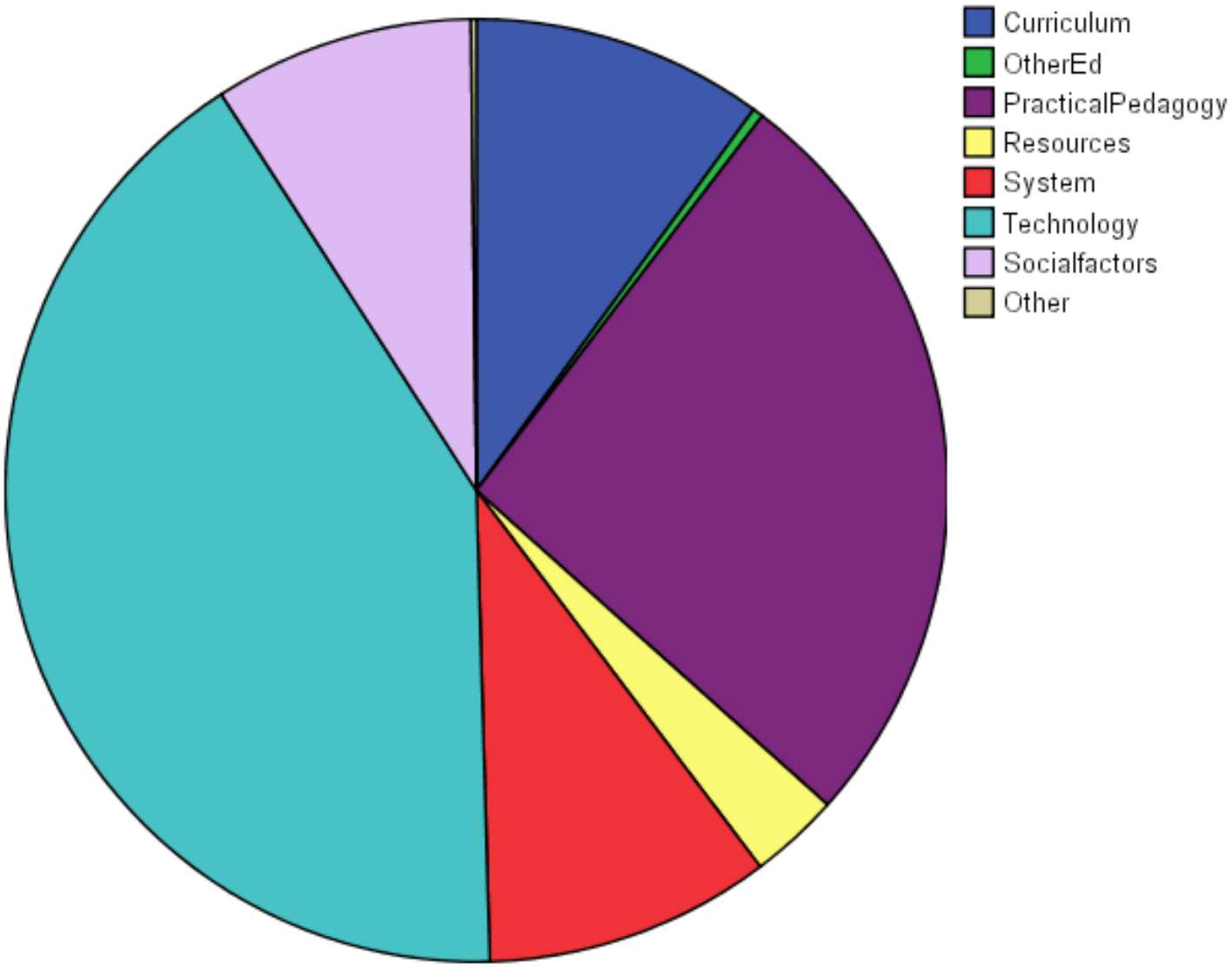
Total papers reviewed: 549

Other activities: panels,tutorials,roundtables

Paper length: 4-8 (full paper)

Volume reviewed: 2004

URL: www.aace.org/conf/elearn/



Category	No. of Papers	% of Total
System	54	9.84
Technology	227	41.35
Resources	17	3.10
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	144	26.23
Curriculum	55	10.02
Social Factors	49	8.93
Psychology	0	0.00
Other Educational	2	0.36
Other	1	0.18
Total	549	100.00

EDMEDIA - Educational Multimedia, Hypermedia and Telecommunications

Description

ED-MEDIA is a very large annual international conference held throughout the world (although most events have been in the US). The coverage of the conference is perhaps broader than the others listed in this booklet, and many of the papers relate to the use of IT in non-science disciplines.

Scope

ED-MEDIA “serves as a multi-disciplinary forum for the discussion and exchange of information on the research, development, and applications on all topics related to multimedia, hypermedia and telecommunications/distance education.

ED-MEDIA ... spans all disciplines and levels of education and annually attracts more than 1,500 leaders in the field from over 70 countries.

The scope of the conference includes, but is not limited to, the following major topics as they relate to the educational and developmental aspects of multimedia/hypermedia and telecommunications.

1. Infrastructure
2. Tools & Content-Oriented Applications
3. New Roles of the Instructor & Learner
4. Human-Computer Interaction (HCI/CHI)
5. Cases & Projects
6. Universal Web Accessibility
7. Indigenous Peoples & Technology”

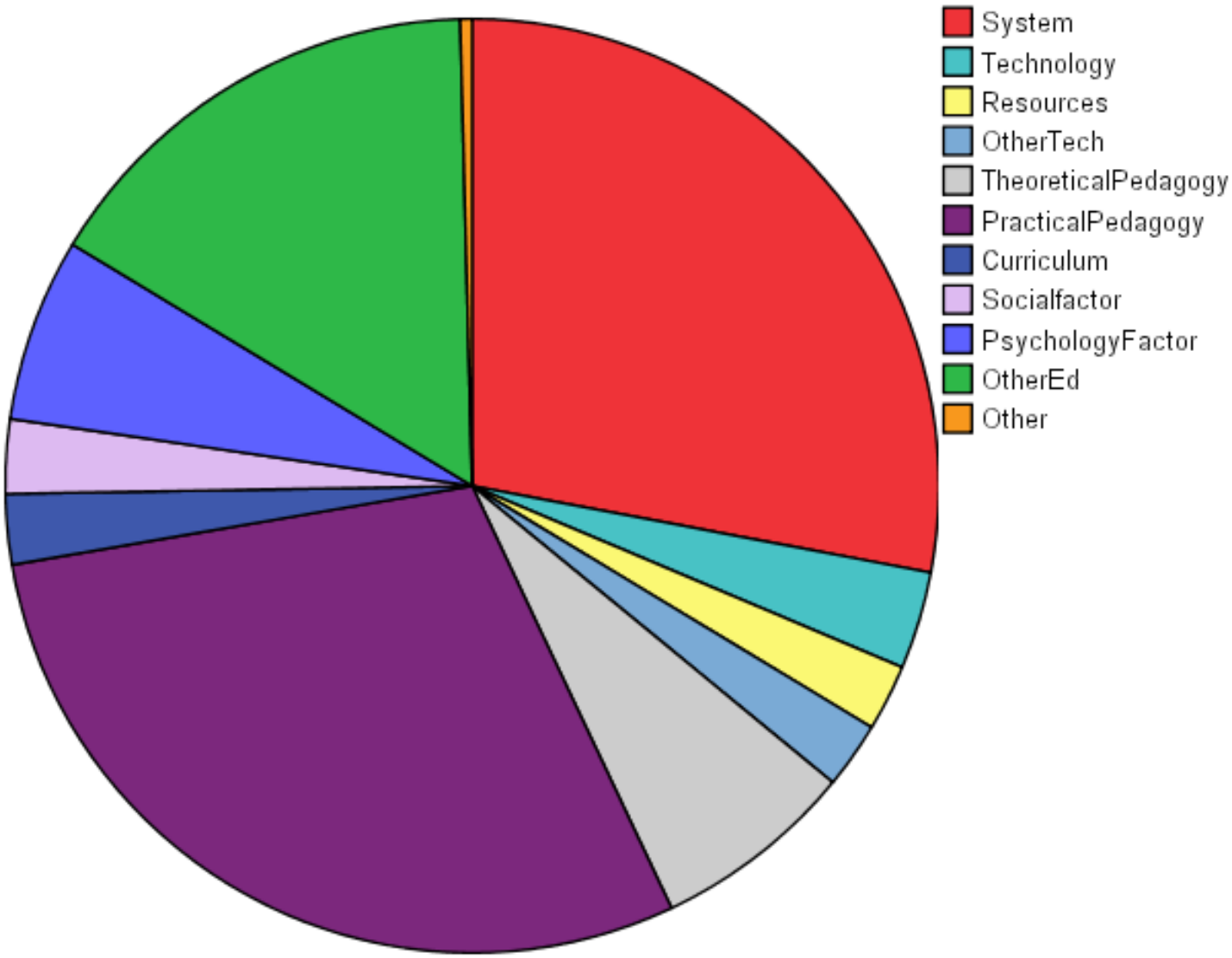
Total papers reviewed: 740

Other activities: posters, panels, tutorials

Paper length: 8 pages (max, full papers), 6 pages (max, short papers)

Volume reviewed: 17th (2005)

URL: www.aace.org/conf/edmedia/



Category	No. of Papers	% of Total
System	207	27.97
Technology	25	3.38
Resources	17	2.30
Other Technical	17	2.30
Theoretical Pedagogy	52	7.03
Practical Pedagogy	217	29.32
Curriculum	18	2.43
Social Factors	19	2.57
Psychology	47	6.35
Other Educational	118	15.95
Other	3	0.41
Total	740	100.00

FIE - IEEE Frontiers in Education Conference

Description

The IEEE FIE Conference has been running since 1971, and up to 400 papers are presented annually at venues in the US.

Scope

“The Frontiers in Education Conference ... promotes the widespread dissemination of innovations that improve computer science, engineering, and technology (CSET) education.”

Notes

Abstract available online.

