Exploring teachers’ perceptions of their pedagogical role with computers: a case study in Malaysia

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Abstract

This study explores teachers’ perceptions of their pedagogical role when conducting science laboratory sessions with computers. Participants in this study were science teachers from 42 randomly selected secondary schools in the state of Negeri Sembilan, Malaysia. The data from 209 teachers (148 females and 61 males) were used for data analysis. There were twelve items in the questionnaire, six items related to the student-centred pedagogical role while the other six related to the teacher-centred pedagogical role. The findings of the study suggest that teachers perceive their pedagogical role as being more student-centred in the science laboratories. Although the results of this study indicate that teachers have assumed the student-centred pedagogical role, they also suggest that teachers are only moderately ready to use this approach in their instruction of science laboratory sessions when computers are available.

Keywords: Computers in education; pedagogical issues; teaching/learning strategies.

1. Introduction

The Malaysian Ministry of Education has always emphasised on the use and integration of information and communication technology (ICT) in the learning environment. The recent nationwide implementation of the teaching of science and technology related subjects in all levels of schools utilising the digital classroom environment was carried out to expedite the implementation of a technology-supported education system in Malaysia. This move was also seen as crucial to fulfil the need for an ICT literate and knowledge-based society in Malaysia.

The implementation of the digital class environment emphasises technology-supported teaching practices; it also signals the need to change the pedagogical approach of teaching practices from being teacher centred to being student centred. With such a scenario, the teachers in Malaysia must shift the current focus on how the instructional
process is being practised. They, too, must make an appropriate adjustment to the traditional mode of teaching when they are in a technology-rich environment (Wang, 2002a).

Norum, Grabinger and Duffield (1999) stressed that teachers have to move away from the “stand and deliver” teaching methods as the technology fosters the use of more student-centred teaching strategies. The teacher’s role changes from that of being the sole authority of information and knowledge dissemination to the role of facilitator of knowledge construction (Rakes, 1996) and from a “sage on the stage” to “a guide at the side” (Cifuentes, 1997). Accordingly, the student’s role shifts from that of being a passive to an active learner (Hirumi, 2002) and from being a dependent to an independent learner (Coombs and Wong, 2000). Students are expected to be creative and critical thinkers and be active players with teamwork skills (Coombs & Wong, 2000). Teachers are accordingly expected to gear their teaching approach towards one which emphasises collaborative learning, inquiry-based learning and instruction that fosters problem solving and critical thinking.

2. Related Research

With the proliferation of IT and computer assisted instruction especially in Malaysian schools, teachers need to ensure that they acquire and develop adequate knowledge and skills to utilise computers as effective tools in their teaching practices. Wang (2002a) stressed that equally important is the need for teachers to deal with the psychological effect of using computer technologies. In other words, teachers need to have appropriate perceptions of their roles when teaching with computers. Teachers are most likely to use the computer for instruction when they are fully and personally convinced of its benefits (Lam, 2000). Cope and Ward (2002) further suggested that teachers’ perceptions of learning technologies are likely to be crucial in the successful integration of learning technologies. Based on this premise, teachers who perceive learning as the accumulation of information (Prosser & Trigwell, 1999) will be more likely to utilise the teacher centred approach where they direct the learning process and control students’ activities in the classroom (Hirumi, 2002). The teachers impart whatever knowledge and skills that they have to their students and become the sole authority in the classroom. On the contrary, teachers who view teaching as a process of conceptual change are more likely to utilise the student-centred teaching approach (Prosser & Trigwell, 1999). This approach engages students in authentic classroom activities that assist in the process of exploration and the discovery of new knowledge and skills.

Teachers need to perceive that the instructional process in the technology-assisted classroom is part of a student-centred teaching approach targeted to achieve desirable and positive learning outcomes (Cope & Ward, 2002). Research has shown that computer-assisted classrooms complement the student-centred teaching approach in many ways. For example, Neo and Neo (2001 & 2002) found that students who used an authoring tool to build a multimedia courseware were able to construct their own knowledge by building on their prior experiences. The students also learned to be creative and critical thinkers as they worked entirely on their own from developing storyboards to packaging multimedia courseware. Students had to generate novel ideas throughout these processes by combining, changing and reapplying existing ideas to nurture effective creative thinking (Harris, 1998). Robin and Harris (1998) discovered that computer technology, with its ability to access, store, manipulate and analyse information, can be used as a tool to assist in the student-centred learning environment. Students will then spend less time gathering information and more time reflecting on the objectives they have set (Robin & Harris, 1998).

Wessel (2000), however, stressed that constructivist and student centred learning environments are not solely dependent on the existence of computers in the classrooms. Wang (2002a) noted that “…teachers’ perceptions of their role in digital learning environments are most likely influenced by their fundamental beliefs and perceptions about teaching and learning regardless of technology” (p. 259). In Wang’s (2000a) investigation, she found that pre-service teachers did not perceive their roles differently in terms of teacher-centredness and student-centredness when placed in classrooms equipped with computers.