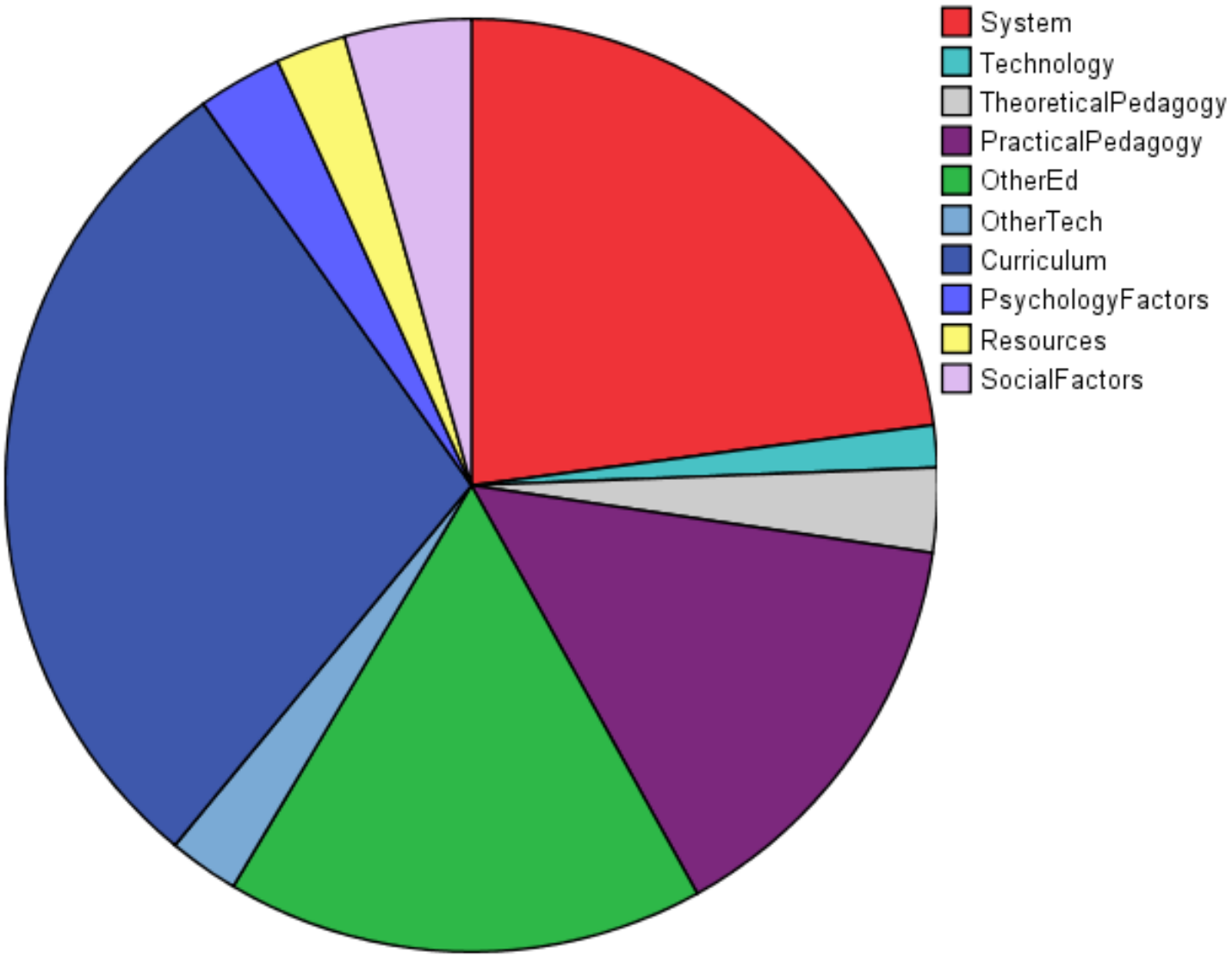
Total papers reviewed: 205

Other activities: panels, interactive sessions and workshops

Paper length: 6 pages (max, full papers), 2 pages (max, works in progress)

Ratio of submissions to acceptances: 58%

URL: www.fie-conference.org



Category	No. of Papers	% of Total
System	47	22.93
Technology	3	1.46
Resources	5	2.44
Other Technical	5	2.44
Theoretical Pedagogy	6	2.93
Practical Pedagogy	30	14.63
Curriculum	60	29.27
Social Factors	9	4.39
Psychology	6	2.93
Other Educational	34	16.59
Other	0	0.00
Total	205	100.00

HEA-ICS - Higher Education Academy Subject Network for ICS Conference

Description

The annual HEA-ICS conference is primarily a National event, although a minority of participants are from outside the UK.

Scope

“Key topics are:

- Emerging Technologies
- Virtual Learning and Teaching
- Evaluating teaching methods
- Quality Assurance and Subject Review
- Impact of technology on the curriculum
- Pedagogic Innovation
- Collaborative Learning
- Innovations in Information Science
- Evaluating the Effectiveness of ICT
- Open, distributed and lifelong learning
- Computer Assisted Assessment
- Multimedia/Interactive Learning
- Web Based Learning
- Managing Change”

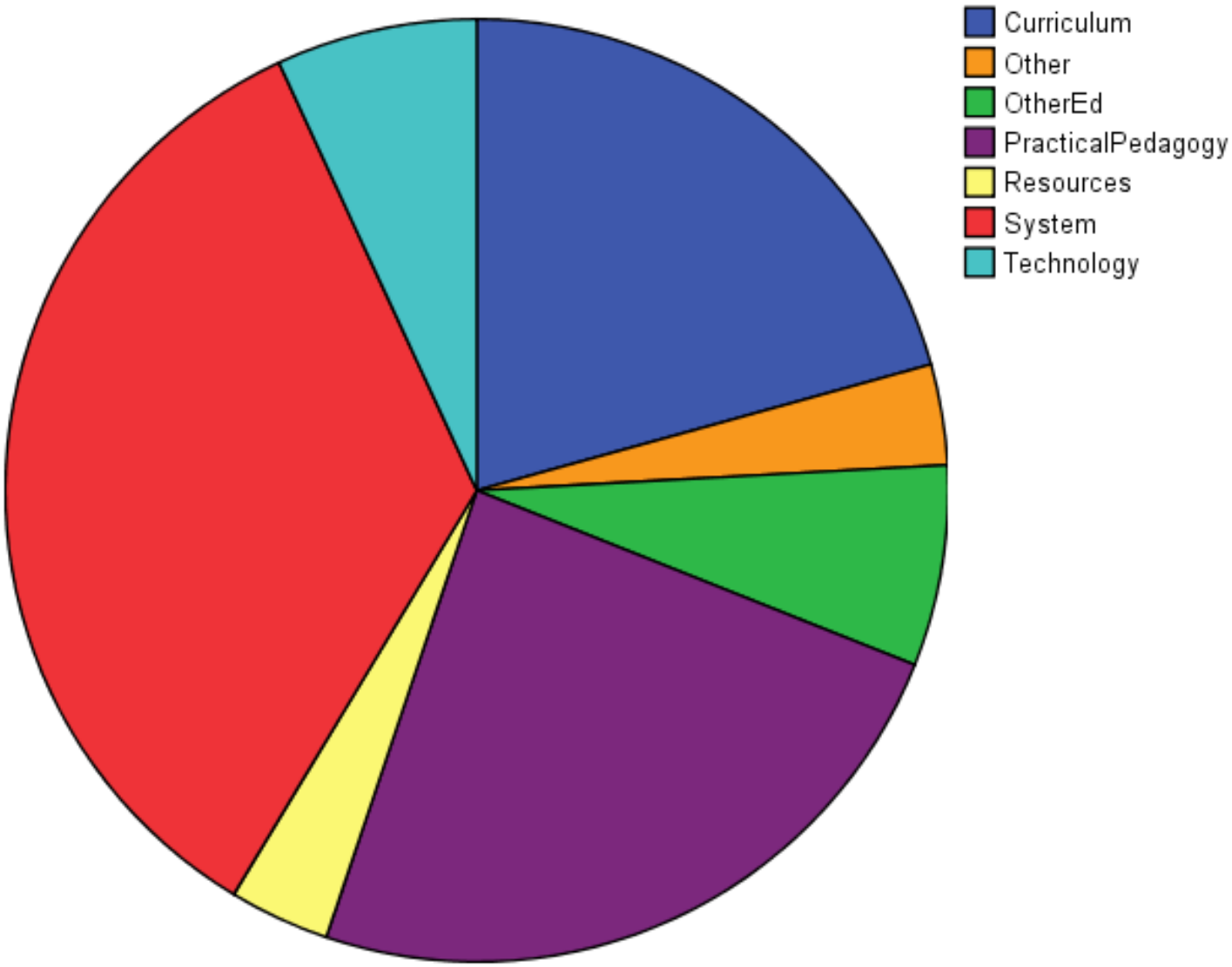
Total papers reviewed: 29

Other activities: posters

Paper length: 5 pages (max)

Volume reviewed: 6th (2005)

URL: www.ics.heacademy.ac.uk/Events/



Category	No. of Papers	% of Total
System	10	34.48
Technology	2	6.90
Resources	1	3.45
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	7	24.14
Curriculum	6	20.69
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	2	6.90
Other	1	3.45
Total	29	100.00

ICALT - IEEE International Conference on Advanced Learning Technologies

Description

IC-ALT is a relatively new annual international conference which already attracts a high number of paper submissions. Its location varies, but is normally in Europe.

Scope

“The conference will bring together people who are working on the design, development, use and evaluation of technologies that will be the foundation of the next generation of e-learning systems and technology-enhanced learning environments.”

Total papers reviewed: 216

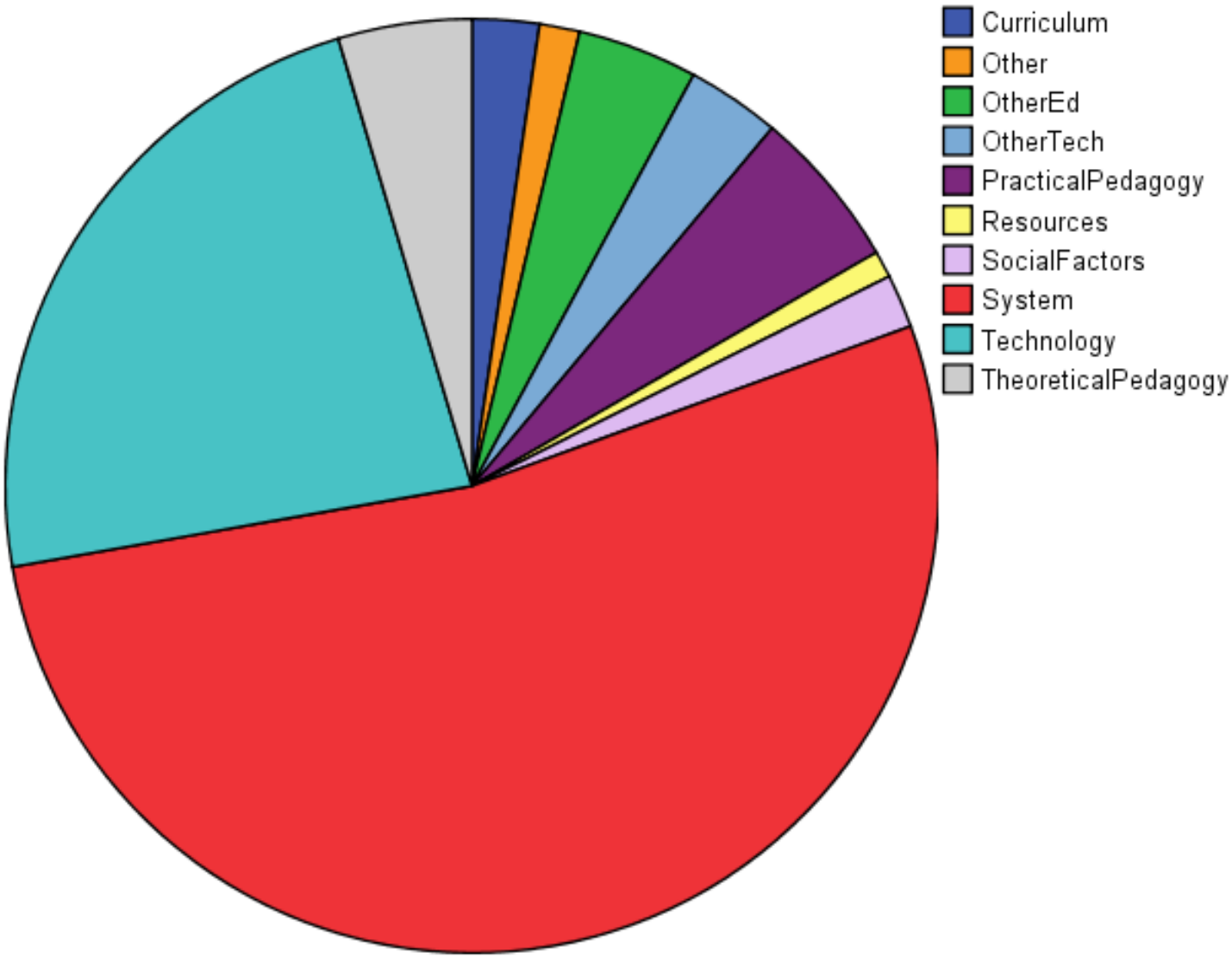
Other activities: posters, panels and workshops

Paper length: 5 pages (max)

Ratio of submissions to acceptances: 30.5%

Volume reviewed: 4th (2004)

URL: lttf.ieee.org



Category	No. of Papers	% of Total
System	114	52.78
Technology	50	23.15
Resources	2	0.93
Other Technical	7	3.24
Theoretical Pedagogy	10	4.63
Practical Pedagogy	12	5.56
Curriculum	5	2.31
Social Factors	4	1.85
Psychology	0	0.00
Other Educational	9	4.17
Other	3	1.39
Total	216	100.00

ICCE - International Conference on Computers in Education

Description

An annual conference sponsored by the Asia-Pacific Society for Computers in Education (APSCE), and held in East Asia or Australia in late autumn. The emphasis for each conference varies — the theme of the 2004 conference sampled here was HCI.

Scope

“ICCE conferences are widely regarded as the premier conference series on computers in education in the Asia-Pacific region … that set new standards of excellence for scientific research related to all aspects of technology enhanced learning and training. … We invite contributions on all topics related to computers in education, including technical, empirical, theoretical, social, and inter-disciplinary perspectives.”

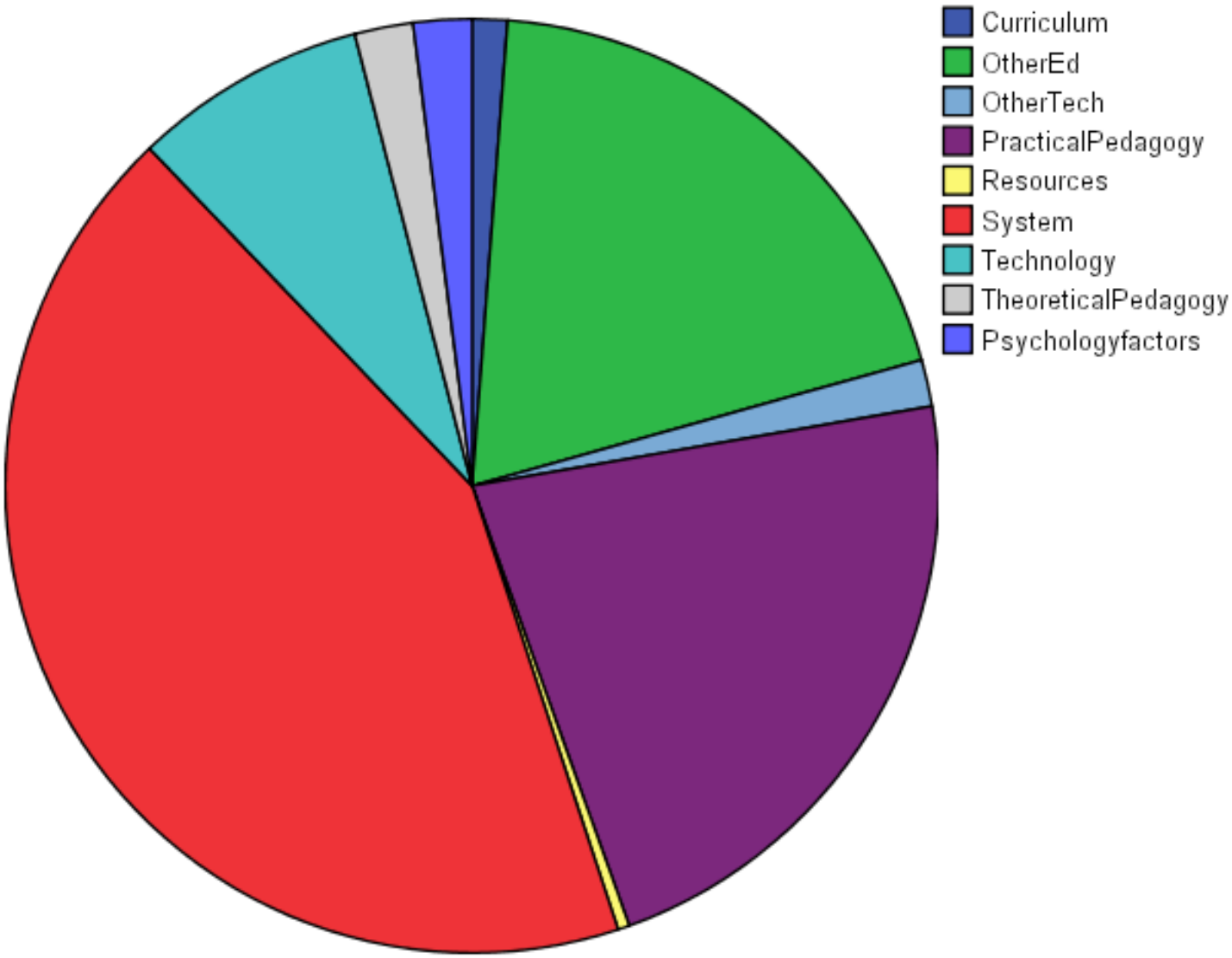
Total papers reviewed: 247

Other activities: doctoral consortium, panels, workshops, tutorials, posters

Paper length: 8 pages (max) (long papers), 4 pages (max) (short papers)

Volume reviewed: 12th (2004)

URL: www.apsce.net



Category	No. of Papers	% of Total
System	106	42.91
Technology	20	8.10
Resources	1	0.40
Other Technical	4	1.62
Theoretical Pedagogy	5	2.02
Practical Pedagogy	55	22.27
Curriculum	3	1.21
Social Factors	0	0.00
Psychology	5	2.02
Other Educational	48	19.43
Other	0	0.00
Total	247	100.00

ICER - International Computing Education Research Workshop

Description

This is a recent two-day international workshop series, which is at the moment relatively small.

Scope

“The International Computing Education Research (ICER) Workshop aims at gathering high-quality contributions to the computing education research discipline. Papers for the ICER workshop will be peer-reviewed and should, as appropriate, display:

- A clear theoretical basis, drawing on existing literature in computing education or related disciplines.
- A strong empirical basis, drawing on relevant research methods. Papers that re-interpret and explain others’ empirical results are welcome.
- An explication of the paper’s impact on, and contribution to, existing knowledge about computing education. ”

Notes

The URL changes annually - search the ACM portal for up-to-date info.

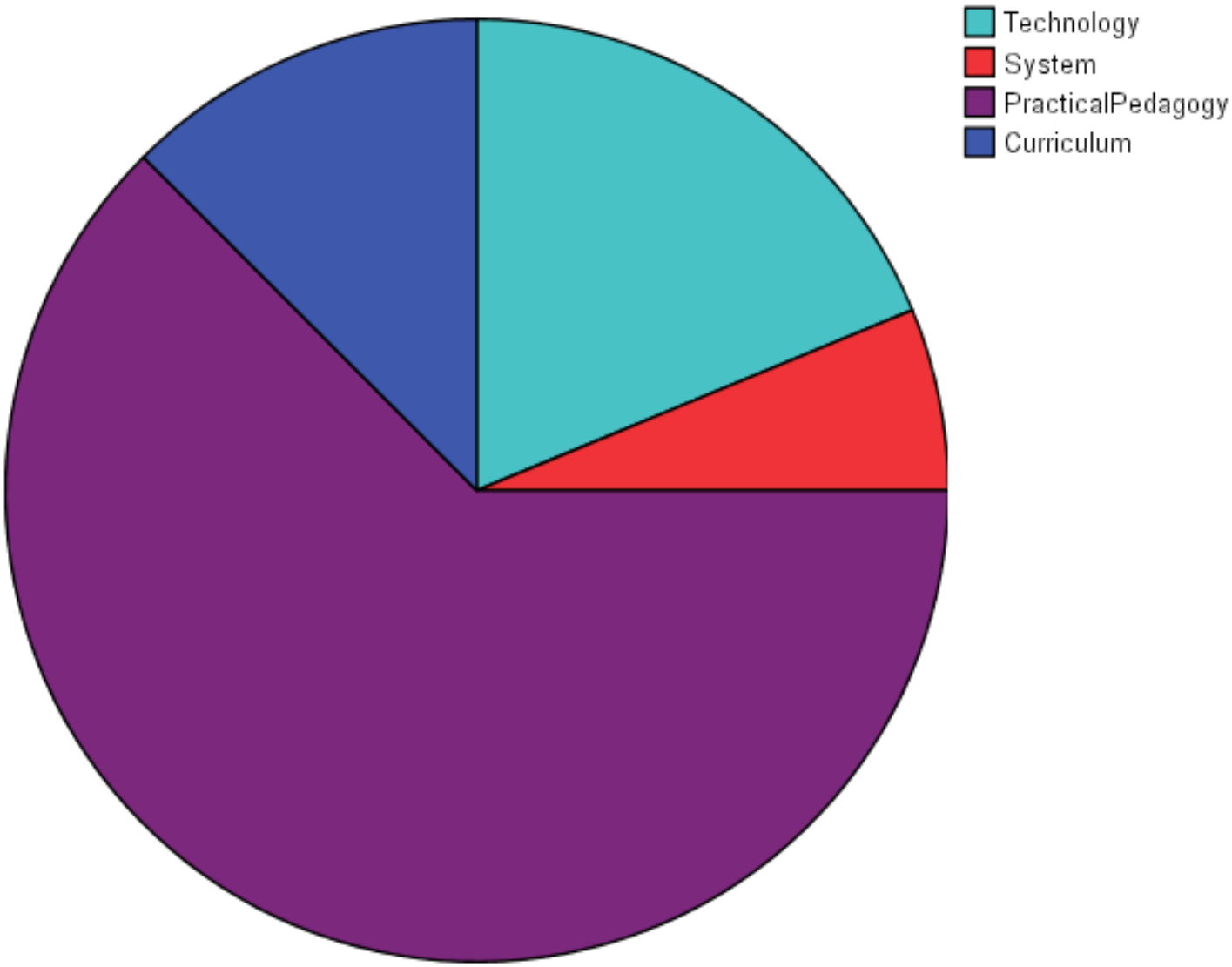
Total papers reviewed: 16

Other activities: no

Paper length: 12 pages (max)