The literature suggests to an extent that the use and integration of computer technologies into the teaching-learning process are changing the pedagogical role of teachers. At the same time it must be recognised that computers alone will not create student centred learning environments. The literature further indicates that teachers’ perceptions of learning technologies play a vital role in effective teaching practices. With these assumptions in mind, the present study was conducted to investigate teacher’s perceptions of their pedagogical role when teaching with computers.
3. Methodology

Participants in this study were science teachers from 42 randomly selected secondary schools in the state of Negeri Sembilan, Malaysia. A total of 252 teachers participated in this study. Out of these, the data from 209 teachers (148 females and 61 males) were complete and used in this study. Their ages ranged from 23 to 53 years old (M= 35.99; S.D.= 7.33). Their average computer experience in school were 2.71 years (S.D.= 1.79) while their average teaching experience was 8.87 years (S.D.= 6.99).

The instrument used was adapted from Bichelmeyer, Reinhard and Monson (1998). The adapted instrument measured the perception of the teachers’ pedagogical role in the science laboratory when computers were used. There were twelve items in the questionnaire, six items related to the student-centred pedagogical role while the other six related to the teacher-centred pedagogical role. Each item was accompanied by two sets of the five-point Likert scale, ranging from “strongly disagree (1)” to “strongly agree (5)”. The questionnaires were posted together with self-addressed envelopes to respective schools. The Cronbach alpha recorded for the actual study for section A was .83. This indicated good internal consistency.

4. Results

Table 1 shows the items related to teachers’ perceptions toward their pedagogical role when computers were used in science laboratory for instruction. The two items with the highest means scores were student centred in nature. Item 12 - Ensure students understand science concepts had the highest mean score (4.15) while the next highest mean score (3.79) was item 10- Guide students in informing hypothesis before carrying out experiments. The high mean score of item 12 indicates that teachers in a computer-assisted learning environment, put in effort to ensure that students understood the science concepts instead of providing them with information and students accordingly memorising the information given. At the same time, the second highest mean score of item 10 suggests that teachers perceived the computer as a tool to assist students in the process of forming hypothesis on various laboratories experiments. This perception is consistent with the preferred student-centred pedagogical role in computer-assisted classroom. The lowest mean score recorded was item 7 - State variables that will be studied during the experiment and item 11- Ensure students memorise science concepts. Both items recorded a mean score of 3.12 and both are teacher-centred items. This indicates the teachers perceived unfavourably towards the teacher-centred instructional approach in the learning environment with the presence of computers.

A paired sample t-tests was conducted and tested at the 0.05 significance level to investigate if there was a significant difference between the perceptions of the teacher-centred pedagogical role with those of the student-centred pedagogical role. The t-test analysis revealed a statistically significant difference between the mean scores of the student-centered pedagogical role (M= 21.97; S.D. =3.54) with that of the teacher-centered pedagogical role (M= 19.24; S.D. =4.89), t(208) =-8.159, P < .0005 with a higher mean recorded for the former.

<table>
<thead>
<tr>
<th>Items</th>
<th>With the use of computers</th>
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<tbody>
<tr>
<td>1. Provide the main directing force in the science laboratory.</td>
<td>3.20 S.D. 1.11</td>
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<tr>
<td>2. Keep order in the science laboratory.</td>
<td>3.26 S.D. 1.07</td>
</tr>
<tr>
<td>3. Guide students to identify variables during experiments.</td>
<td>3.78 S.D. 0.92</td>
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<td>4. Involve students’ views when evaluating students’ work.</td>
<td>3.74 S.D. 0.84</td>
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<td>5. Direct teacher’s attention to the class as a whole.</td>
<td>3.31 S.D. 1.04</td>
</tr>
<tr>
<td>6. Define learning objectives for each student based on individual needs.</td>
<td>3.18 S.D. 1.02</td>
</tr>
<tr>
<td>7. State variables that will be studied during the experiment.</td>
<td>3.12 S.D. 1.09</td>
</tr>
<tr>
<td>8. State hypothesis to students before carrying out experiments.</td>
<td>3.23 S.D. 1.08</td>
</tr>
<tr>
<td>9. Use different evaluation procedures for each student.</td>
<td>3.32 S.D. 0.99</td>
</tr>
<tr>
<td>10. Guide students in forming hypothesis before carrying out experiments.</td>
<td>3.79 S.D. 0.88</td>
</tr>
<tr>
<td>11. Ensure students memorise science concepts.</td>
<td>3.12 S.D. 1.14</td>
</tr>
<tr>
<td>12. Ensure students understand science concepts.</td>
<td>4.15 S.D. 0.72</td>
</tr>
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</table>

*teacher centred; student centred
6. Discussion and Conclusion

The results of this study proved encouraging as science teachers perceived their roles to be more student-centred during the instruction and viewed their role as more of a facilitator than being the sole authority of information dissemination. This is a positive indication as it suggests that teachers are emphasising student-centredness in their instructional practices. The integration of ICT in the teaching-learning process has greatly enhanced and fostered the use of more student-centred learning strategies (Norum et al., 1999). This means that the teacher’s role gravitates more to being more student-centred than being teacher-centred in conjunction with ICT use (Norum et al., 1999).

To conclude, this study suggests that science teachers have adopted a student centred approach when computers are available for use in the science laboratories. Despite this positive outcome, the result of this study is indicative that teachers may only be moderately ready to assume the student-centred role fully in the instruction within the science laboratories. This is not surprising given that the practice of the student-centred pedagogical approach in the computer-assisted environment needs time for assimilation into the actual learning environment (Sandholtz, Ringstaff and Dwyer, 1990). Sandholtz et al. (1990) warned that even when teachers are willing to embrace new technology, the change can be slow and sometimes in the extreme case; it can have an adverse effect.

References