Volume reviewed: 1st (2005)

URL: icer2005.cs.washington.edu



Category	No. of Papers	% of Total
System	1	6.25
Technology	3	18.75
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	10	62.50
Curriculum	2	12.50
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	16	100.00

ICET - IASTED International Conference on Education and Technology

Scope

“The primary objective of ICET is to act as a major forum for presenting the latest developments in the field of technology and education. It encourages the exchange of information and experiences between educators, researchers, students and policy makers.”

Notes

Due to unavailability of the published proceedings, the data used for this conference was from the online abstracts.

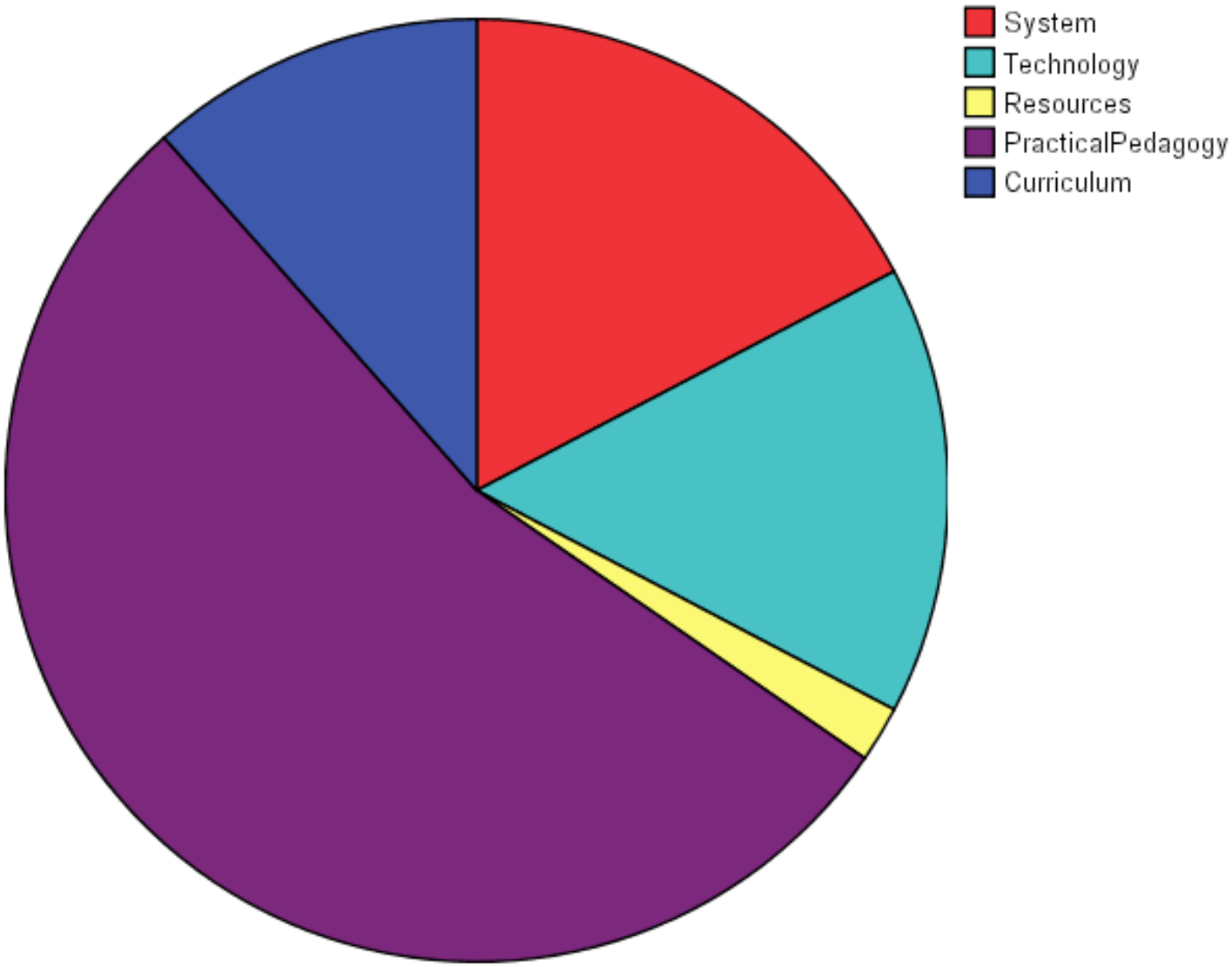
Total papers reviewed: 52

Other activities: posters

Paper length: 6 (max)

Volume reviewed: 2005

URL: www.iasted.org/conferences/



Category	No. of Papers	% of Total
System	9	17.31
Technology	8	15.38
Resources	1	1.92
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	28	53.85
Curriculum	6	11.54
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	52	100.00

ITHET - International Conference on IT Based HE and Training

Description

ITHET is an annual international conference co-sponsored by the IEEE Computer Society and by UNESCO.

Scope

“ITHET2005 aims to provide an environment for experts to discuss the current state of the art for learning both in industry and universities. Virtual environments, e-training, and e-learning will be topics of particular interest.”

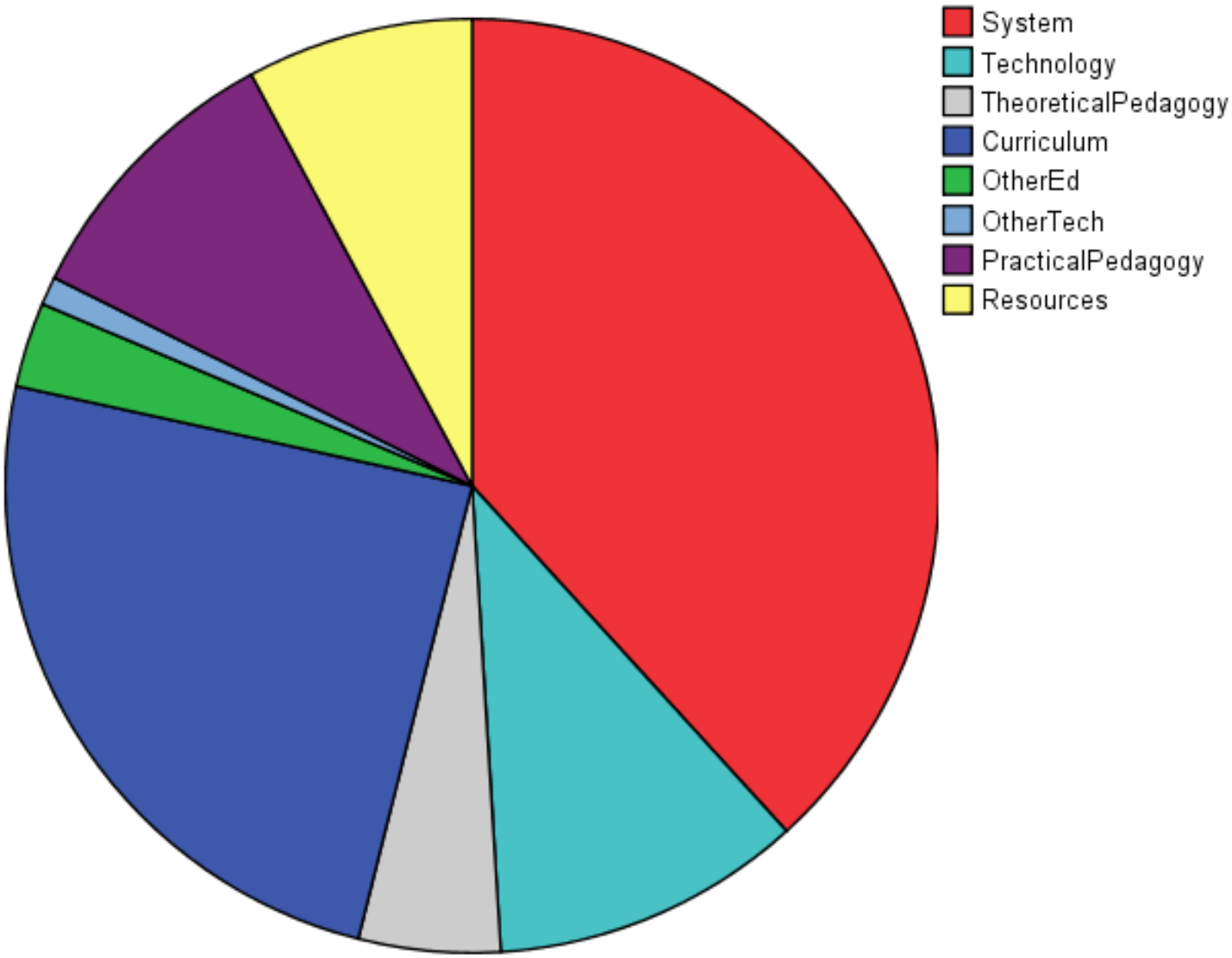
Total papers reviewed: 102

Other activities: workshops, panel sessions

Paper length: 6 pages (max, full paper)

Volume reviewed: 6th (2005)

URL: fie.engrng.pitt.edu



Category	No. of Papers	% of Total
System	39	38.24
Technology	11	10.78
Resources	8	7.84
Other Technical	1	0.98
Theoretical Pedagogy	5	4.90
Practical Pedagogy	10	9.80
Curriculum	25	24.51
Social Factors	0	0.00
Psychology	0	0.00
Other Educational	3	2.94
Other	0	0.00
Total	102	100.00

ITS - Intelligent Tutoring Systems

Description

This is a bienniel international conference series. Papers are reviewed by up to five referees. This may not be easy to obtain in the UK (although document supply from the British Library is possible).

Scope

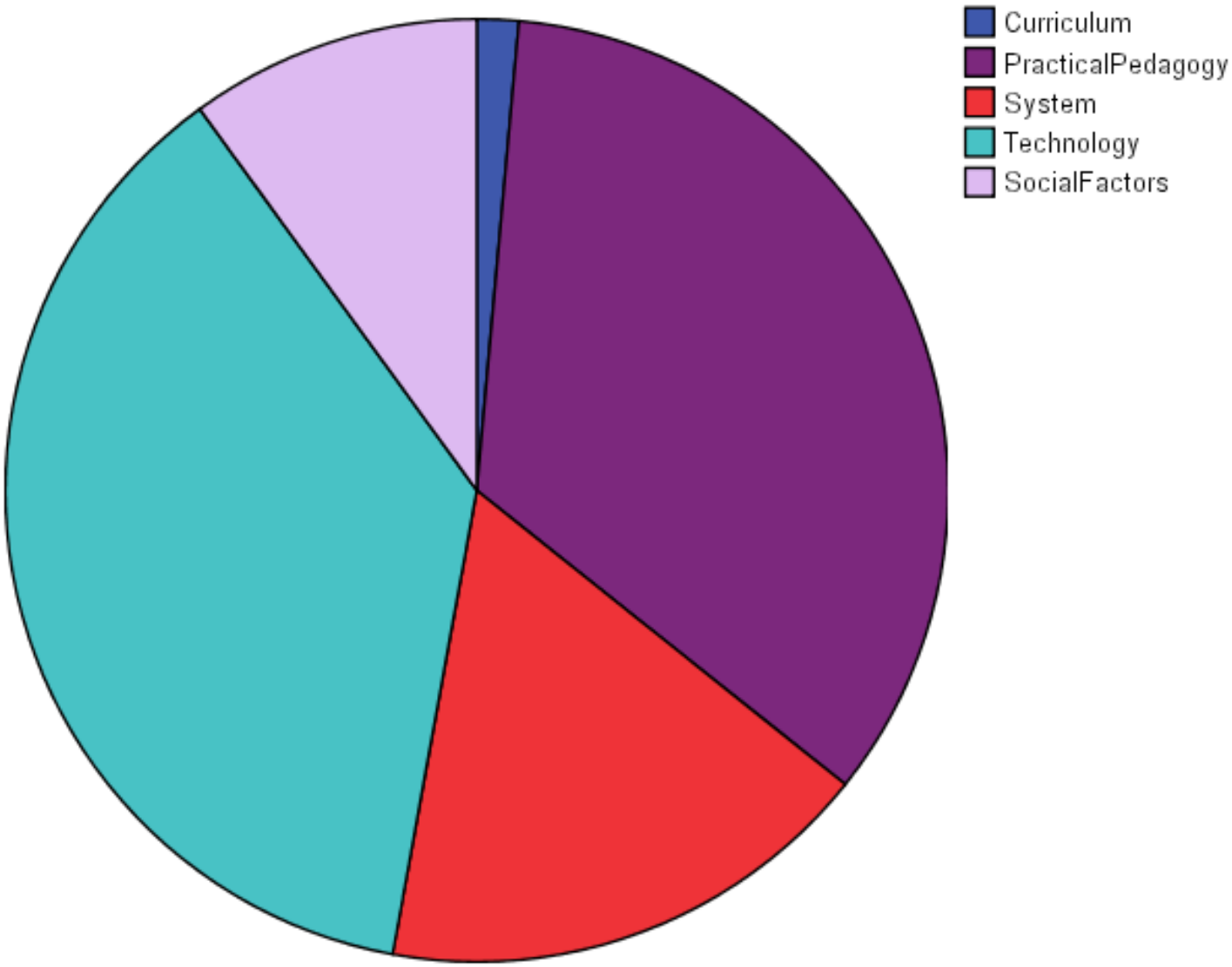
“The objective of these Conferences is to provide a forum for the interchange of ideas in all areas of Computer Science and Human Learning. It provides a unique environment in which researchers and practitioners in the fields of Computer Science and Human Learning can exchange ideas, theories, experiments, techniques, applications and evaluations of initiatives supporting new developments relevant for the future.”

Total papers reviewed: 70

Paper length: 5000 words (max)

Volume reviewed: 7 (2004)

URL: www.itsconference.org



Category	No. of Papers	% of Total
System	12	17.14
Technology	26	37.14
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	24	34.29
Curriculum	1	1.43
Social Factors	7	10.00
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	70	100.00

ITiCSE - Integrating Technology into Computer Science Education

Description

A large international conference sponsored by the ACM Special Interest Group in Computer Science Education, held annually somewhere in Europe, usually towards the end of June.

Scope

“ITiCSE traditionally accepts submissions on The use of technology in supporting computer science teaching and learning, The practice of teaching computer science, and Computer science education research and we welcome proposals in these areas within the theme.”

Notes

This conference is one of the major Computer Science Education conferences. It is held annually in Europe, and is popular with American delegates. However the timing (late June) can be awkward for UK academics.

The conference proceedings are published as a volume of *ACM SIGCSE Bulletin*.

Total papers reviewed: 68

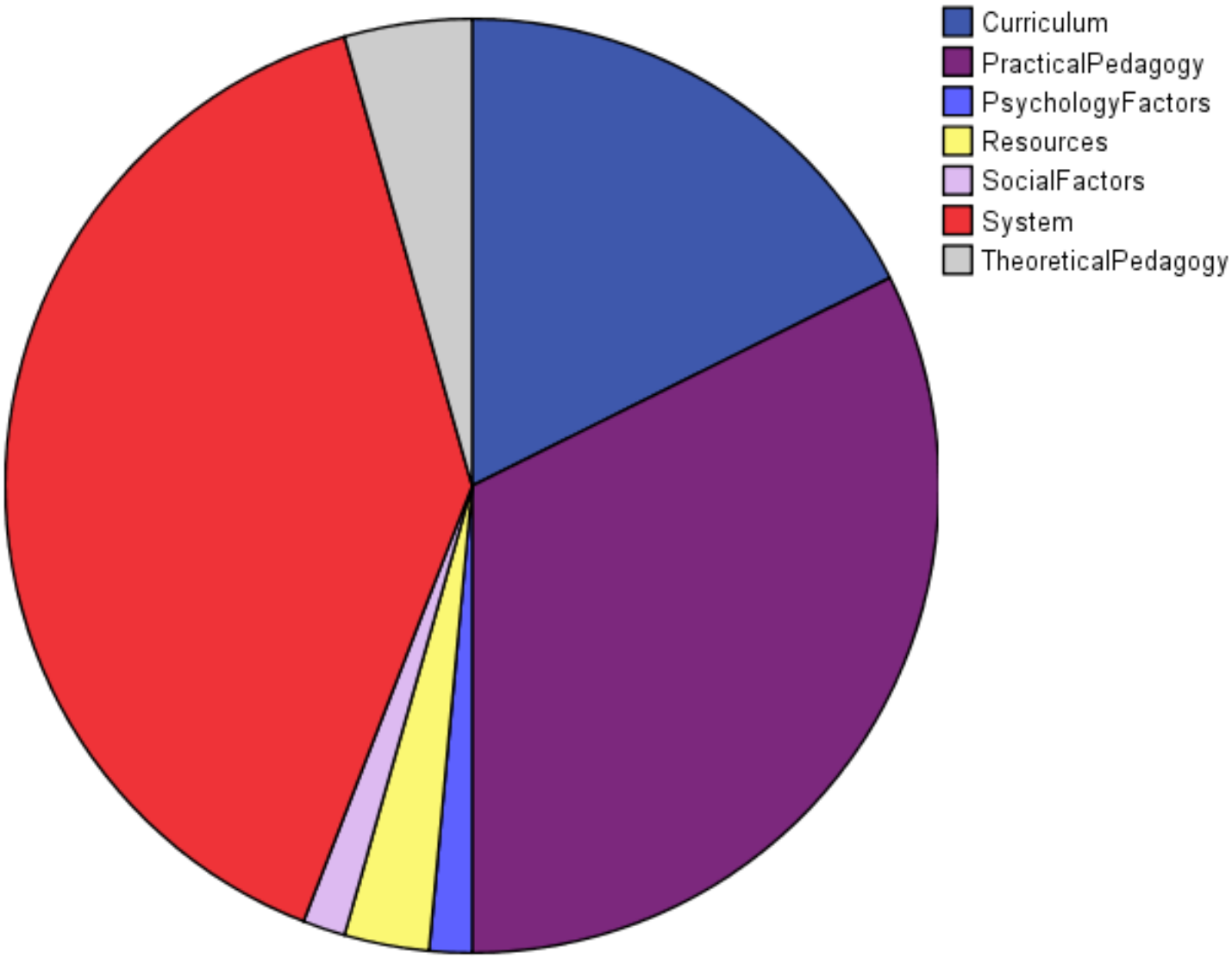
Other activities: posters, panels, tutorials

Paper length: 5 pages (max)

Ratio of submissions to acceptances: 34% (2003)

Volume reviewed: 10th (2005)

URL: portal.acm.org



Category	No. of Papers	% of Total
System	27	39.71
Technology	0	0.00
Resources	2	2.94
Other Technical	0	0.00
Theoretical Pedagogy	3	4.41
Practical Pedagogy	22	32.35
Curriculum	12	17.65
Social Factors	1	1.47
Psychology	1	1.47
Other Educational	0	0.00
Other	0	0.00
Total	68	100.00

Koli Calling - Baltic Sea Conference on Computing Education Research

Description

This is a small conference held in late autumn in Eastern Finland.

Scope

“Koli Calling conference aims to promote exchange of relevant research contributions and practical information between colleagues in the international community of Computing Education Research. Furthermore, Koli Calling aims to combine teaching and learning experiences with solid, theoretically anchored research orientation.”

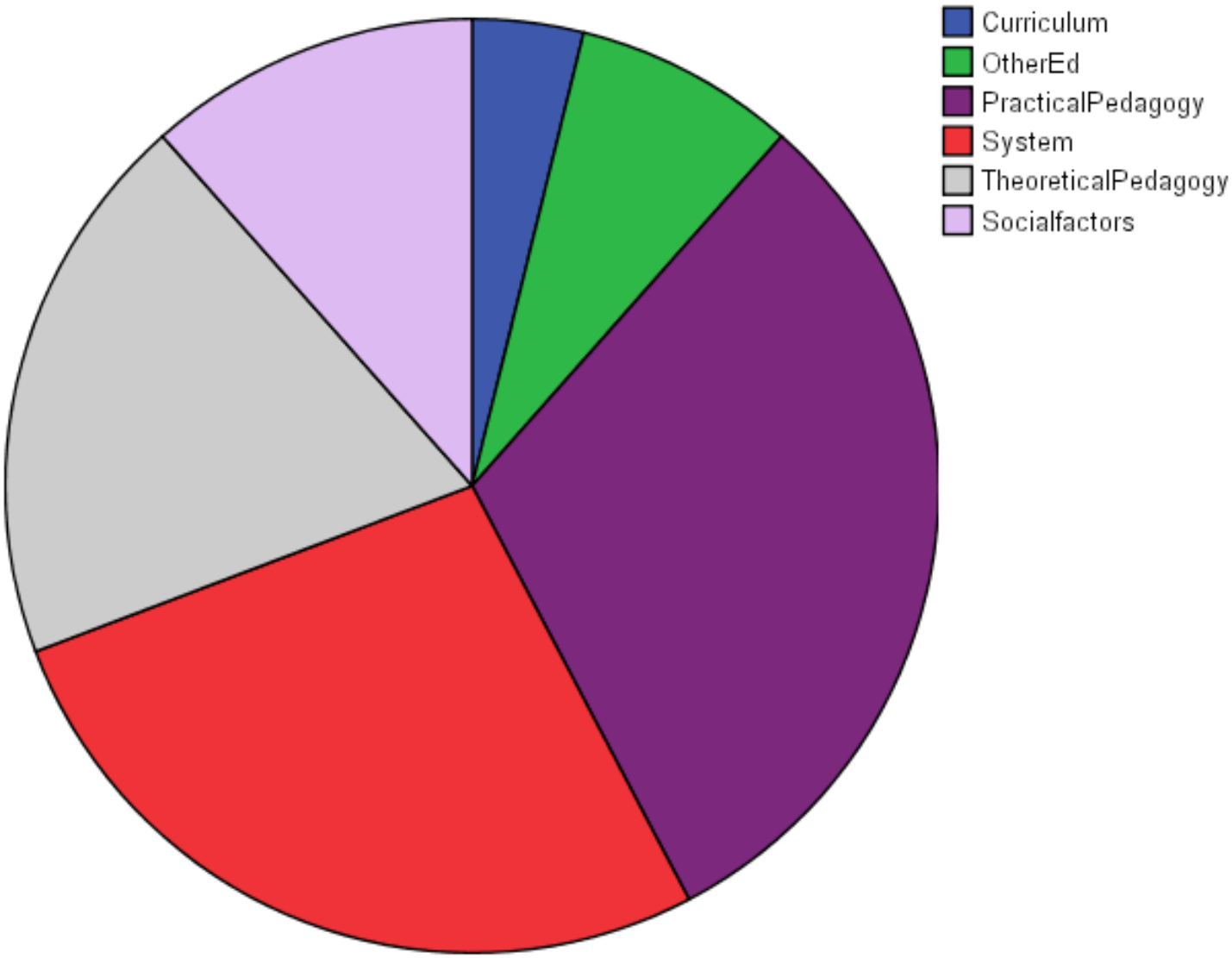
Total papers reviewed: 26

Other activities: posters

Paper length: 8 pages (max)

Volume reviewed: 5th (2005)

URL: cs.joensuu.fi/kolistelut/



Category	No. of Papers	% of Total
System	7	26.92
Technology	0	0.00
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	5	19.23
Practical Pedagogy	8	30.77
Curriculum	1	3.85
Social Factors	3	11.54
Psychology	0	0.00
Other Educational	2	7.69
Other	0	0.00
Total	26	100.00

MICTE - International Conference on Multimedia and ICTs in Education

Description

MICTE is a new biennial conference held in Spain. It has a wide range of international participants but is specifically aimed at building a forum in Spain so the conference venue is likely to be there each year. This is a large conference and a broad range of topics is addressed.

Scope

“MICTE means to promote a multi and inter-disciplinary approach to learning technologies so bringing together specialists from different areas of expertise is a major goal. Researches and professionals in many areas related to education often work disconnected so sharing knowledge and reflection in such a spread community formed by educational researchers, educational consultants, teachers, learning material developers, computer scientists, course managers and courser directors, e-learning-related company managers, programmers, etc. is needed to create new insights and to expand expertise.

This forum also seeks to promote developments in areas at the interface between Technology, Education and Sociology. By sharing experiences, m-ICTE2005 means to describe, on one hand, how governments, universities, schools, and other educational and training institutions are using ICTs in different countries and how these technologies are affecting educational, economical and industry-related fields of the society. On the other hand, m-ICTE2005 will discuss how national and supranational governments are developing strategies to promote the inclusion of ICTs in educational contexts, based on different vision of what future scenarios will be. m-ICTE2005 aims to cover a range of topics which involve agents with many different approach to ICTs in Education.”

Notes

The conference reviewed is from 2005 as MICTE was not held in 2004.

In addition to the papers categorised there were 36 papers (about 15%) which were unavailable on the website or were presented in Spanish.

Selected papers are invited for submission in revised/extended form with the possibility of journal publication.

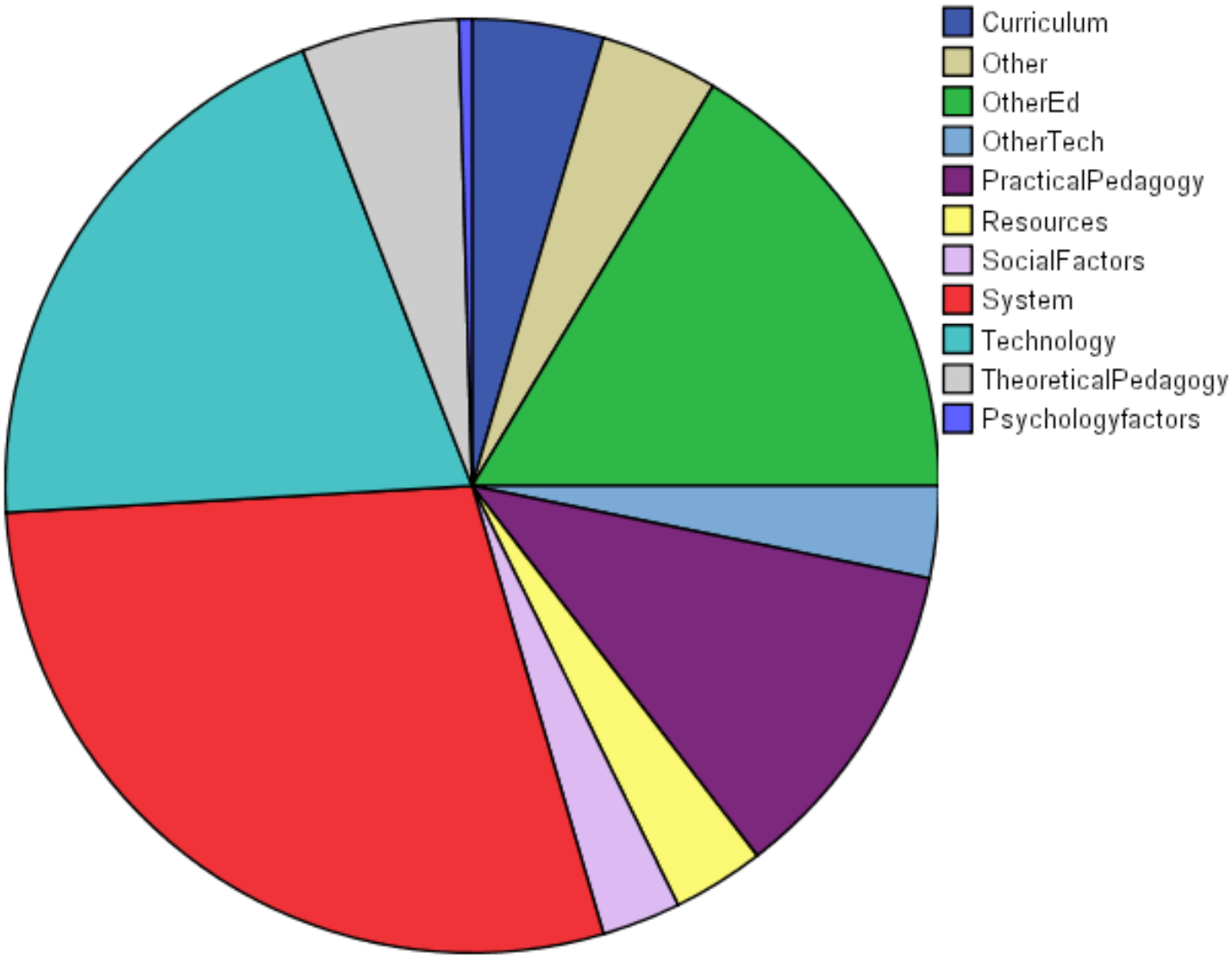
Total papers reviewed: 220

Other activities: posters

Paper length: 5 (max)

Volume reviewed: 3rd (2005)

URL: www.formatex.org/micte2005/



Category	No. of Papers	% of Total
System	63	28.64
Technology	44	20.00
Resources	7	3.18
Other Technical	7	3.18
Theoretical Pedagogy	12	5.45
Practical Pedagogy	25	11.36
Curriculum	10	4.55
Social Factors	6	2.73
Psychology	1	0.45
Other Educational	36	16.36
Other	9	4.09
Total	220	100.00

ML - IADIS International Conference on Mobile Learning

Description

This annual international conference is run by IADIS (www.iadis.org)), during early summer.

Scope

This conference “aims to provide a forum for presenting and discussing cutting edge mobile learning research. In particular empirical research informed by theories of learning such as collaborative, contextual, constructivist and constructionist approaches which are well suited for mobile learning experiences and scenarios, is encouraged. Furthermore, given the continuous developments in technology, the conference aims to generate speculative debate in relation to where the field may be going.”

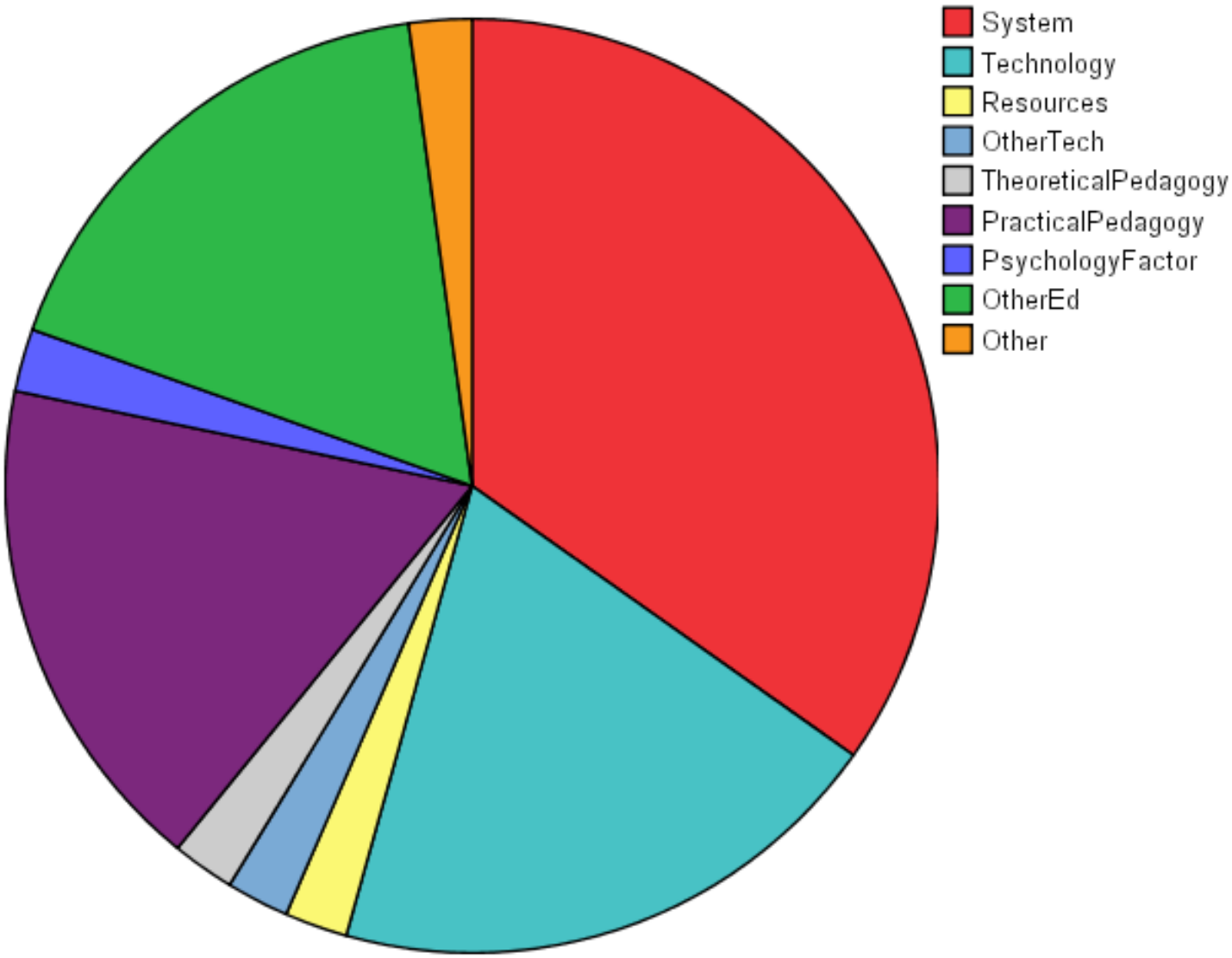
Total papers reviewed: 46

Other activities: posters, panels, tutorials, doctoral consortium

Paper length: 8 pages and 5,000 words (max)

Volume reviewed: 2005

URL: www.iadis.org



Category	No. of Papers	% of Total
System	16	34.78
Technology	9	19.57
Resources	1	2.17
Other Technical	1	2.17
Theoretical Pedagogy	1	2.17
Practical Pedagogy	8	17.39
Curriculum	0	0.00
Social Factors	0	0.00
Psychology	1	2.17
Other Educational	8	17.39
Other	1	2.17
Total	46	100.00

ML - Psychology of Programming Interest Group Annual Workshop

Description

The title of this workshop is self-explanatory. It is organised by PPIG, an informal group of academics interested in the psychology and philosophy of programming. Although predominately UK-based, the group and the workshop attract significant international participation.

Scope

“The annual PPIG workshop is a forum in which researchers concerned with psychological aspects of software development can present and discuss recent results, findings and developments. Despite its name PPIG entertains a broad spectrum of research approaches, from theoretical perspectives drawing on psychological theory to empirical perspectives grounded in real-world experience, and is equally concerned with all aspects of programming and software engineering, from the design of programming languages to communication issues in software teams, and from computing education to high-performance professional practice.”

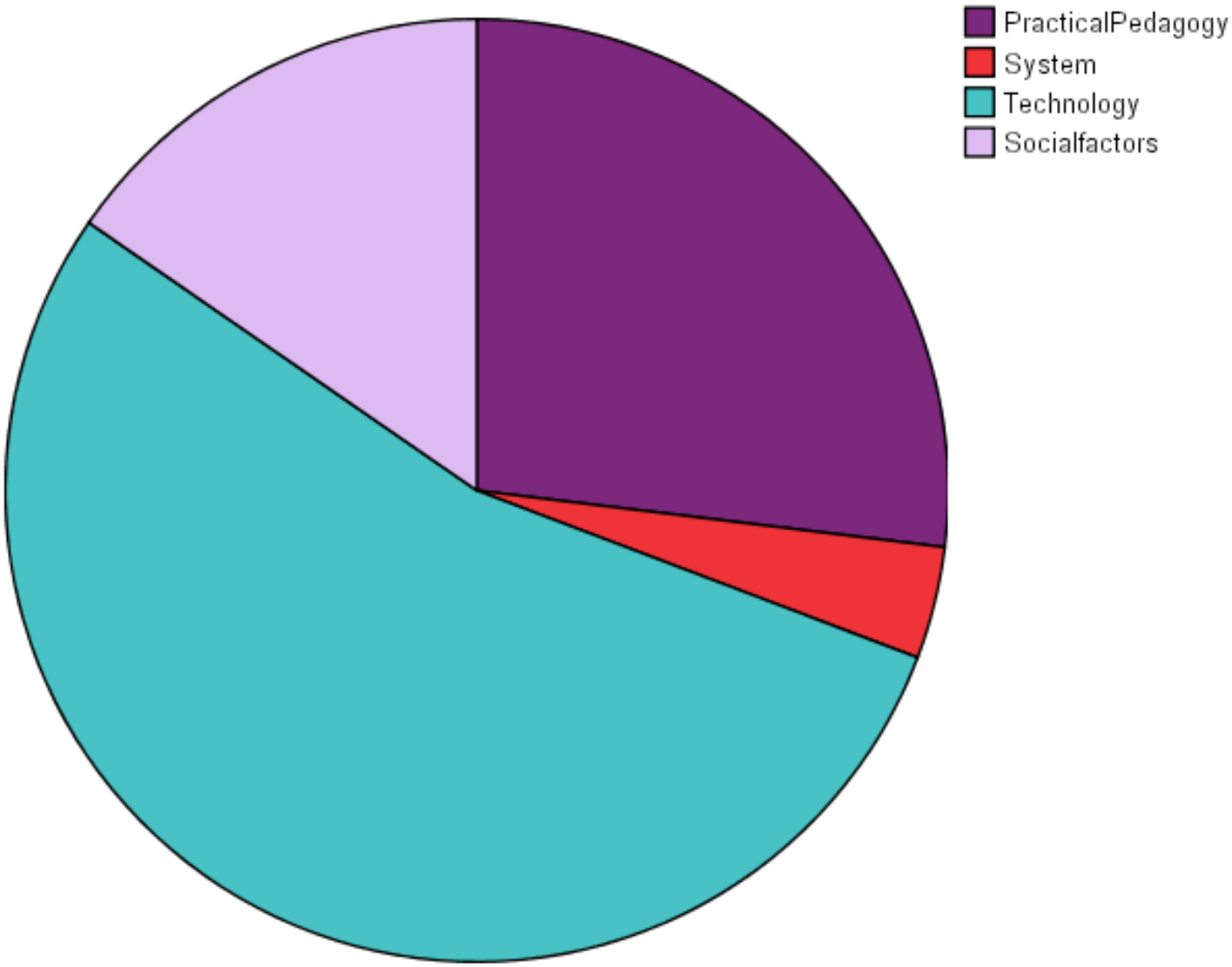
Total papers reviewed: 26

Other activities: no

Paper length: 15 pages (max)

Volume reviewed: 17th (2005)

URL: www.ppig.org/workshops



Category	No. of Papers	% of Total
System	1	3.85
Technology	14	53.85
Resources	0	0.00
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	7	26.92
Curriculum	0	0.00
Social Factors	4	15.38
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	26	100.00

TSCSE - ACM Technical Symposium on Computer Science Education

Description

The annual conference is held in the US, and has a similar focus to the ITiCSE conference which is held is Europe.

Scope

“This symposium addresses problems common among educators working to develop, implement and/or evaluate computing programs, curricula, and courses. In addition, the symposium provides a forum for sharing new ideas for syllabi, laboratories, and other elements of teaching and pedagogy, at all levels of instruction.”

Notes

This conference is held annually in the US, and has a similar focus to that of ITiCSE.

The conference proceedings are published as a volume of *ACM SIGCSE Bulletin*.

Total papers reviewed: 104

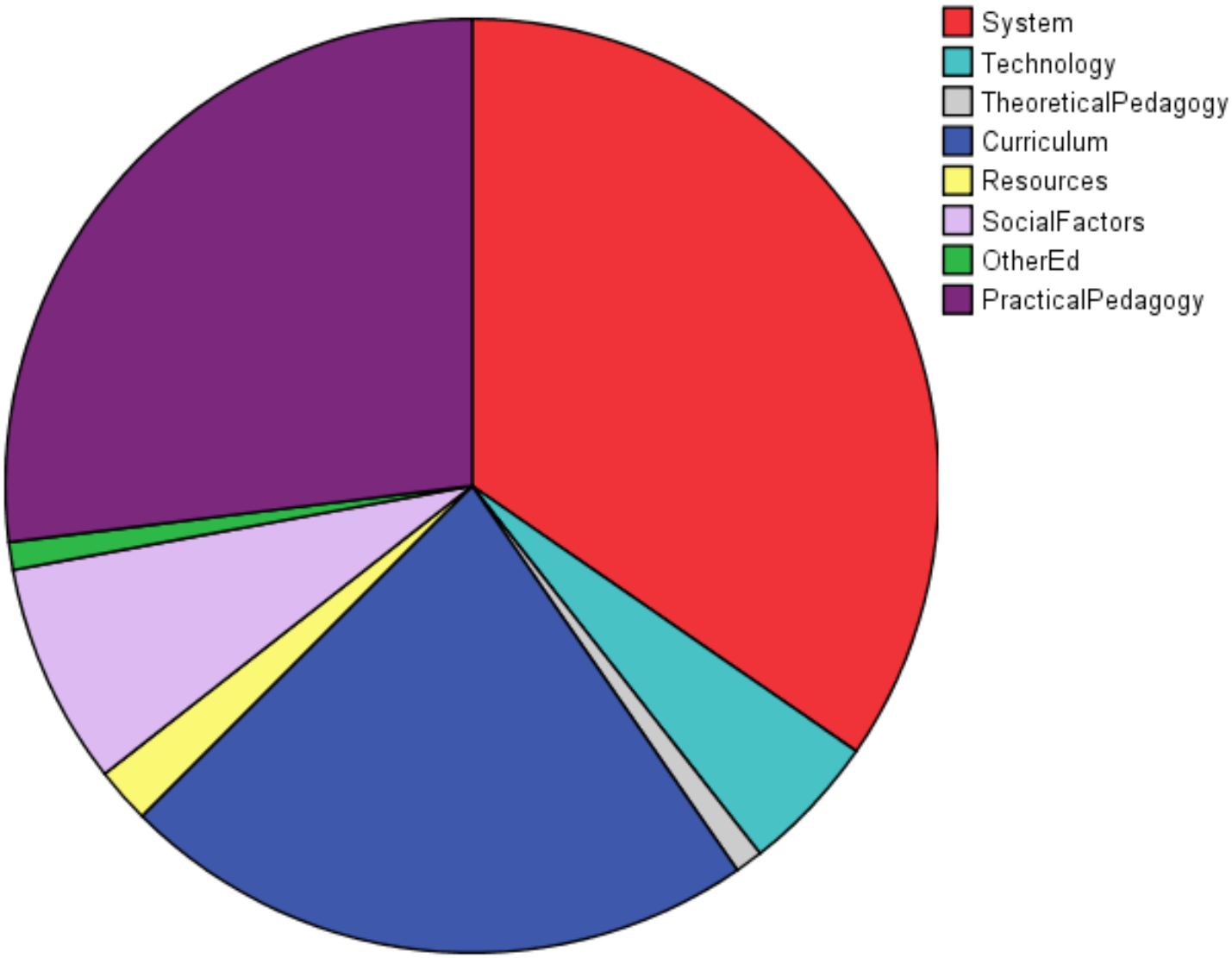
Other activities: posters, panels, workshops

Paper length: 5 pages (max)

Ratio of submissions to acceptances: 32% (2005)

Volume reviewed: 2005

URL: portal.acm.org



Category	No. of Papers	% of Total
System	36	34.62
Technology	5	4.81
Resources	2	1.92
Other Technical	0	0.00
Theoretical Pedagogy	1	0.96
Practical Pedagogy	28	26.92
Curriculum	23	22.12
Social Factors	8	7.69
Psychology	0	0.00
Other Educational	1	0.96
Other	0	0.00
Total	104	100.00

WBE - IASTED International Conference on Web-based Education

Description

This international conference is held annually in January.

Scope

“WBE is aimed to provide scholars, faculty, researchers, and administrators in all web-based educational areas with an excellent opportunity to convene with colleagues from approximately 50 countries and discuss innovative ideas, results and outcomes of research in this new and exciting field.”

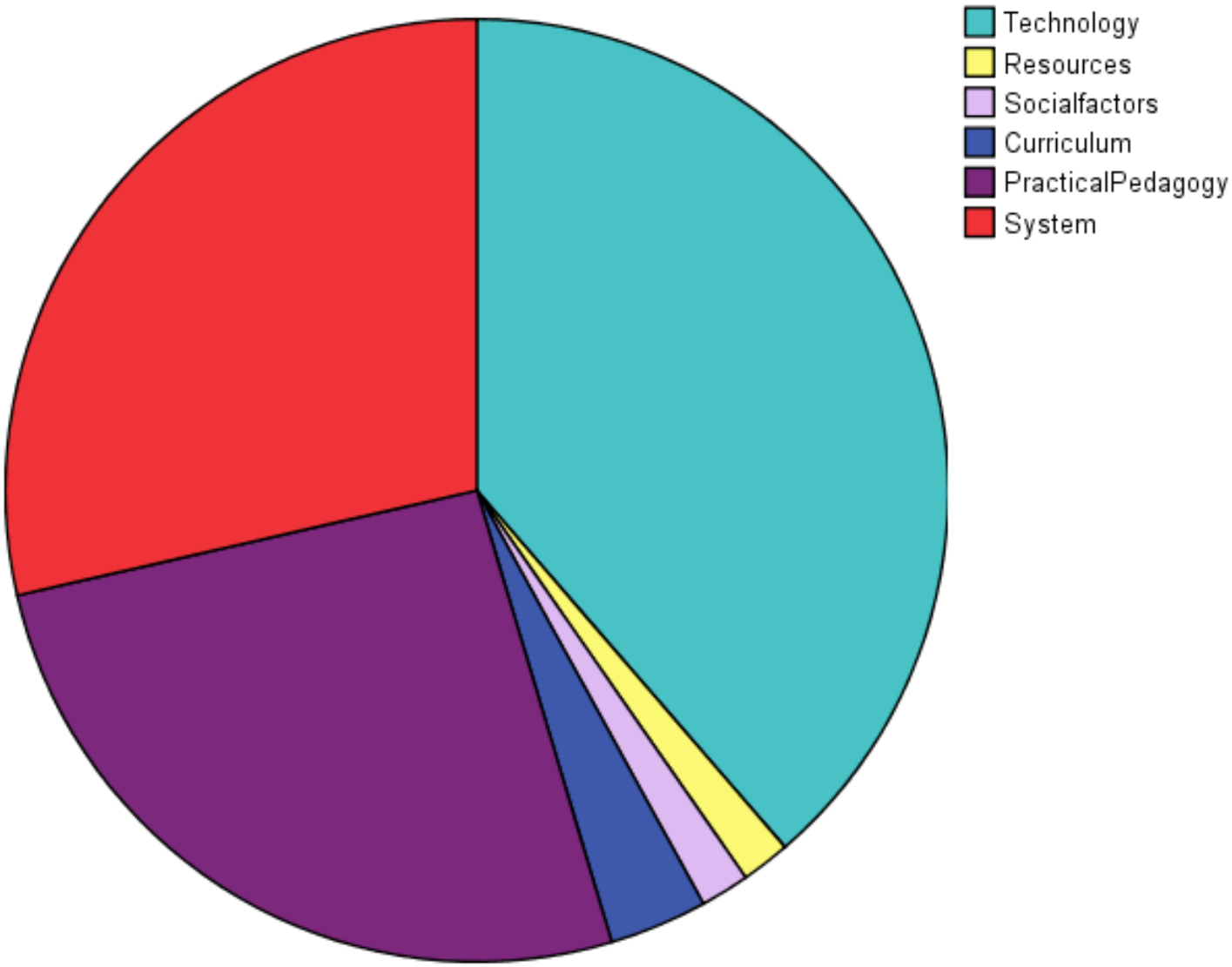
Total papers reviewed: 119

Other activities: tutorials

Paper length: 6 pages (max free), 10 pages (paid for)

Volume reviewed: 4th (2005)

URL: www.iasted.org/conferences/



Category	No. of Papers	% of Total
System	34	28.57
Technology	46	38.66
Resources	2	1.68
Other Technical	0	0.00
Theoretical Pedagogy	0	0.00
Practical Pedagogy	31	26.05
Curriculum	4	3.36
Social Factors	2	1.68
Psychology	0	0.00
Other Educational	0	0.00
Other	0	0.00
Total	119	100.00

Other Conferences

A number of conferences were originally considered for this survey, but were not included since there are issues with their scope or availability As for the section above on difficult to obtain conferences, we list them here with reasons for their exclusion from the booklet.

Adaptive Hypermedia and Adaptive Web-Based Systems

This is a biennial international conference, with proceedings published by Springer, but only one quarter (approximately) of the content is education-related.

Other Peripheral Conferences

The following were omitted since they had little relevance to both Computer Science and to Higher Education:

International Conference on Intelligent Data Engineering and Automated Learning

American Society for Engineering Education (ASEE) Annual Conference and Exposition

Annual ASEE Global Colloquium on Engineering Education

Further Reading

We hope that we have whetted your appetite for starting research in Computer Science Education. We have throughout suggested further places where you can find more detailed information, and these have been collated in the references at the end.

Sally Fincher and Marian Petre's recent book (2003) delivers a detailed overview of the issues involved in the discipline, together with discussions of particular topics within the field. This is required reading if you choose to take your research further.

A complementary guide has been produced by Norman Reid (2003) for the Higher Education Academy Subject Centre for Physical Sciences, and is well worth consulting, especially if your interest in computing relates to hardware or electronics.

The Higher Education Academy Subject Centre for Information and Computing Sciences will keep you informed of new resources, and of opportunities to disseminate your findings. Please visit our web site (www.ics.heacademy.ac.uk) and register.

Associations and Organisations

Conferences, workshops, and other events are often hosted by professional and academic bodies, who also offer resources which may help you in your research. The following are relevant to Computer Science Education.

The ACM Special Interest Group on Computer Science Education (ACM SIGCSE) (www.acm.org/sigcse/) is a US organisation which publishes a regular bulletin and sponsors the annual Technical Symposium and Integrating Technology into Computer Science Education conference.

The Association for the Advancement of Computing in Education (AACE) (www.aace.org) is a US organisation which publishes several journals, including the Journal of Interactive Learning Research (JILR), the Journal of Technology and Teacher Education (JTATE) and the International Journal on E-Learning (IJEL). It sponsors conferences, including the annual ED-MEDIA event. The organisation does not focus solely on Computer Science Education, and much of its activities relate to educational technology in schools.

The Society for Information Technology and Teacher Education (SITE) (www.aace.org/site/) is an "international association of individual teacher educators … who are interested in the creation and dissemination of knowledge about the use of information technology in teacher education and faculty/ staff development." In conjunction with the AACE it publishes the Journal of Technology and Teacher Education (JTATE)

The International Society for Technology in Education (ISTE) (www.iste.org) is a US based organisation which focuses on the use of technology in schools. It claims worldwide membership, but the scope of its activities is essentially restricted to the US.

The American Society for Engineering Education (ASEE) (www.asee.org) is an international organisation which publishes the IEEE Transactions on Education and sponsors the annual Frontiers in Education (FIE) conference.

The IEEE Education Society (www.ewh.ieee.org/soc/es/) is an international organisation which publishes the IEEE Transactions on Education and sponsors the annual Frontiers in Education (FIE) conference.

The Staff and Educational Development Association (SEDA) (www.seda.ac.uk) is a UK membership-based organisation which, in addition to organising events throughout the UK, publishes extensively on subjects related to teaching in HE. Although its focus is principally educational, subject based research is also of interest.

The Psychology of Programming Interest Group (PPIG) (www.ppig.org) is an informal European based society which organises an annual workshop and bi-annual newsletters. The society's focus includes both psychological aspects of programming and computational aspects of psychology.

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Acknowledgements

We would like to thank many colleagues who have offered ideas and suggestions, and in particular the contributions (in alphabetical order) of Martin Campbell-Kelly, Justus Randolph, Bob Soloman, and Jarkko Suhonen.